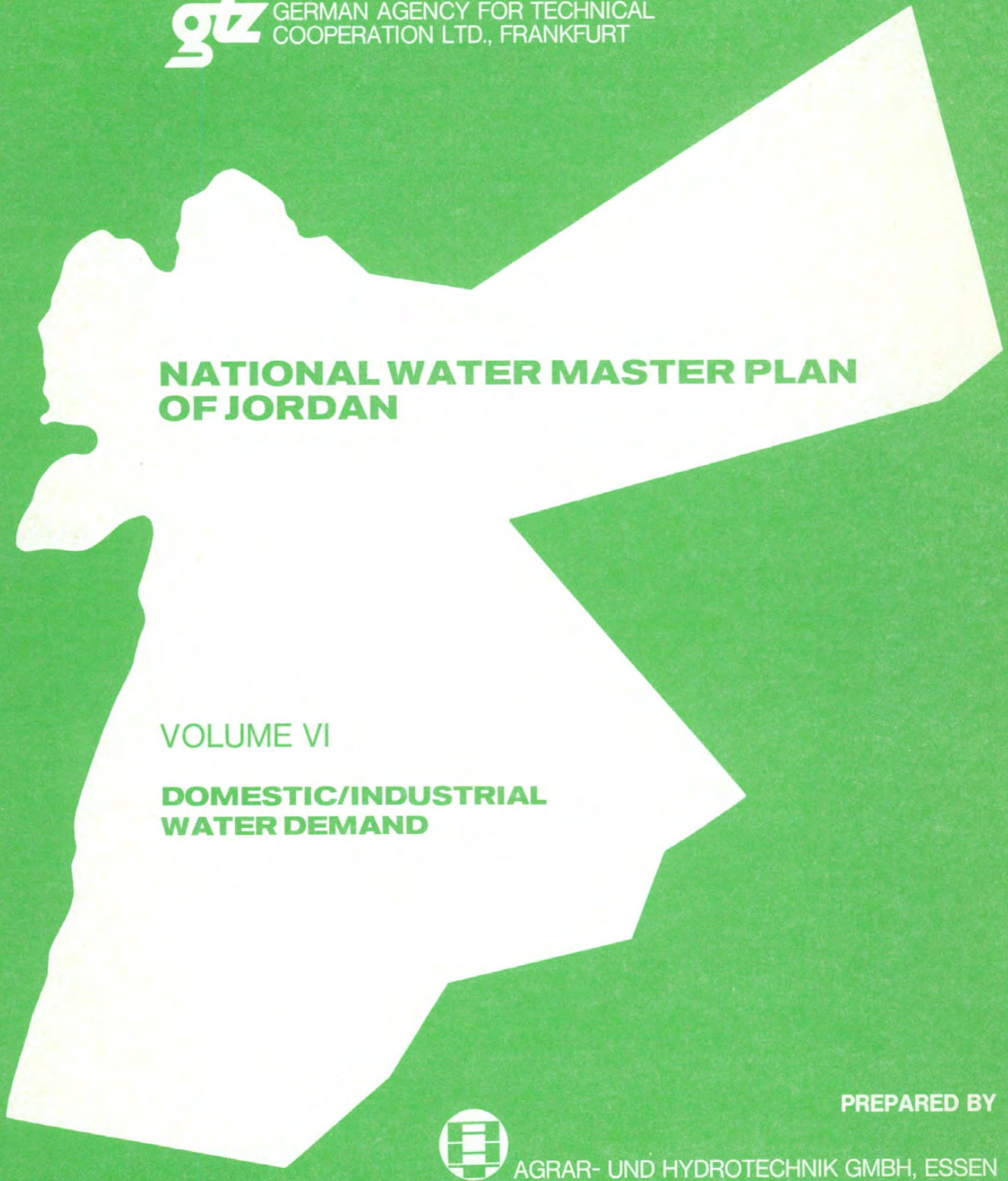
THE HASHEMITE KINGDOM OF JORDAN
NATURAL RESOURCES AUTHORITY, AMMAN

FEDERAL REPUBLIC OF GERMANY
GERMAN AGENCY FOR TECHNICAL COOPERATION LTD., FRANKFURT



NATIONAL WATER MASTER PLAN OF JORDAN

VOLUME VI

DOMESTIC/INDUSTRIAL WATER DEMAND

PREPARED BY

AGRAR- UND HYDROTECHNIK GMBH, ESSEN

BUNDESANSTALT FÜR GEOWISSENSCHAFTEN UND ROHSTOFFE, HANNOVER

JULY 1977

National Water Master Plan of Jordan

VOLUME VI

Domestic/Industrial Water Demand

I. INTRODUCTION
II. EXISTING WATER SUPPLY SYSTEMS
III. PRESENT WATER CONSUMPTION
IV. PROJECTIONS OF FUTURE WATER DEMAND
V. WASTE WATER DISPOSAL
VI. WATER QUALITY AND WATER POLLUTION CONTROL

ANNEX : SUMMARY TABLES
"MUNICIPAL AND INDUSTRIAL WATER SUPPLY, CONSUMPTION/DEMAND 1975 - 2000"

MAPS

Domestic/Industrial Water Demand

Table of Contents

		Page
I.	INTRODUCTION	1
II.	EXISTING WATER SUPPLY SYSTEMS	3
	1. General	3
	2. Extent and Organization of the Water Supply Systems in Jordan	4
	3. Description of Existing Water Supply Systems	7
	3.1 Municipal Water Supply Systems	7
	3.2 Industrial Water Supply	11
	4. Short-term Development of Municipal Water Supply Systems	12
III.	PRESENT WATER CONSUMPTION	18
	1. General	18
	2. Water Consumption in the City of Amman	19
	3. Water Consumption in the City of Zarqa	26
	4. Water Consumption in other Towns	27
	5. Water Consumption in Systems of the Water Supply Corporation	29
	6. Water Consumption from Unpiped Supplies	31
	7. Seasonal Fluctuations in the Water Consumption	32
IV.	PROJECTIONS OF FUTURE WATER DEMAND	37
	1. General	37
	2. Projections of the Future Unit Water Demand	38
	2.1 Domestic Unit Demand	38
	2.2 Demand for Commerce and Small Industries	43
	2.3 Water Losses in the Distribution Systems	44
	2.4 Municipal Unit Water Demand	45
	3. Estimates of Industrial Water Demand	48

		Page
4.	Present Production and Future Demand (area-wise)	56
4.1	Basic Principles	56
4.2	Consumer Groups	57
4.3	Present Water Consumption per Area	61
4.4	Estimate of the Future Area Demand	64
4.5	Recommendations for Future Survey of the Domestic/Industrial Water Demand	65
V.	WASTE WATER DISPOSAL	67
1.	Existing Waste Water Disposal Practices	67
2.	Sewerage System in the City of Amman	68
3.	Intended Development of Sanitary Sewerage System	71
4.	Projection of Waste Water Quantities	73
5.	Re-use of Waste Water	75
6.	Municipal Stormwater Drainage	76
VI.	WATER QUALITY AND WATER POLLUTION CONTROL	78
1.	Water Quality - General	78
2.	Water Quality Control in the Existing Water Supply Systems	79
3.	Water Quality Control and Pollution of Water Sources	81
4.	Preventive Measures for Protection of Water Sources	87
5.	Recommendations for Water Pollution Control	89
	REFERENCES	94

SCHEDULE OF FIGURES

		Page
1. WS-1	Water Supply Amman-Wadi Sir, 1962 - 1975	22
2. WS-2	Water Supply Amman, Groups of Service Connections and Corresponding Water Quantities Billed, 1975	24
3. WS-3	Water Supply Amman, Monthly Water Production 1974 and Monthly Climatic Parameters	35
4. WS-4	Water Supply Corporation, Monthly Water Production 1975	36
5. WS-5	Daily Municipal Unit Water Demand, 1975 - 2000	42

SCHEDULE OF TABLES

			Page
1.	WS 2-1	Population Served by Water Supply Systems	3
2.	WS 2-2	Municipal Water Supply Systems 1975	8
3.	WS 2-3	Current Extension Works carried out by WSC	15
4.	WS 3-1	Amman Water Supply, Water Production Billing Data 1973-1975	21
5.	WS 3-2	Water Production 1975 in Various Towns	28
6.	WS 3-3	Water Supply Corporation Systems, Water Produced/Delivered 1975	30
7.	WS 3-4	Monthly Water Production 1975	34
8.	WS 4-1	Annual Municipal Unit Water Demand 1975 - 2000	40
9.	WS 4-2	Daily Municipal Unit Water Demand 1975 - 2000	41
10.	WS 4-3	Industries with Independent Water Supply in Amman	49
11.	WS 4-4	Industries with Independent Water Supply in Zarqa	51
12.	WS 4-5	Water Demand for the Existing Industries in Aqaba	52
13.	WS 4-6	Industrial Consumption/Demand 1975 - 2000 in Aqaba	53
14.	WS 4-7	Consumption/Demand 1975 - 2000 for the Phosphate Mines	54
15.	WS 4-8	Population in Jordan, Piped and Unpiped Supply	59
16.	WS 4-9	Utilization of Produced Water 1975	62/63
17.	WS 5-1	Waste Water Factors	74
18.	WS 6-1	Bacteriological Examination of Drinking Water	80
19.	WS 6-2-1	Results of Water Examination Jordan River East Side Wadis	83
20.	WS 6-2-2	Results of Water Examination Yarmouk River and Dead Sea East Shore Wadis	84
21.	WS 6-3	Results of Water Examination, Zerqa River Basin	85/86
22.	WS 6-4	Drinking Water Standards	92/93

LIST OF MAPS

1. Map WS-1 — Water Supply Systems in Jordan, 1975-1980

2. Map WS-2N, Map WS-2S — Water Production / Consumption 1975

3. Map WS-3N, Map WS-3S — Domestic Consumption / Demand 1975

4. Map WS-4 — Industrial Water Supply 1975 - 1985

5. Map WS-5 — Projected Domestic / Industrial Demand 1985 - 2000

Glossary of Abbreviations

m	-	metre
l	-	litre
ml	-	millilitre
h	-	hour
y	-	year
MCM	-	million cubic metres
l/c/d	-	litres per capita per day
m^3/h	-	cubic metres per hour
mg/l	-	milligrams per litre

I. INTRODUCTION

Within the scope of investigations preparatory to the formulation of the National Water Master Plan, the present conditions of domestic and industrial water supply were reviewed and projections were established with regard to future water demand/waste water production. These data constitute basic components for the comparative consideration of plans and policies for the utilization of the water resources.

The review of the present situation is based on data of 1975. The available information on domestic and industrial water supply has been evaluated, and consideration was given to the potential water demand under present conditions in order to identify the existing inadequacies and constraints.

Based on existing development plans and trends, medium-term (year 1985) and long-term (year 2000) water demand projections have been formulated accordingly in a first approach.

Further estimates have been made regarding the quantities of waste water from domestic and industrial consumer groups, and particular attention has been paid to problems and aspects related to water resources pollution and quality control.

Information was primarily received from the following authorities:

- the Ministry of Municipal and Rural Affairs, Amman
- the Amman Water and Sewerage Authority (AWSA), Amman
- the Water Supply Corporation (WSC), Amman.

Additional data were obtained and conclusions were developed through contacts and discussions with other local agencies and institutions concerned and through the investigations on socio-economic trends and regional development aspects, which were part of the integrated multi-disciplinary approach for the formulation of the National Water Master Plan.

II. EXISTING WATER SUPPLY SYSTEMS

1. General

This chapter deals with the present conditions of domestic and industrial water supply, in particular with the organization of the water supply in the country, the description of the water supply systems, and the existing short-term development plans of the authorities.

In 1975 about 80 per cent of the country's population of 1.95 million inhabitants, living in about 800 communities [x)] , was served by public water supply systems. The remainder depended on water carried from nearby springs, cisterns or other water sources.

The following table indicates the present situation of the domestic water supply with regard to the population:

Table WS 2-1 Population Served by Water Supply Systems

Communities Number of Inhabitants	No.	Total Population 1975 No.x 10^3	%	Population Served by Piped Water Supply No.x 10^3	%	Unpiped Systems No.x 10^3	%
more than 100,000	3	910.0	47	910.0	100	-	0
10,000 - 100,000	14	269.0	13	250.0	93	19.0	7
3,000 - 10,000	71	305.0	16	142.7	47	162.3	53
less than 3,000	712	468.0	24	239.0	52	229.0	48
Total	800	1,952.0	100	1,541.7	80	410.3	20

x) Reference is made to Volume VII

The total water production in 1975 summarized on the base of information received from the water supply authorities can be divided between the consumer groups as follows:

- cities and towns	22.9 MCM
- small communities	5.8 MCM
- various other consumers	1.7 MCM
- industry	10.0 MCM
- for the population not connected to piped systems	5.3 MCM
Total	45.7 MCM

Therefore about 28.7 MCM of water was supplied to a population of about 1.55 million by means of piped water supply systems. The average consumption per capita per day amounts to about 51 l, including the consumption of commerce and small industries in the towns. If losses are considered, then the actual average consumption drops to about 40 l/c/d. The actual consumption in the individual systems, in fact, varies considerably.

The reasons for this obviously insufficient supply are the actual shortage of potable water in the country, the irrational utilization of water resources, and the unexpected increase in the population due to political events.

The water supply authorities are concerned about the present situation and there are plans for improvement and extension of the water supply systems in the future.

2. Extent and Organization of the Water Supply Systems in Jordan

The public water supply systems in Jordan are managed and operated by municipalities or special governmental

agencies. Large industrial enterprises generally have their own deep wells. Some of the industries in Amman and Zarqa area receive water from the public network.

City of Amman

Until 1972 the public water supply in Amman was operated by the municipality. In 1973 the Amman Water and Sewerage Authority (AWSA) took over the responsibility for the water supply and sewage systems. The operation of the stormwater drainage facilities remains the concern of the municipality. In 1975 AWSA produced about 17 MCM of water from deep wells and springs near Amman for some 600,000 inhabitants and other consumers in the city. The water distribution is effected through the municipal pipe network and locally also by means of tank cars, as the network does not meet the requirements in all areas. The costs of operation and maintenance are covered through water fees charged to the consumers. Investments for construction and system extensions, however, are substantially supported by the municipality and the government.

Other Towns

The Ministry of Municipal and Rural Affairs, through the municipalities, supervises the water supply system in the following towns (each with a population of more than 10,000):

Suweileh	Jarash
Wadi Sir	Souf
Zarqa	Salt
Ruseifa	Karak
Ajlun	Ma'an.

In 1975 the systems of these towns produced about 6.6 MCM of water for about 340,000 inhabitants. The Ministry supports the municipalities in the operation and maintenance of the systems as well as with the necessary investments for improvement and extension of the works.

Water Supply Systems under the Operation of the Water Supply Corporation

The Water Supply Corporation was established in 1972 as a special agency for water supply. WSC took over the control of all water supply systems previously operated by the Natural Resources Auhtority (NRA). There are plans to incorporate all the water supply systems in the Kingdom into the administration of the Water Supply Corporation by 1980.

The WSC headquarters in Amman is the centre of the administration, design, operation and maintenance divisions. A number of branch offices all over the country maintain and operate the local systems. They are also in charge of water metering and billing. Among the total WSC staff of about 550 there are 35 engineers. Operation and maintenance costs are largely covered by water fees, while investments for system improvements, extensions, and new projects are supported by the Government.

In 1975 Water Supply Corporation operated the following "grouped water supply" systems:

- Northern District
- Tannour
- Ain Deek
- Wadi Rajib
- South of Amman
- Ghuweir
- Tafila
- Shaubak
- Aqaba

A total of about 7.5 MCM, produced mainly from deep wells, was distributed through these systems to about 600,000 inhabitants and other consumers. The water is delivered by WSC through main pipelines to transfer stations in each community. There it is metered and distributed through the network. About 25 per cent of the water is supplied directly to individual consumers, including governmental institutions, the remaining 75 per cent is distributed by the communities through their own pipe networks. A number of villages receive water by WSC-operated tank cars, and several "desert stations" (wells drilled and operated by WSC) provide the water supply for the Bedouins. In some cases permanent settlements have developed in the vicinity of such "desert stations".

3. Description of Existing Water Supply Systems

3.1 Municipal Water Supply Systems

The first municipal water supply systems was constructed in the thirties in the City of Amman. Most of the existing systems were completed in the fifties and sixties.

Two classes of water supply systems can be distinguished: those supplying only one single municipality, and grouped systems under the control of WSC which are supplying several communities from one water source.

The municipal water supply systems in operation in 1975 are listed in Table WS 2-2 and shown on Drawing No. WS-1 "Water Supply Systems in Jordan 1975 - 1980".

All these systems use groundwater, which is pumped either from deep wells or from springs and in most cases stored in small reservoirs near the water sources. There is no

Table WS 2-2

Municipal Water Supply Systems
1975

System	operated by	Raw water sources		Population served	Water production	Water quantity accounted for
		deep wells	springs	x 10^3	m^3 x 10^3	l/c/d
Amman	AWSA	x	x	606.6	15,278.0	37.0
Zerqa	M	x		184.0	3,150.0	27.8
Ruseifah	M	x		43.0	500.0	20.7
Salt	M	x	x	29.0	550.0	33.9
Aqaba	WSC	x		16.1	725.0	80.9
Souf	M		x	15.0	117.0	14.0
Wadi Sir	M		x	15.0	566.0	67.5
Suweileh	M		x	15.0	597.0	71.0
Ma'an	M	x		12.0	304.0	45.2
Karak	M		x	12.0	365.0	54.2
Jarash	M		x	11.0	365.0	59.2
Ajlun	M		x	4.0	146.0	65.0
Northern District	WSC	x	x		3,613.5	
- Irbid				119.1		20.0
- Mafraq				17.0		50.4
- Ramtha				25.4		28.0
- El Husn				10.0		31.3
- Other communities				195.2		20.0
Tafileh	WSC	x		20.0	322.0	71.4
South of Amman with Madaba	WSC	x		96.5	1.160.0	23.7
Ghuweir	WSC	x		62.2	492.0	17.7
Tannour	WSC	x		28.0	286.0	23.3
Shaubak	WSC	x		10.0	71.0	16.5
Wadi Rajib	WSC	x		6.9	75.5	25.0
Ain Deek	WSC		x	5.2	60.0	26.3
Total				1,558.2	28,742.0	

Note: M = Municipality

WSC = Water Supply Corporation

treatment of the raw water for drinking purposes, but in all the systems the water is chlorinated in the storage reservoirs. However, the chlorination does not always function properly.

The water is pumped from the reservoirs through feeder mains to the distribution systems of the individual communities. Practically all distribution networks are equipped with small storage tanks. In most of the systems the lifting head of water exceeds 150 m, in some cases being considerably higher. All kinds of pipe material have been used for the construction of the feeder mains and the distribution networks. In some cases the pipes are not insulated internally and have no outside protection. Very often the pipes are laid above ground and very poorly protected at the road crossings. The water is delivered to the individual consumers through house connections, where it is metered. The meters are owned by the consumers. Nearly all internationally known types of water meters can be found in the water supply systems.

All water supply systems are subdivided into supply areas, the size of which depends on local and topographical conditions. Due to the shortage of water and the high head losses in systems of an inadequate size these areas can be supplied only periodically, i.e. one or two days per week. In some cases the water supply is operated only every tenth day. A continuous supply for the whole distribution system would deprive the consumers of water in the higher region. Water tanks are installed on the roofs of the individual houses in Amman and in other communities to reduce the inconvenience of having only a part-time supply.

The volume of water unaccounted for, i.e. the difference between the quantities produced and those billed, amounts

to about 50 per cent in the City of Amman, about 35 per cent in towns operating their own water supply systems, and between 20 per cent and 35 per cent in WSC's grouped systems with an average of about 28 per cent. Details on this subject are given in Chapter III.

The water quantities accounted for per inhabitant and day vary between less than 20 l/c/d and more than 70 l/c/d. These data should not be considered as the real domestic consumption because they include the consumption of commerce and small industries as well as some large industry in the cities of Amman and Zarqa. In some systems the real domestic consumption is reckoned to be higher than recorded, due to faulty water meters. The real consumption in the WSC systems is assumed to be less than calculated because of the additional losses in the individual distribution systems.

A brief description of the existing water supply will now be given:

- The City of Amman is supplied from wells and springs in the vicinity of the city and additionally from springs in the Wadi Sir area. Practically the whole built-up area of the city is covered by the distribution network. Part of the water from the Wadi Sir springs is delivered by AWSA to the town of Wadi Sir.

- The City of Zarqa is supplied from its own wells.

- The City of Irbid is supplied by the Northern District System of WSC.

- The town of Madaba operates its own raw water source, the Mosa springs. Additionally, water is delivered to Madaba by WSC's "South of Amman System" from wells south of Amman.

- The town of Aqaba is supplied from the Wadi Yutum wells, operated by WSC.

- The towns of Karak, Jarash, Ajloun and Salt are supplied from their own springs.

- The raw water sources of the Northern District System of WSC are;

  a) the Azraq springs
  b) the Summayya wells
  c) the Dhuleil wells

  Part of the water from these sources is used to supply individual consumers and small communities in the areas nearby, and the surplus is pumped to the Zaatary booster station, from where it is piped to the western part of the system.

- The rest of the towns and communities are supplied either by WSC's systems or by their own municipal systems with water originating from wells and springs nearby.

- Besides these piped systems, AWSA and WSC operate tank cars which supply individual consumers in the higher areas of Amman and in scattered villages in the country.

3.2 Industrial Water Supply

Two classes of industries can be distinguished with respect to water supply:

- industries supplied by public networks;
- industries operating their own raw water supplies.

The former are mostly small enterprises with a negligible water consumption while the latter are important industries such as phosphate mines, a cement factory, textiles factories, a refinery, etc. which require large quantities of

water for the technological processes. They normally operate deep wells in the vicinity of the works.

The consideration of the industrial water supply systems in this Report has been restricted to the water consumption and demand, which are discussed in detail in Chapter IV. Technical details of the systems have been omitted as being outside the scope of the study.

4. Short-term Development of Municipal Water Supply Systems

Two different aspects of the development of municipal water supply systems can be considered: the improvement of existing networks and distribution, and the development of new sources of water.

The water supply authorities plan to reduce the enormous water quantities unaccounted-for to a technically acceptable level. The achievement of this target would strengthen the financial position of the authorities as larger water quantities would be billed without any increase in maintenance and operation costs.

With improvement and extension of the existing network, a better distribution and quality of water supply could be achieved, without any further increase in the water quantities produced.

In view of the limited capacity of the raw water sources under operation and the rapid increase of the population in the country, several projects for development of new sources are under way, most of them being part of the National Development Plan 1976 - 1980.

City of Amman

The AWSA intends to extend the distribution network with the development of the built-up areas in the city.

The authority, being aware of the scarcity of groundwater within the Amman Basin and the incessant increase of the city's demand, in 1976 commissioned the Swedish consultants VBB to undertake a study of potential water resources for Amman water supply. VBB submitted the report "Water Resources Study for Amman Water Supply" in November 1976.

The study has indicated that the groundwater resources within the Amman area will be able to meet the demand up to 1980. Several outside water resources have been studied for the future water supply of the city, and after final evaluation of all of them, only two of them have been considered within the feasible master plan alternatives. The proposed Master Plan outlines the following stages of development:

1) 1977 - 1980
   Development of the groundwater resources in Amman up to an average use of 25 MCM/year.

2) 1980 - 1991
   Development of the King Talal Dam project (1st stage) in two steps of 20 MCM/y and 12 MCM/y respectively. This stage includes construction of a water intake at the dam, transmission pipeline with pumping stations, treatment plant, and reservoir.

3) 1991 - 1996
   Development of the Upper Wadi Wala Dam project with an output of 12 MCM/y, including dam structure, intake, transmission pipeline with pumping stations, treatment plant, and reservoir.

4) 1996 - 2005

Development of the King Talal Dam project (2nd stage), implying a doubling of existing facilities and installation of a denitrification plant as the concentration of the dissolved solids and nitrates in the water is expected to increase due to recycling of waste water in the Zarqa River Basin.

Water Supply Systems Operated by WSC

The Water Supply Corporation has a large programme for the improvement and extension of existing systems. The intention is to connect additional villages to the systems and to increase the systems' capacity. The largest extension works under way in 1976 were for the improvement of the Northern District System.

The capacities of the water sources in the system have been increased, additional pump units have been installed at the pumping stations in Azraq, the Summayya wells, and the Dhuleil wells, and at Zaatary booster station. After completion of the works the new outputs will be as follows:

Azraq pools	300 m^3/hour
Summayya wells	300 m^3/hour
Dhuleil wells	600 m^3/hour

An additional pipeline from the Zaatary booster station to the Irbid area was under construction.

Further extension of the Northern District System eastwards to supply an additional 25,000 people has been envisaged.

Table WS 2-3 gives the current extension works on various WSC systems, most of which will be in operation in 1978.

Table WS 2-3 Current Extension Works Carried out by WSC

Project Description	Location	population served	Water Source Type	Yield m^3/h
Sarrut System	between Zarqa and Jarash	10,000	spring	15
Hashimiya System	west of Zarqa	10,000	well	25
Yazidiya System	north of Salt	10,000	well	20
Yarqa System	Salt and vill.		spring	100
El Qa System	west of Ma'an	30,000	well	100
Connection of Tafilea system to Shaubak system	northwest of Ma'an	80,000	wells	200

The largest project on the WSC's list of short-term development is the Irbid-Yarmouk Water Supply. A preliminary report was prepared by the Engineering Services Department of Crown Agents, London, in 1976. It is intended in the future to supply the city of Irbid and the surrounding area with additional water from Yarmouk River. Plans for the construction of the multipurpose Maqarin Dam in the valley of Yarmouk north of Irbid are under way. Part of the stored water, up to a maximum of 26 MCM/year, will be available for domestic water supply.The proposed construction programme provides for 4 phases of development, each with an average output of 18,000 m^3/day. As the time schedule for the construction of the dam is uncertain, a temporary intake on Yarmouk River will be erected in Phase I, together with raw water pumphouse and pipeline, treatment plant with receiving tanks, filters, etc., second stage pumping station and treated water pipeline and storage reservoir with a capacity of equal to the average daily output. Additional pipelines, pumping sets, treatment plant, and storage capacities will follow in the subsequent construct-

tion phases. It is recommended that the first phase should be already in operation in 1979, and the whole scheme should be complete in 2006.

The WSC commissioned the Britisch consultants Howard Humphreys & Sons to undertake a feasibility study for the supply of Aqaba with water from the Qa'Disi wells. It is expected that the report will be submitted in July 1977. The rapid development of Aqaba as an international port and industrial center necessitates a large extension of the water supply system. As potential sources of raw water 8 deep wells in Qa'Disi are considered, about 50 km northeast of Aqaba with an estimated maximum output of 24 MCM/y. Most probably the development of this project will provide for a supply of 17.5 MCM/year in 1995. The project will consist of the construction of a transmission pipeline to Aqaba, storage reservoirs, and a distribution system.

The extension of the South of Amman System to the south and the development of new sources of water is under consideration. The project aims at a future domestic supply in the area entirely from the well fields of Suwaqa and Qastal. The expected maximum output for domestic water supply is about 300 - 350 m^3/h. After completion of the scheme in 1980 - 1981 the supply from the Amman area will be cut off and this water used as an additional supply for the City of Amman.

Jordan Valley Authority

As part of a large programme for the development of Jordan Valley region, the Jordan Valley Commission plans to construct grouped water supply systems for some newly founded communities:

- the Janshiya System 15,000 inhabitants
- the Waqas System 18,000 inhabitants
- the Subera System 18,000 inhabitants
- the Wadi Shueib System 30,000 inhabitants

The projects are in the design stage, and the number of inhabitants to be supplied are 1980 - 1985 projections.

III. PRESENT WATER CONSUMPTION

1. General

The basic data on water consumption in 1975 dealt with in this chapter have been obtained from the water supply authorities concerned. It is very difficult to estimate the degree of accuracy in the recording of the water quantities produced. Some of the raw water sources are equipped with water meters, in which case the readings have been recorded. But most of the sources lack any metering devices and the water quantities produced have been estimated on the basis of the daily operation time and the capacities of the pumps, considering the output flow as constant, although the lifting heads are subject to seasonal fluctuations. Therefore the water production figures can only be regarded as approximate.

The number of people served by WSC or the municipalities should also be considered as rather inaccurate assumptions. In some of the areas supplied the number of inhabitants has been adjusted according to the methods applied in Volume VII "Socio-Economic and Regional Development Aspects".

The calculation of the actual water consumption has been made separately for the following groups of water supply systems:

- City of Amman
- City of Zarqa
- other towns, supplied by their own system
- WSC's systems
- unpiped supplies.

The results are always given as average values and they are defined as "water quantities produced". For

a better analysis of water utilization a breakdown of the total water quantities produced has been made, the main components being as following:

- domestic use
- use by commerce and small industries
- industrial use from public networks in the cities of Amman and Zarqa
- water losses and/or quantities unaccounted for.

The consumption in industries which operate their own wells has been studied separately, together with the future requirements, in Chapter IV. For the sake of completeness the data on industries supplied by public networks in the cities of Amman and Zarqa are mentioned in Sub-chapters III-2 and III-3 respectively.

2. Water Consumption in the City of Amman

The data obtained from the AWSA consist of the following:

- the annual water production from the wells in Amman and the springs in Wadi Sir for the period of 1962 - 1975;
- the annual water production for the period of 1973 - 1975 sub-divided into:
  . quantities delivered to the town of Wadi Sir,
  . billed quantities delivered to consumers connected to the Amman network,
  . quantities distributed by tank cars within the City of Amman.

The above mentioned data have been presented in Table WS 3-1 and Fig. WS-1 and could be interpreted in the following way. The increase of water consumption does not follow the increase of the water production. There is no connection between the produced/consumed water and

the number of people supplied, as the increase in the amount of water supplied is higher than the growth of the population. Peaks of water production in the years 1964 - 1966 and 1971 - 1972 could not be reasonably explained. The increase of "consumption per capita per day" is negligible, providing consumption by commerce and small industries is included. The difference between the water quantities produced and those billed amounts to 50 per cent or even more. It contains not only the water losses in the system but also all "quantities unaccounted for". Hence there is reason enough to question these data and especially the amount of water consumed.

The situation can be changed considerably if the results of a leakage survey in the Amman distribution system undertaken by the Swedish consultants VBB in 1975 are taken into account. The reports stated that the technical water losses in the Amman network in 1975 amounted to about 1.9 MCM.

Thus the following estimate can be made:

- water delivered to the distribution network in Amman in 1975 as per Table No. WS 3-1	16,891 $m^3 \times 10^3$
- minus losses according to the leakage report	- 1,900 $m^3 \times 10^3$
- assumed additional losses for safety's sake (thus total technical losses of 20 per cent)	- 991 $m^3 \times 10^3$
Water consumed in Amman in 1975	14,000 $m^3 \times 10^3$

As result of this assumption the average consumption per inhabitant would be

$$\frac{14{,}000 \times 10^3}{606{,}600 \times 365} = 63 \text{ l/c/d.}$$

Table WS 3-1

Amman Water Supply

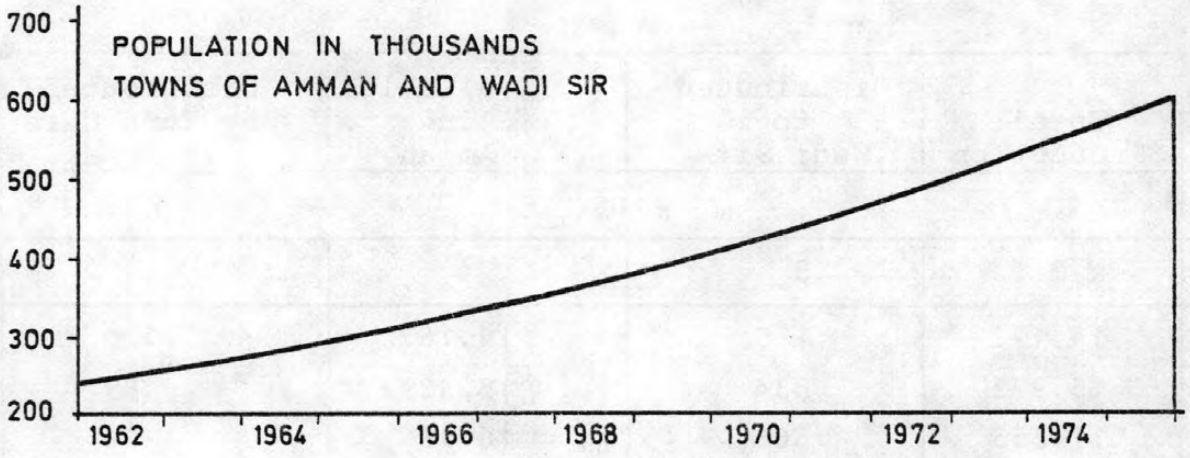
Water Production/Billing Data 1973-1975

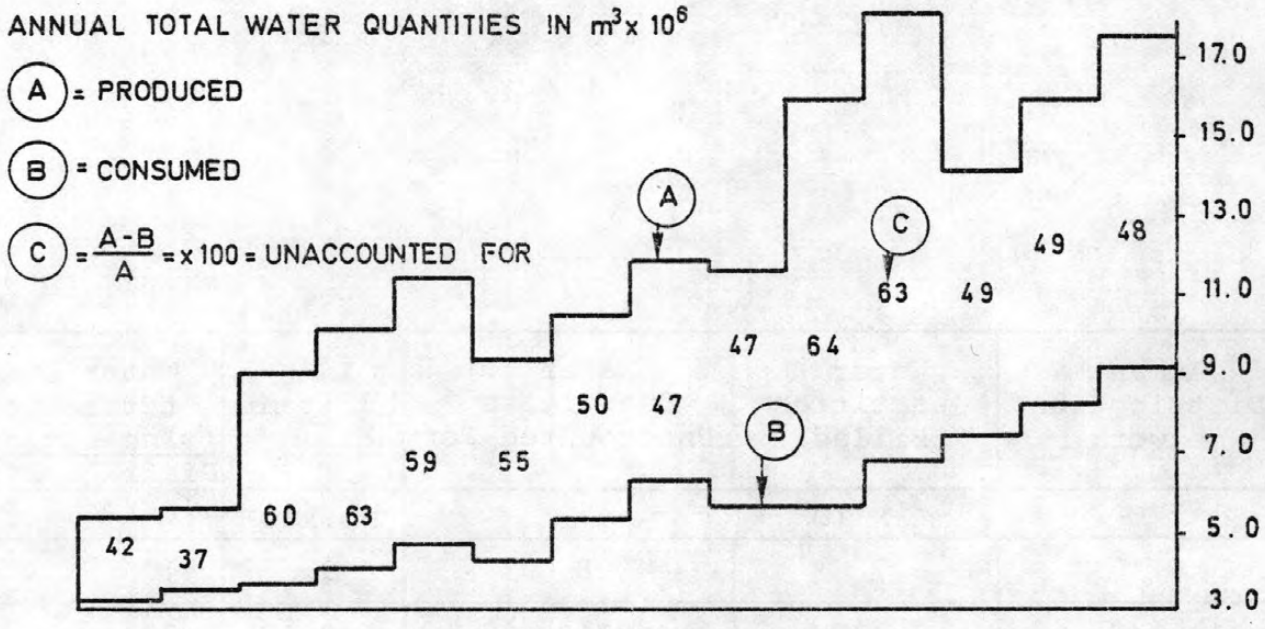
Year	Total Production	Distributed to Wadi Sir	Available in Amman	Distributed by Tank Cars in Amman
	$m^3 \times 10^3$			
1	2	3	4	5
1973	14,172	5	14,167	120
1974	15,973	534	15,439	89
1975	17,553	566	16,987	96

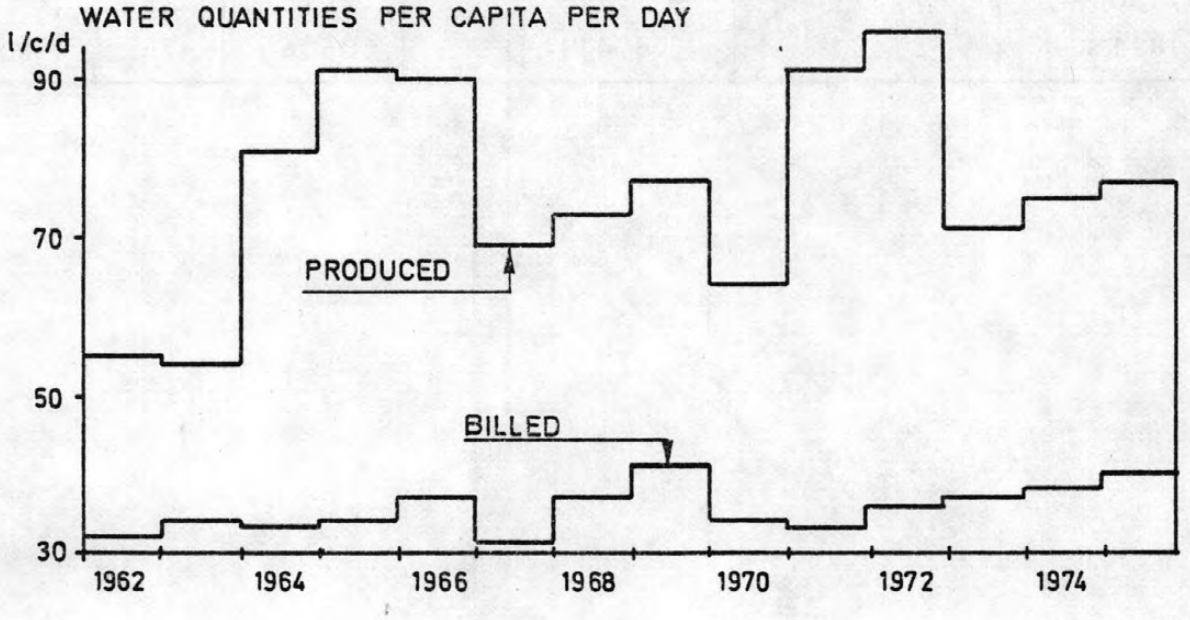
Amman Distribution Network	Water Quantities Billed	Water Quantities Unaccounted For	Inhabitants	Water Quantities per Inhabitant	
				Distrib.	Billed
$m^3 \times 10^3$			No.$\times 10^3$	l/c/d	l/c/d
6	7	8	9	10	11
14,047	7,335	6,712	533.1	72	37
15,350	7,571	7,779	568.5	74	36
16,891	8,480	8,411	606.6	76	38

WATER SUPPLY AMMAN - WADI SIR

1962 - 1975







Thus the quantity of water unaccounted for - 8,411 m^3 x 10^3 - (Table No. WS 3-1) has been reduced, as a result of the above assumption, to technical water losses, amounting to 16,891 - 14,000 = 2,891 m^3 x 10^3. This figure seems to be more realistic, because for various reasons the quantities metered by the service connections tend to be on the low side. Some of the meters in Amman are out of operation. Many types of old meters do not meter small quantities. The reading system itself may need improvement.

Therefore the real consumption in the City of Amman can be assumed as higher than that stated in Table No. WS 3-1.

There was no information available about the water quantities supplied to various consumers, e.g. domestic use, small industries and commerce, industries. A study for the projection of the future water rates prepared by AWSA has been used to facilitate the desired breakdown. As a base for further analyses all service connections in Amman in 1974 are grouped according to their quarterly consumption as follows:

10 groups with a consumption of up to 100 m^3/quarter
16 groups with a consumption from 100 - 1,000 m^3/quarter
5 groups with a consumption from 1,000 - 1,500 m^3/quarter
1 group with a consumption of more than 1,500 m^3/quarter

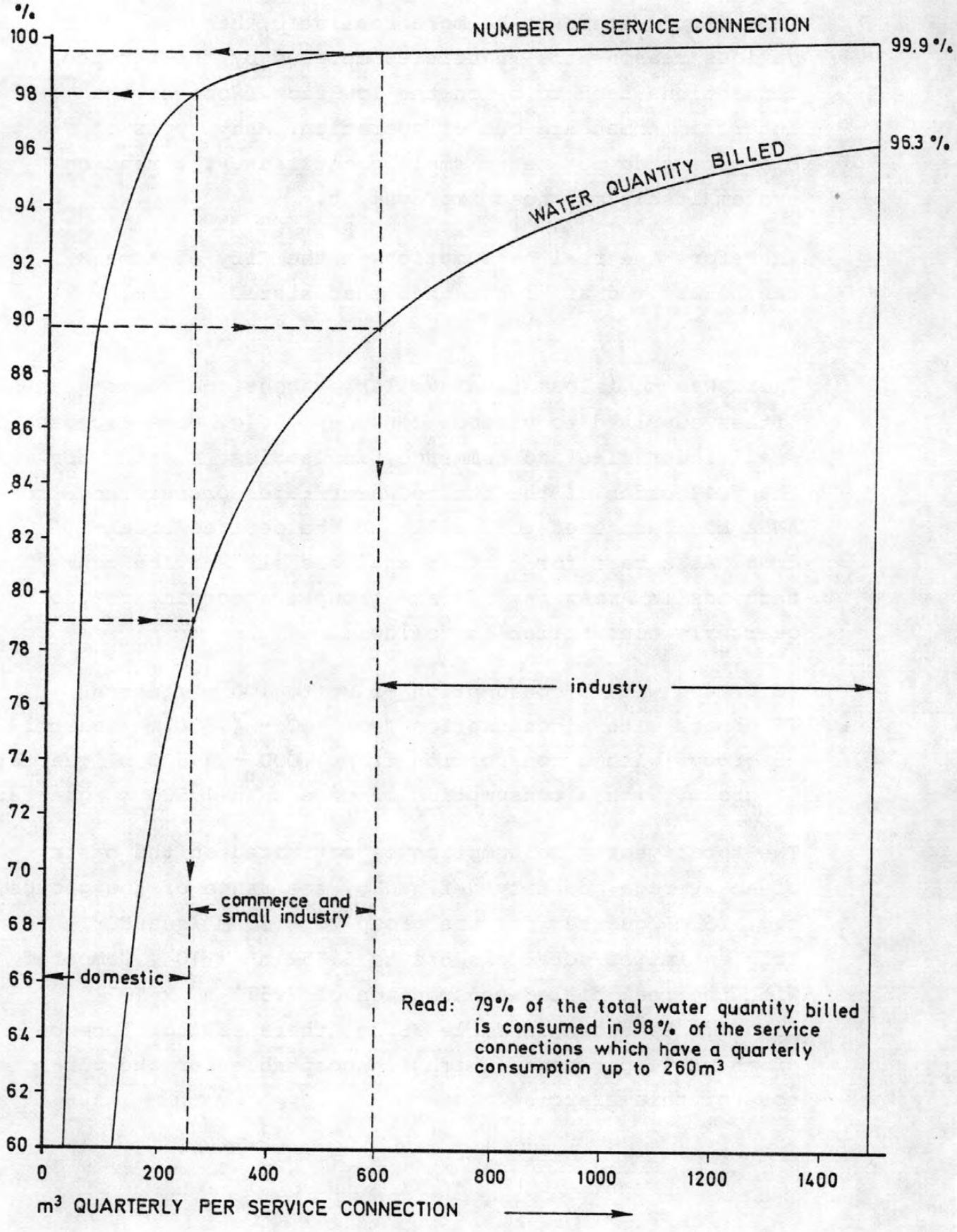
The total yearly consumption is estimated on the basis of an average quantity defined by the range of the groups, e.g. 25 m^3/quarter for the group 20 - 30 m^3/quarter. This estimated total amounts to 6,752 m^3 x 10^3. Compared with the real billed consumption of 7,571 m^3 x 10^3 for 1974 as shown in Table WS 3-1 there is a difference of about 11 per cent, which is acceptable for the purpose of this exercise.

FIG. WS - 2

WATER SUPPLY AMMAN

GROUPS OF SERVICE CONNECTIONS AND CORRESPONDING WATER QUANTITIES BILLED

1975



Based on the data from this study Fig. WS-2 has been drawn showing the percentage of the service connections and the corresponding water quantities billed versus the groups of connections. Assuming the upper limits of quarterly consumption for domestic connections and commerce/small industries to be 260 m^3 and 600 m^3 respectively, the following breakdown can be made:

Consumer group	Number of Service connections		Water quantity	
	No.	%	$m^3 x 10^3$	%
domestic consumption	39,200	98	11,060	79
commerce and small industries	600	1.5	1,540	11
Industries	200	0.5	1,400	10
Total	40,000	100.0	14,000	100

The average domestic consumption per inhabitant would then amount to 50 l/c/d. Finally, on the base of the water production figures for 1975 as per Table WS 3-1 and the computed percentage of distribution from the above table, a breakdown of the water produced has been made.

Total production 1975 (see Table WS 3-1)	16,987 $m^3 \times 10^3$
Production for domestic use (16,987 x 0.79)	13,419 $m^3 \times 10^3$
Production for commerce and small industries (16,987 x 0.11)	1,868 $m^3 \times 10^3$
Production for industries (supplied from the networks) (16,987 x 0.10)	1,700 $m^3 \times 10^3$

3. Water Consumption in the City of Zarqa

The water supplied to the consumers in the City of Zarqa originates from deep wells operated by the municipality. The total quantity produced in 1975 amounted to 3,500 $m^3 \times 10^3$, 73.5 per cent of which was billed to the population of 184,000 inhabitants. Adopting the relation established in Sub-chapter III-2, 79 per cent of the quantities billed were supplied to domestic connections. Thus the average billed consumption in 1975 was about 30 l/c/d.

The large industrial enterprises located in the City of Zarqa operate their own deep wells; details on their production are given in Sub-chapter IV-2.5.

Assuming the same distribution of the total water quantity to the various consumers as for the City of Amman (Fig. WS-2) the water production for the City of Zarqa in 1975 can be broken down as shown below:

Total production 1975	3,500 $m^3 \times 10^3$
Production for domestic use (3,500 x 0.79)	2,765 $m^3 \times 10^3$
Production for commerce and small industries (3,500 x 0.11)	385 $m^3 \times 10^3$
Production for industries (supplied from the networks) (3,500 x 0.10)	350 $m^3 \times 10^3$

4. Water Consumption in other Towns

Local investigations on water production and water consumption have been made in towns which run their own water supply systems and which have not been mentioned in the previous sub-chapters. A part of the data obtained from the municipalities were incomplete and some seemed to be of doubtful accuracy. In spite of this, the data have been compiled and evaluated in Table WS 3-2, with regard to which the following comments can be made.

The number of people served, as given by the municipalities, differ from the numbers adopted in Volume VII. However, the differences are not significant.

The municipalities have not been able to provide records for the water quantities unaccounted for. An average of 35 per cent has been assumed.

The distribution of the water quantities accounted for between domestic use and commerce and small industries is in the relation of 88 per cent to 12 per cent, i.e. the same ratio as for the cities of Amman and Zarqa, if the industrial consumption is omitted.

The annual water production in the town of Aqaba was estimated to be 1,000 $m^3 \times 10^3$. The consumption in the port area amounts to about 275 $m^3 \times 10^3$, including 1o per cent losses. Therefore 725 $m^3 \times 10^3$ is considered as domestic consumption.

The total production of the Azraq Spring at Suweileh was 657 $m^3 \times 10^3$. Since about 60 $m^3 \times 10^3$ was delivered to the cement factory in Fuheis, only 597 $m^3 \times 10^3$ was available for the town of Suweileh.

Table WS 3-2 Water Production 1975 in various towns

Name of Town	Population	Water Sources		Water Production	Water quantities unaccounted-for		Water quantities accounted-for		
		deep wells	springs				domestic use	commerce, small industries	per capita and day
	No.x10^3	-	-	m^3x10^3	%	m^3x10^3	m^3 x 10^3		l/c/d
Ruseifah	43.0	x	-	500.0	35	130.0	325.6	44.4	20.7
Salt	29.0	x	x	550.0	35	142.0	359.0	49.0	33.9
Aqaba	16.1	x	-	275.0 725.0	- 35	- 188.0	- 472.5	- 64.5	80.9
Suf	15.0	-	x	117.0	35	30.0	76.5	10.5	14.0
Wadi Sir	15.0	-	x	566.0	35	146.0	369.6	50.4	67.5
Suweileh	15.0	-	x	60.0 597.0	- 35	- 155.0	389.0	- 53.0	71.0
Ma'an	12.0	x	-	304.0	35	79.0	198.0	27.0	45.2
Karak	12.0	-	x	365.0	35	95.0	237.6	32.4	54.2
Jarash	11.0	-	x	365.0	35	95.0	237.6	32.4	59.2
Ajlun	4.0	-	x	146.0	35	38.0	95.0	13.0	65.0
Madaba	30.0	x	x	104.7 208.0	39	108.4	197.5	26.9	16.5

The town of Madaba was supplied from the Mosa springs with 200 $m^3 \times 10^3$ and from the WSC's South of Amman System with 104.7 $m^3 \times 10^3$ in 1975.

5. Water Consumption in Systems of the Water Supply Corporation

The Water Supply Corporation made available the following data on the water consumption from piped water supply systems operated in 1975:

- the water quantities produced, i.e. pumped ex wells for each water supply system;
- the number of people served in each community connected to WSC systems as well as the quantity of water sold to each community.

The data have been evaluated in detail and the results summarized in Table WS 3-3.

The total water quantities produced are divided between communities and "other consumers", the latter being governmental institutions such as army camps. The ratio of distribution between these two categories of consumers is in the range of 80 : 20 for all WSC systems.

The water losses as shown in Table WS 3-3 represent the differences between the water quantities pumped ex wells and those metered at the transfer stations, i.e. the losses in the transmission pipeline. They vary from 13.5 per cent to 35 per cent for the different systems with an average of 28.6 per cent for all WSC systems. These figures seem to be very high for trunk pipelines and the explanation could be found in a combination of several factors such as leakages in old pipelines, discrepancies in the metering systems at the wells and at the transfer stations, and illegal on-line connections.

Table WS 3-3

Water Supply Corporation Systems
Water Produced / Delivered
1975

No	Name of Water Supply System		Population Served in Communities	Total Water Quantity			Water Losses	Per Inhabitant and Day		Delivered to	
				Produced	Delivered to						
					Communities	Other Consumers		produced	delivered	Communities	Other Consumers
			No.x10^3	$m^3 \times 10^3$			%	l/c/d		%	
0	1		2	3	4	5	6	7	8	9	10
1	Northern District Distrib. in the	Azraq Area	13.2		104.7	357.4			21.7	23	77
		Summayyah Area	18.9		337.7	332.3			50.0	50	50
		Western Area	334.6		2,244.2	193.3			18.4	92	8
		Total	366.7	4,818.1	2,686.6	883.0	35.0	27.1	20.0	75	25
2	Tannour System		28.0	304.0	238.5	15.5	19.6	27.9	23.3	94	6
3	Ain Deek System		5.2	130.5	50.0	58.0	20.0	31.6	26.3	46	54
4	Wadi Rajib System		6.9	75.5	63.0	-	20.0	30.0	25.0	100	-
5	South of Amman	1 Section	39.6		323.2	136.4			22.3	70	30
		2 Section	12.9		196.0	32.7			41.6	86	14
		3 Section	44.0		317.4	4.1			17.7	99	1
		Total	96.5	1,146.9	836.6	173.2	13.5	26.9	23.7	83	17
6	Ghuweir System	Northern Section	35.0		216.3	90.3			16.9	71	29
		Southern Section	27.2		186.0	39.8			18.7	82	18
		Total	62.2	648.0	402.3	130.1	21.7	21.6	17.7	76	24
7	Tafileh System		20.0	329.0	245.7	5.0	31.2	44.2	33.6	98	2
8	Shaubak System		10.0	78.0	60.3	5.3	18.9	19.6	16.5	92	8
-	Grand Total		595.5	7,530.0	4,583.0	1,270.1	28.6	27.1	21.1	78	22

The average water quantity available at the transfer stations for the communities amounts to about 21 l/c/d. It varies between 15.5 l/c/d and 50 l/c/d for various systems. However, these quantities cannot be considered as the actual domestic consumption because of the additional water losses occurring in the local distribution systems.

6. Water Consumption from Unpiped Supplies

The water quantities carried home from unimproved sources such as rivers, water holes, springs, etc. vary widely. Many factors affect the water consumption in the rural areas, the most significant being the general availability of water and the distance the water has to be carried home. The climatic conditions and the specific habits of the population should also be considered when determining the domestic consumption. From surveys in other countries with a similar climate, it has been ascertained that the average daily water quantity carried home amounts to about 15 liters per capita, excluding the water used for laundry. The habit in Jordan is that the water for laundry is also carried home. Therefore a consumption of about 35 l/c/d has been assumed for the population not served by a piped water supply.

Compared with the actual consumption per capita in Amman and other large municipalities, an actual daily consumption of 35 l/c/d seems to be high. But more detailed analyses of the municipal water consumption as billed differs significantly from the actual consumption considering the large quantities of water unaccounted for and the existing metering practices. The consumption of the population served by piped systems is definitely higher. Therefore the consumption of 35 l/c/d for the population in rural areas can be considered as a realistic assumption.

7. Seasonal Fluctuations in the Water Consumption

In order to establish the magnitude of the seasonal fluctuation in the domestic supply, the information regarding the monthly water production in the City of Amman and some large systems of WSC has been evaluated and the summary of the results is shown in Table WS 3-4 and in Figures WS-3 and WS-4.

The total production of the Amman wells as given in this table slightly differs from the figure given in Sub-chapter III-2. The discrepancy is due to the fact that the former data refer to the calender year 1975 while the latter relate to the "accounting year 1975" which starts on 1st December.

As result of the analyses the following conclusions have been drawn:

City of Amman

The peak production/consumption occurs in July. It corresponds to the maximum annual temperature and to the minimum (zero) rainfall. The ratio between the maximum and the average monthly production, expressed by the peak factors 1.24 for 1974 and 1.34 for 1975, does not indicate any extraordinary seasonal fluctuations. Based on a limited amount of information - only two years - the analyses could not establish any regularity in the variation of the water production between the maximum and minimum figures. It can be assumed that different factors, e.g. the consumption habits of the population or the availability of groundwater, have affected the production fluctuations.

Water Supply Systems operated by WSC

Three large water supply systems have been considered: Northern District System, South of Amman System, and Ghuweir System. The maximum production in these systems occurs in September and October; the trend of high production from July to October is visible. The average factor is 1.30. The displacement of the peaks from July to September/October is only due to disturbance in the operation of the raw water sources.

Table WS 3-4

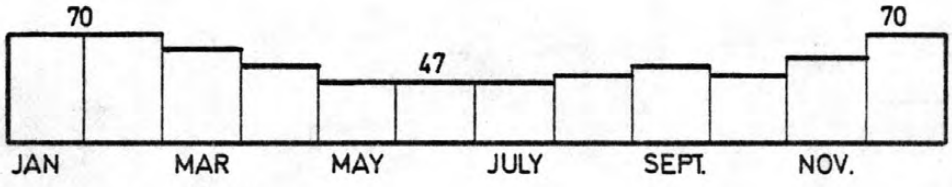
Monthly Water Production
1975

Month 1975	City of Amman	Northern District System				South of Amman System			Ghuweir System
		Azraq	Dhuleil	Summa-yya	Total	Ras el-Ain	Wadi Um Riman	Total	
	$m^3 \times 10^3$								
Jan.	1,437.8	64.9	208.8	39.5	313.2	35.6	22.8	58.4	38.9
Feb.	1,250.8	51.2	183.0	28.7	262.9	54.2	-	54.2	33.7
Mar.	1,471.4	66.1	201.3	32.3	299.7	-	68.6	68.6	45.8
Apr.	1,385.7	92.2	225.9	43.6	361.7	6.8	83.9	90.2	56.7
May	1,695.2	113.0	225.6	60.2	398.8	17.5	88.4	105.9	59.6
June	1,642.3	106.5	216.1	117.8	440.4	29.0	86.2	115.2	49.6
July	1,956.5	129.9	221.0	118.7	469.6	37.7	73.4	111.1	64.2
Aug.	1,527.0	120.5	247.7	100.5	468.7	38.0	80.0	118.0	45.3
Sept.	1,320.2	111.0	274.3	82.3	467.6	39.3	85.2	124.5	69.7
Oct.	1,355.4	107.9	316.8	84.5	509.2	33.9	87.3	121.2	70.6
Nov.	1,220.5	97.1	291.2	69.1	457.4	12.0	84.8	96.8	59.6
Dec.	1,193.2	81.0	243.9	44.0	368.9	-	82.8	82.8	49.2
Total	17,456.0	1,141.3	2,855.6	821.2	4,818.1	303.5	834.4	1,146.9	647.9

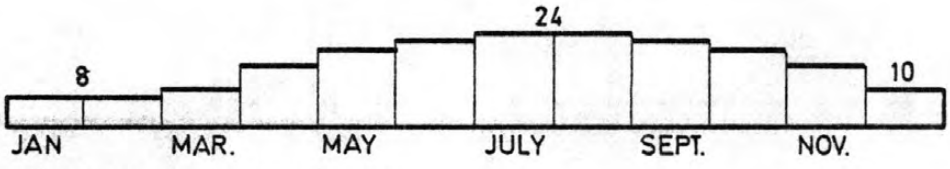
Note: The figures in the table indicate the monthly output of the raw water sources.

WATER SUPPLY AMMAN

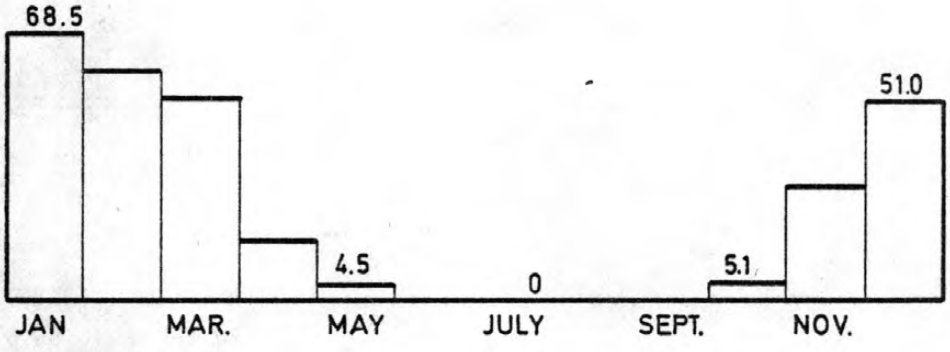
MONTHLY WATER PRODUCTION 1974 AND 1975
MONTHLY CLIMATIC PARAMETERS



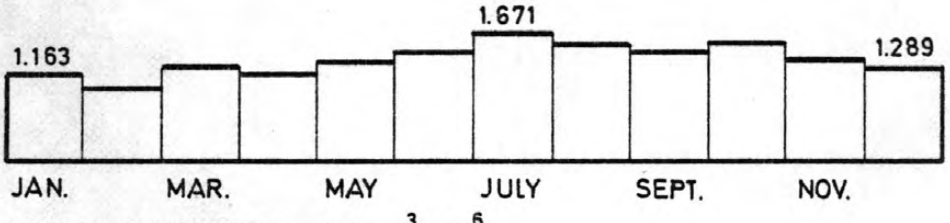
MEAN HUMIDITY %



MEAN TEMPERATURE °C

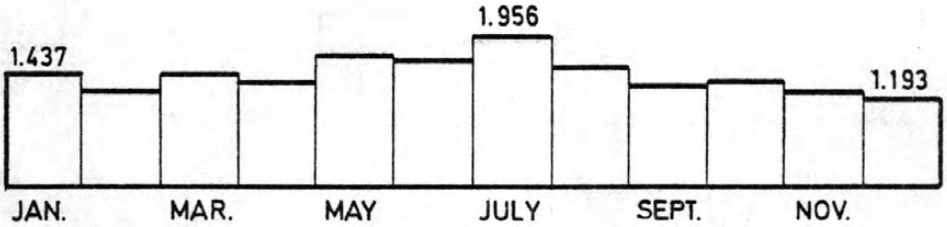


AVERAGE RAINFALL mm



WATER PRODUCTION 1974 $m^3 \times 10^6$

TOTAL	: 16.185
AVERAGE	: 1.349
MAX.	: 1.671
PEAK FACTOR	: 1.24



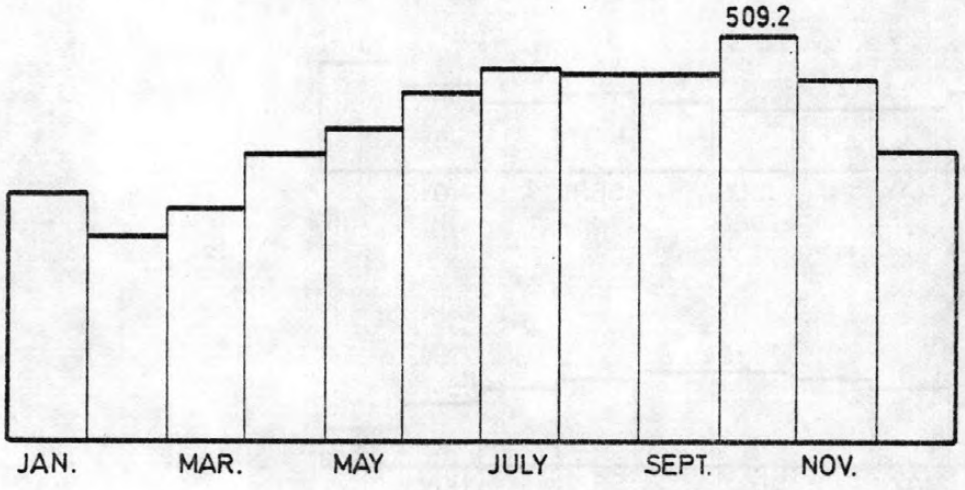
WATER PRODUCTION 1975 $m^3 \times 10^6$

TOTAL	: 17.456
AVERAGE	: 1.464
MAX.	: 1.956
PEAK FACTOR	: 1.34

WATER SUPPLY CORPORATION

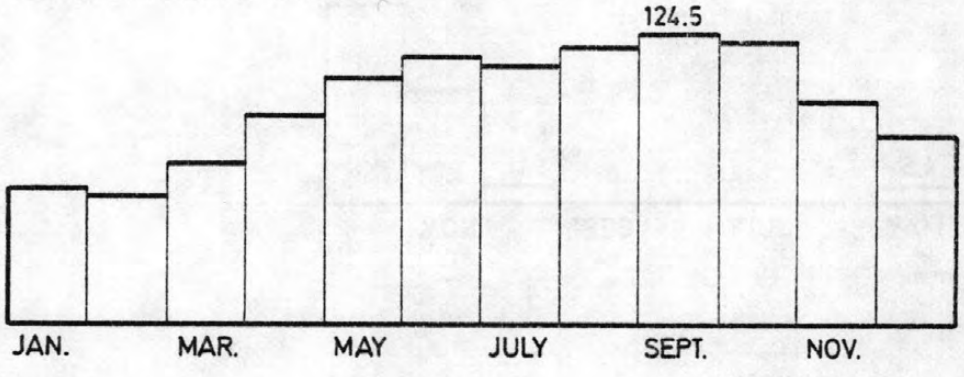
MONTHLY WATER PRODUCTION 1975

NORTHERN DISTRICT SYSTEM



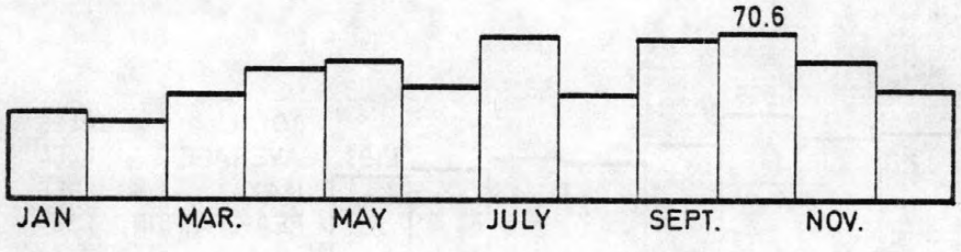
TOTAL	: 4.818.1
AVERAGE	: 401.5
MAX.	: 509.2
PEAK FACTOR:	1.27

SOUTH OF AMMAN SYSTEM



TOTAL	: 1.146.9
AVERAGE	: 95.6
MAX.	: 124.5
PEAK FACTOR:	1.30

GHUWEIR SYSTEM



TOTAL	: 647.9
AVERAGE	: 54.0
MAX.	: 70.6
PEAK FACTOR:	1.30

IV. PROJECTIONS OF FUTURE WATER DEMAND

1. General

In a country such as Jordan, developing rapidly from a relatively small economic base and having rather limited water resources, there is a significant risk in relying on projections of the future demand based on limited historical data. It was therefore necessary to supplement the data available with common practice and experience accumulated in other countries, considerung the specific conditions in Jordan.

The following methodology has been adopted for this study. The average daily unit demand per inhabitant has been established for different categories of communities, first as present demand and then projected for the years 1985 and 2000. This daily unit demand for potable water consists of:

a) domestic demand;
b) commerce and industrial demand (supplied by the public network);
c) water losses in the systems.

All these components have been separately projected in regard to the specific conditions in different communities and the expected stage of development in the future.

The existing conditions in the field of industrial water supply have been examined and analyzed and the projected demands for the years 1985 and 2000 established having regard to the proposed trends of development.

For the purpose of the water demand/water resources balance, the country has been broken

up into several "areas" used further as a base for determination of the future water utilization policies. The methodology of partition and the identification of the "areas" is described in Volume III.

Based on the domestic unit demand and the number of the population served in each "area" as well as the specific demand of the individual industries, the area demands have been calculated for the present stage and for the years 1985 and 2000.

The results of the estimates are compiled in Tables WS 4-1 and 4-2 as well as in Figure WS-5.

2. Projection of the Future Unit Water Demand

2.1 Domestic Unit Demand

The existing domestic consumption in different communities has been analyzed in Chapter III. As already mentioned the results from this study are rather inconclusive. The average consumption figures ascertained should be treated with caution for the following reasons:

a) the data available represent only a short period of time ;
b) the percentage of the water quantities "unaccounted for" is very high ;
c) the consumption figures would be higher if the demand were not suppressed .

Therefore these figures have been considered only as a broad indication of the present state of water supply. Having regard to

a) the size of the communities ;
b) the expected improvement of living standards ;
c) the specific climatic conditions ;
d) the specific habits of the population ;

e) the standard of the distribution systems and the sanitary facilities,

the domestic unit demand has been estimated separately for four categories of communities.

The Cities of Amman, Zarqa and Irbid

Those are the largest communities in the country with a relatively high standard of living which is expected to improve further with the urban development. As present demand 85 l/c/d are estimated. Compared with the actual present consumption this figure seems to be very high, but in fact it is still below the average demand of European and Mediterranean cities of this size. The demand for the year 1985 is expected to be 110 l/c/d and for the year 2000, 120 l/c/d, which means that by the end of the century these cities will achieve an appropriate standard of water supply and sanitary facilities. It could be assumed that these figures will even be exceeded in the future, due to the climate conditions in Jordan.

The Town of Aqaba

The analyses of the present consumption in Aqaba (Table WS 2-2) indicate that despite the obviously inadequate supply, the per capita consumption is much higher than in the other towns.

Several studies for Aqaba water supply have been carried out by different consultants *) in conjunction with or as a part of general plans for the development of Aqaba. As the trends of the projected development seem to be rather ambitious and there is great uncertainty about the feasibility of some of the projects envisaged, a low growth of the population and a fairly

---

*) TAMS/DAR, 1975-1976
Howard Humphreys & Sons, 1976-1977

Table WS 4-1 Annual Municipal Unit Water Demand 1975 - 2000

Name/Size of Communities	Domestic Unit Water Demand			Demand for Commerce and Small Industries			Water Losses			Total Annual Municipal Water Production		
	l/c/d			%			%			m^3/c/y		
	1975	1985	2000	1975	1985	2000	1975	1985	2000	1975	1985	2000
Cities of Amman Zerqa Irbid	85	110	120	14	14	14	35	25	15	47.8	57.3	57.7
Town of Aqaba	120	150	170	14	14	14	30	20	15	64.9	74.8	81.4
Communities with a population between 50,000 - 3,000 inhabitants	65	90	110	10	10	10	30	20	15	34.0	43.5	50.7
Communities with a population less than 3,000 inhabitants	65	85	100	5	5	5	30	20	15	32.5	39.9	44.2
Consumers in unpiped water supply systems	35	35	35	0	0	0	0	0	0	13.0	13.0	13.0

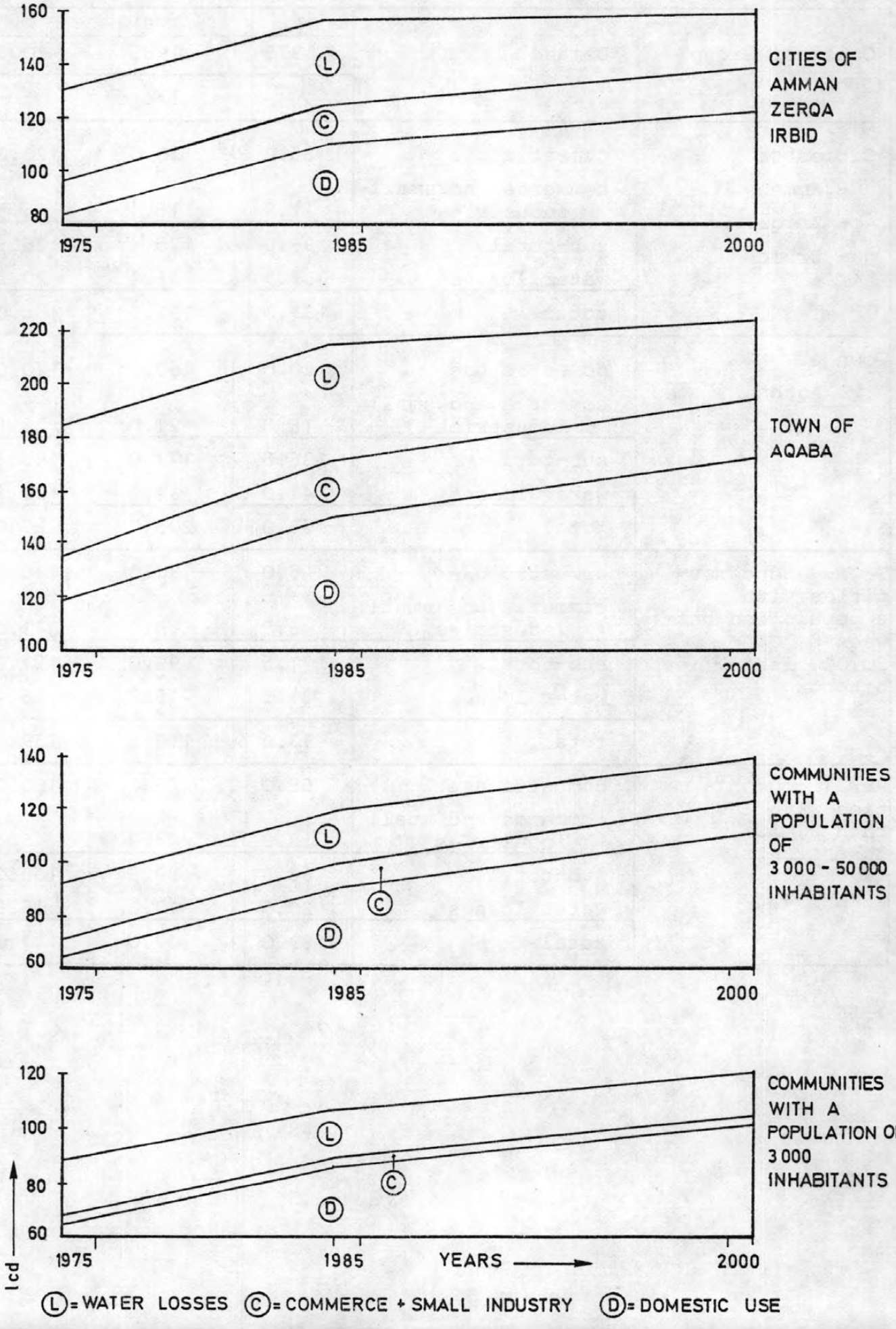
Table WS 4-2

Daily Municipal Unit Water Demand
1975 - 2000

Consumer Groups	Demand	Years		
		1975	1985	2000
		l/c/d		
Cities of - Amman - Zerqa - Irbid	domestic use	85.0	110.0	120.0
	commerce and small industries	11.9	15.4	16.8
	sub-total	96.9	125.4	136.8
	water losses	33.9	31.4	20.5
	total	131.0	157.0	158.0
Town of Aqaba	domestic use	120.0	150.0	170.0
	commerce and small industries	16.8	21.0	23.8
	sub-total	136.8	171.0	193.8
	water losses	41.0	34.2	29.1
	total	178.0	205.0	223.0
Towns and communities with a population between 3,000 - 50,000 inhabitants	domestic use	65.0	90.0	110.0
	commerce and small industries	6.5	9.0	11.0
	sub-total	71.5	99.0	121.0
	water losses	21.5	19.8	18.1
	total	93.0	119.0	139.0
Rural communities with less than 3,000 inhabitants	domestic use	65.0	85.0	100.0
	commerce and small industries	3.3	4.3	5.0
	sub-total	68.3	89.3	105.0
	water losses	20.5	17.8	15.8
	total	89.0	107.0	121.0

FIG. WS - 5

DAILY MUNICIPAL UNIT WATER DEMAND
1975 - 2000



conservative approach to the estimation of the domestic unit demand have been adopted. As present demand 120 l/c/d are suggested, further projected to 150 l/c/d and 170 l/c/d for the years 1985 and 2000 respectively.

Communities with a population of between 50,000 and 3,000 inhabitants

This category of communities seems to include a broad range at first sight, but considering the almost uniform standard of housing, the present conditions of domestic supply and sewerage facilities, and the common desire for an improvement in living standards, the classification proves to be justified. The present unit demand is estimated as 65 l/c/d, slightly lower than the demand for the large cities. The demand projections for the year 1975 (90 l/c/d) and for the year 2000 (110 l/c/d) take account of the improvement in the living conditions, up-grading of the housing standards, and existence of modern sanitary installations.

Communities with less than 3,000 inhabitants

For the population of these rural communities a present demand of 65 l/c/d is assumed, but a lower growth rate and a moderate development have been considered in the future projections. The estimated demand for the year 1985 is 85 l/c/d, and for the year 2000 it amounts to 100 l/c/d.

Analyses of the present consumption from unpiped supplies have been made in Sub-chapter III-6. The amount of 35 l/c/d is also taken as the future demand for this class of consumers.

2.2 Demand for Commerce and Small Industries

The demand of this consumer group includes the water used by commerce, small industries, governmental municipal institutions, schools, and public utilities. It

has been estimated as a percentage of the domestic unit demand based on the analyses made for the City of Amman in Sub-chapter III-2. This demand amounts in Amman to 12 per cent, provided the industrial consumption is excluded.

As a safe assumption 14 per cent are applied for the water supply systems in Amman, Zarqa, Irbid and Aqaba. This percentage is reduced to 10 per cent for the communities with a population of between 50,000 and 3,000 inhabitants, and to 5 per cent for the smaller communities.

2.3 Water Losses in the Distribution Systems

The water quantities unaccounted for in the existing distribution systems have been analysed in Chapter III. They vary broadly for different systems, being about 50 per cent for the City of Amman, 36 per cent for the City of Zerqa, and about 30 per cent in the other towns. As already mentioned before, these quantities consist of technical losses in the systems, such as leakage losses from the mains and losses from flushing out the mains, as well as water which is supplied but not paid for because of faulty meters, illegal connections or incorrect billing. It has not been possible to calculate the percentages of the technical losses separately.

In regard to the programmes for meter renewal and improvement of the metering system, as well as the plans for the reinforcement and up-grading of several distribution systems, the losses in the future may be expected to approach the level usual for the water supply systems in Central Europe, where the losses seldom exceed 10 per cent. The present losses have been assumed as 35 per cent for the large cities and 30 per cent for the other communities. The target for

the year 2000 should be to reduce this percentage to 15 per cent. It could be expected that the losses in some new systems in the future will be kept even below this level.

The above estimate seems to be rather optimistic in view of the present conditions. But, considering the shortage of water in the country, one of the main goals for the water supply bodies in the future will be to keep the amount of wasted and lost water at the lowest possible level. Therefore 15 per cent losses by the end of the century are a reasonable forecast and all efforts should be made to achieve this target.

Details of the projection of the water losses can be seen in Table WS 4-1, where the losses are indicated as a percentage of the sub-total "domestic demand/demand for commerce and small industries", and in Table WS 4-2 as actual water quantities in l/c/d.

2.4 Municipal Unit Water Demand

The overall projected demand rates for the different consumer groups are presented in Table WS 4-2. The technique for determination of the various components of the municipal unit demand has been explained in detail in the previous sub-chapters. The assumed rates have been a matter of discussion with the water authorities concerned and have met with their general approval. In this sub-chapter the assumed rates are compared with other projections in the field of water supply in Jordan and with real consumption rates established in various studies in large cities in this geographical region.

The present demand for the large cities of Amman, Zarqa and Irbid is assumed as 131 l/c/d, increasing in the future to 157 l/c/d in the year 1985 and to

158 l/c/d in the year 2000. In their study for the Amman Water Supply the Swedish consultants VBB have arrived at the following demand figures: 77 l/c/d in the year 1975, 97 l/c/d in the year 1985, and 132 l/c/d in the year 2000. Comparing their projection with the figures in this Report, one can assume that the two studies aim more or less at roughly the same level of water supply by the end of the projected period in the year 2000, the VBB's rates being about 20 per cent lower. The intermediate projection indicates a continuous process of moderate increase in the unit demand for the whole period of 1975 - 2000. The projection in this Report provides for a significant increase of the unit demand in the initial period of 1975 - 1985 up to the level which corresponds to an appropriate standard of water supply. For the purpose of water balances, this approach seems to be thoroughly justified in regard to the long-term planning of the water resources utilization and allocation.

Comparison has also been made between the projected demand of 158 l/c/d for the large cities in Jordan and the actual per capita consumption figures *) in various cities located in the same geographical area.

Some of these consumption rates are listed below:

Athens	in 1974	128 l/c/d
Suez	in 1975	130 l/c/d
Jerusalem	in 1965	146 l/c/d
Istanbul	in 1974	156 l/c/d
Beirut	in 1971	160 l/c/d
Baghdad	in 1965	160 l/c/d
Riyadh	in 1970	172 l/c/d

The average of these demands is nearly 150 l/c/d, including system losses. Hence the rate of 158 l/c/d

---

*) Howard Humphreys & Sons, Aqaba Water Supply, Feasibility Study, Fig. 1

in the year 2000 for the large Jordanian cities seems to be a realistic projection. It could even be assumed that the demand will in fact exceed the projection. The future demand in the large cities will be influenced above all by the availability of water.

The Water Supply Corporation has established domestic unit demand rates as a guide for the design of new water supply projects:

- in small communities
  in 1975: 50 - 60 l/c/d, with an annual increase of 1-2 l/c/d

- larger communities
  in 1975: 70-80 l/c/d, with an annual increase of 1-2 l/c/d

Water losses are assumed to be 30 per cent. No special allowances are made for municipal and industrial use.

Considering an annual increase of 1.5 l/c/d these rates have been projected as maximum and minimum demands for the years 1985 and 2000 and compared with the projected rates for the "communities with a population of between 50,000 and 3,000" and "communities with less than 3,000 inhabitants" from this Report.

The comparison shows minor deviations between the two projections. In the case of larger communities the WSC's rates tend to be slightly higher with the exception of the 1985 projection. For the "communities with less than 3,000 inhabitants" the comparison indicates once again the more intensive growth of the Master Plan rates during the period 1975 - 1985, a trend which was already shown in the previous comparison.

Year	Demand	Communities with population of between 50,000 - 3,000 inhabitants	Communities with less than 3,000 inhabitants
1975	maximum	104	78
	minimum	91	65
	average	97	72
	National Master Plan	93	89
1985	maximum	123	89
	minimum	110	85
	average	117	92
	National Master Plan	119	107
2000	maximum	152	127
	minimum	139	114
	average	146	121
	National Master Plan	139	121

3. Estimates of Industrial Water Demand

In order to establish a basis for estimating future industrial demand, analyses of the present water usage by various industrial enterprises have been made. The field work indicated that almost all large industries use water from their own water sources, mainly deep wells in the vicinity of the works. Small parts of the industries are supplied by the public networks in the cities of Amman and Zerqa.

The future water demands have been projected considering the plans for industrial development in the country, such as extensions of existing works and the establishment of new ones.

Detailed analyses of the industrial water demand for different communities and various industries are given below.

City of Amman

After investigations on the present water consumption and discussions with the authorities concerned, the following estimates have been made for the industries operating their own water sources.

Table WS 4-3 Industries with Independent Water Supply in Amman

Industrial Consumers with own wells			Consumption	Demand	
Name	Type of Industry	Location	1975	1985	2000
			$m^3 \times 10^3$		
Schneller	School	Marka	1,700	5,050	7,200
Jordan Ice and Aerated Water Co. Ltd.	Soft Drinks	Marka	270	550	1,100
Rainbow	Poultry	Ain Ghaga	15	25	35
Jordanian Electric Power Company	Electrical Works	Ain Ghaga	146	220	260
United Industry Corp.	Batteries	Marka	85	140	230
			2,216	5,985	8,825
Total (rounded)			2,200	6,000	8,900

The present consumption of the industries supplied by the public network in town has been assumed in Sub-chapter III-2 as 1,700 $m^3 \times 10^3$. It can be estimated that this figure will slightly increase in the future to about 2,000 $m^3 \times 10^3$ in 1985. As the future domestic unit demand provides for the supply of small industries (14 per cent) these quantities are not further considered as separate industrial demand.

City of Zarqa

The City of Zarqa with the neighbouring towns of Ruseifah and Awajan is the major industrial center in Jordan. As the investigations have indicated, no further concentration of large industries in the area is envisaged. Therefore the present consumption of the existing industrial enterprises has been projected with regard to the intended developments in the future as stated in Table WS 4-4. The phosphate mines in Ruseifah are considered separately under the heading phosphate industry.

The consumption of the industries supplied by the public network has been assumed in Sub-chapter III-2 as 350 $m^3 \times 10^3$ in 1975. It could be expected that the demand for these industries will remain more or less constant in the future and it could be covered by the projected demand for commerce and small industries.

City of Irbid

There is no industrial water demand in Irbid at present. The investigations have not indicated any large industrial developments in the area in the near future. Therefore it can be assumed that the future industrial demand, being insignificant, will be covered by the projected demand for commerce and small industries.

Town of Aqaba

The present industrial consumption in Aqaba amounts to about 275 $m^3 \times 10^3$ per year. Among the main consumers are the port area with the free trade zone and the beach hotels. As already mentioned in Sub-chapter IV-2 there are ambitious plans to develop Aqaba

Table WS 4-4 Industries with Independent Water Supply in Zarqa

Industrial Consumers with own wells			Consumption	Demand	
Name	Type of Industry	Location	1975	1985	2000
			$m^3 \times 10^3$		
Army Factory	Textiles	Awajan	50	70	500
Jordan Paper and Cardboard Factory Company	Paper	Awajan	210	300	400
7-Up Company	Soft Drinks	Ruseifah	180	400	3,900
Transjordan Minerals Research Company	Mining	Ruseifah	75	300	700
Jordan Tanning Co. Ltd.	Tannery	Awajan	300	400	500
Jordan Worsted Mills Company	Textiles	Ruseifah	120	150	180
Refinery		Zarqa	1,150	2,100	2,100
Ceramic Factory		Awajan	135	300	300
Jordan Dairy Co. Ltd.	Milk	Ruseifah	15	130	220
J.C.A. Co. Ltd.	various	Ruseifah	200	750	4,500
Total			2,435	4,900	13,300

as in important industrial and touristic center and international seaport. The latest study concerned with the future water demand has been undertaken by the Britisch consultants Howard Humphreys & Sons / Peat Marwick Mitchell & Co. for the Water Supply Corporation. The preliminary report in draft form was available in October 1976.

The projected demand for the existing consumers has been adopted from the intermediate projection in the above report.

Table WS 4-5 Water Demand for the Existing Industries in Aqaba

Industries	Demand ($m^3 \times 10^3 y$)	
	1985	2000
Port	267	460
Free Trade Zone	018	064
Tourism	203	708
Timber Plant and various industries	312	1,088
Total	800	2,320

The largest industrial development in the future will be the fertilizer plant with a projected capacity of 600,000 tonnes per year of superphosphates and ammonium-phosphates. It is expected that the plant will commence operations in 1980 and the demand for potable water for processing purposes will amount to about 5,000 $m^3 \times 10^3$ according to the Fertilizer Company in Amman.

The plans to build a refinery in Aqaba must be considered as very uncertain. The justification for this project depends largely on both economic and political developments on the international oil market, which has proved

to be a most risky field for forecasts. For the purpose of the water balance it has been assumed that the refinery will be built in two stages with water demands of 2,000 $m^3 \times 10^3$ in 1985 and 5,000 $m^3 \times 10^3$ in 2000.

The present consumption and the projected demand for Aqaba are summarized below:

Table WS 4-6 Industrial Consumption/ Demand 1975-2000 in Aqaba

Consumers	Consumption 1975	Demand	
		1985	2000
	$m^3 \times 10^3$	$m^3 \times 10^3$	
Port Area, FTZ, Tourism, and other industries	275	800	2,320
Fertilizer Plant	-	5,000	5,000
Refinery	-	2,000	5,000
Total	275	7,800	12,320

Phosphate Industry

There are large deposits of phosphate in Jordan and several sites have been investigated in order to prove the feasibility of industrial mining. In 1975 the mines in Ruseifah and Al-Hassa were already in operation. It is expected that the mines at Wadi Al-Abyad and El-Shadiyah will commence operations in 1978 and 1980 respectively.

The water is needed for transportation of the sludge to a dumping site as well as in the drying process. Part of the water at Ruseifah is used in the manufacture of fertilizer. The re-use of the water in the technological process is not feasible.

The data given below represent the present consumption and the future demand in the phosphate industry as obtained from the main office of the phosphate industry in Amman:

Table WS 4-7 Consumption/Demand 1975-2000 for the Phosphate Mines

Name of Mine	Consumption 1975	Demand 1975	Demand 1985	Demand 2000
Ruseifa	500	2,000	4,000	4,000
Al-Hassa	2,200	4,500	6,500	-
Wadi Al-Abyad	-	3,000	3,000	-
El-Shiddiyya	-	4,200	4,200	4,200

The water quantities are given in $m^3 \times 10^3$ per year.

It has been estimated that the Al-Hassa and Wadi Al-Abyad mines will have a rather short life, ceasing operations in 1990 and 1992 respectively.

Cement Factory Fuheis-Suweileh

The factory is supplied with water from springs in the vicinity of Fuheis. The consumption in 1975 was about 300 $m^3 \times 10^3$ including losses in the transmission mains. The demand for 1980 and onwards has been estimated by the factory management as 1,800 m^3/day. Thus the yearly demand will amount to 600 $m^3 \times 10^3$ including losses. No further increase in the demand is expected.

Arab Potash Company - Dead Sea

The feasibility study for the development of a chemical complex for the extraction of potash, bromine, magnesium chloride and other chemicals is under way. The plant will be erected on the southern shores of the Dead Sea. As a first stage of the development,

the potash processing is projected to start in late 1981 with an output of 1 million tonnes of potash per year. Two years later the plants for bromide, magnesium chloride and other chemicals will follow.

Considering the early stage of development and the uncertainty about the technological process to be adopted, only a very approximate estimate of the fresh water demand could be made. After discussions with the Arab Potash Co. in Amman the following figures have been assumed for the purposes of the water balance:

1981	800 m^3/h	7,000 $m^3 \times 10^3/y$
1985	1,030 m^3/h	9,000 $m^3 \times 10^3/y$

The re-use of waste water in the technological process is not thought to be feasible.

Copper Project - Finan

Prefeasibility studies for a copper mining complex in Finan, Wadi Araba, have been undertaken. It is extremely difficult to project the water demand for such an enterprise, due to the great uncertainty about the feasibility of the project, the time schedule for its construction,and the technological process. In view of the enormous fluctuations in the raw copper prices on the world market, the whole development must be regarded as extremely tentative.

After discussions with geological experts from NRA in Amman, 9,000 $m^3 \times 10^3$ has been assumed as the future fresh water demand in 1985 and onwards for the purposes of the water balance.

4. Present Production and Future Demand (areawise)

4.1 Basic Principles

All data regarding the consumption/demand for the domestic and industrial water supply have been summarized in Tables WS 4-10 in a convenient form for further consideration in the plans for the utilization of the water resources (water balances).

Each area is presented in a separate table. The term "water consumption" means the actual water production in 1975 based on data received from the water supply bodies concerned. The term "water demand" means the water production required to meet the actual need for potable water. The water demand has been estimated according to areas on the basis of an annual average demand per capita and the population figure for each area as determined in Volume VIII. This estimate was first prepared for the present time as "1975 demand" in order to establish the inadequacies in the water supply, and then extended also for the near future as "1985 demand", and as "2000 demand".

The peak factor of 1.30 for the calculation of the maximum monthly consumption is based on the analyses made in Sub-chapter III-7. This factor has been increased to 1.40 for the demand projections for the large cities, 1.50 for the communities with a population of between 50,000 and 3,000 inhabitants and 1.60 for the smaller communities, in order to have a sufficient safety margin in the estimation of the monthly peaks.

The factors used for determination of the waste water quantities in Tables WS 4-10 are defined

in Chapter V.

The data regarding the municipal water supply summarized in the tables is presented graphically in Drawings WS3N, WS3S, WS5N, and WS5S, while the industrial demand is presented in Drawing WS4.

4.2 Consumer Groups

All communities have been divided into two groups - those which are connected to piped water supply systems and those without a piped water supply. The first group has been additionally subdivided into:

- cities and large towns such as Amman, Zerqa, Irbid, Aqaba;
- communities with a population of between 50,000 and 3,000 inhabitants;
- communities with less than 3,000 inhabitants.

The industrial consumers form a separate group with the demands analysed in Sub-chapter IV-3.

The consumption/demand for governmental institutions such as military camps is considered separately under "other consumers". The quantities consumed in 1975 are also adopted as a future demand since data on future development is not available.

The water supplied by the piped systems originates mainly from groundwater sources such as deep wells or springs. Where the "unpiped supply" consumers are concerned, it has been assumed that they use water from both ground and surface water sources.

The population of each area has been split up according to whether the people have a piped or

unpiped water supply, in the following way:

a) Based on data from the water supply bodies, the communities with a piped supply have been classified in the appropriate consumer groups, and the number of people served in 1975 in each area has been established. The rest of the population of the area has been considered to belong to the group with an "unpiped supply".

b) For the projections for 1985 and 2000 the number of people currently served by piped systems has been increased by the growth rate assumed for the population as a whole in the particular area concerned.

c) Furthermore, the number of people with the "unpiped supply" has been gradually reduced by shifting some of them to the "piped supply" group. In the first instance this move was applied to the population which will be served by the new WSC systems. For the remainder of the population without a piped supply, it has been assumed that during the period 1975 - 2000 they will be shifted step by step to the groups with a piped supply. The target is to supply more than 95 per cent of the population with piped water by the year 2000.

Where applicable, a shifting of population from the consumer group "less than 3,000 inhabitants" to the group "50,000 - 3,000 inhabitants" has been carried out thus taking into consideration the natural growth of the communities. It has been assumed that the total number of communities will not increase in the future.

Table WS 4-8 presents the breakdown of the population into groups with "piped" and "unpiped" supply.

Population in Jordan

Table WS 4-8 Piped and Unpiped Supply

Area	1975		1985		2000	
	Piped	Unpiped	Piped	Unpiped	Piped	Unpiped
AB 12	0	33,700	19,900	46,500	69,200	42,000
AB 13	1,300	10,600	11,700	11,700	28,700	10,500
AB 14	0	4,900	4,800	4,800	11,600	4,500
AB 15	0	10,300	14,200	6,100	30,000	4,000
AB 21	8,000	2,700	10,000	1,800	11,800	1,000
AB 22	11,700	100	13,200	0	14,400	0
AB 23	6,300	500	7,100	400	8,200	0
AB 24	0	6,000	3,100	3,000	5,500	1,000
AB 25	0	1,200	400	900	1,400	0
AB 26	0	2,200	1,300	1,300	2,100	1,000
AD 21	8,900	6,200	15,200	1,700	17,000	1,500
AD 23	700	8,300	5,000	5,000	8,500	2,500
AD 52	133,100	15,600	150,000	16,900	178,600	15,000
AE	156,000	14,000	238,200	4,900	403,500	3,500
AF	13,200	7,300	20,200	2,200	21,900	2,000
AG	1,200	200	1,500	100	1,700	0
AH	4,700	9,800	11,500	2,800	11,400	2,000
AI	4,000	13,500	13,000	3,200	10,300	3,000
AK	0	1,500	700	700	600	600
AL 0	5,600	8,600	22,400	5,600	42,800	4,000
AL 11	46,000	25,000	61,100	15,300	76,000	14,300
AL 21	0	51,900	33,600	22,400	39,500	19,000
AL 22/ 23	0	12,700	7,100	4,700	8,000	2,500
AL 31	0	200	100	100	200	200
AL 32	227,000	56,000	408,400	8,400	693,400	7,500
AL 41/ 42	616,100	40,500	1,061,800	1,600	2,044,600	1,000
AL 72	1,200	1,200	2,000	1,300	3,900	1,000
AL 73	21,200	2,000	27,500	3,000	42,800	3,000
AM	44,000	7,400	52,700	5,900	63,700	4,500
AN	24,500	0	33,200	0	50,800	0

Table WS 4-8 (contd.)

Area	1975		1985		2000	
	Piped	Unpiped	Piped	Unpiped	Piped	Unpiped
AP 1/2	2,700	300	3,100	400	4,100	0
CA 1	100	2,900	1,200	2,700	3,400	2,000
CA 2	0	600	200	400	600	0
CA 3	9,300	0	10,100	0	10,500	0
CA 4	14,600	0	17,600	0	22,300	0
CC	30,800	1,700	36,500	1,900	44,300	2,000
CD 11	19,900	0	23,100	0	28,100	0
CD 31	0	900	500	400	900	0
CD 32	0	6,000	3,200	3,000	3,300	2,500
CD 4	37,300	7,600	37,500	4,700	37,300	4,500
CD 8	6,200	100	8,500	400	12,400	1,000
CE	23,300	0	30,400	0	41,200	0
CF 11/ 12	400	7,200	3,500	8,100	13,200	7,500
CF 2	3,300	100	4,700	0	7,800	0
DA 11	0	6,600	4,600	2,000	4,500	1,500
DB	13,300	0	21,400	0	39,600	0
DC 1/2	3,500	600	3,600	400	4,400	500
DE	4,300	0	3,500	0	2,300	0
DF 1	400	0	400	0	300	0
DG 11	0	4,000	1,600	3,700	4,100	3,000
DG 21	0	600	200	500	500	500
DH 1/2	0	2,200	800	2,000	1,700	2,000
EA 1	16,100	1,100	20,200	1,400	26,000	1,800
ED 11	0	3,900	2,200	2,200	3,000	2,200
ED 12	0	600	500	200	500	300
F/H	4,200	7,200	9,900	4,200	12,000	6,300
G 1	0	600	600	200	600	500
G 2	17,200	900	19,900	1,000	23,300	1,000
I	0	200	100	100	100	100
K	0	300	200	200	300	200

Note: Reference is made to Volume VII, Annex 1.

4.3 Present Water Consumption per Area

The data on water production in 1975 obtained from the water supply bodies have been considered as the present municipal water consumption. The production figures and the allocation of the water are shown in Table WS 4-9. As the areas supplied by the various systems are not identical with the areas dealt with in this Report, some explanations would be needed to throw light on the methodology of determining the production figures per area.

The water production figures for each system as obtained from WSC for the year 1975 and shown in Table WS 3-3 have been further split up to "communities" and "other consumers" according to the ratios established in the above table. The results in $m^3 \times 10^3$ are shown below:

Name of WSC Grouped Water Supply System	Water Production in 1975		
	Total	Communities	Other Consumers
Northern District	4,818.1	3,613.5	1,204.6
Tannour System	304.0	286.0	18.0
Ain Deek System	130.5	60.0	70.5
Wadi Rajib System	75.5	75.5	-
South of Amman System	1,146.9	952.0	194.9
Ghuweir System	648.0	492.0	156.0
Tafileh System	329.0	322.0	7.0
Shauback System	78.0	71.0	7.0

The production figures from the above table together with the production figures of the municipal systems have been distributed area-wise in Table WS 4-9 using the distribution factor "f", which represents the ratio between the number of people served per area as per Table WS 4-8 and the number of people

Table WS 4-9 Utilization of Produced Water 1975

Water Supply System		Water Production from Wells and Springs in Area	Water Production from Wells and Springs Quantity	Distribution Factor	Distribution of Produced Water 1975 to Area	for Consumers: Communities	for Consumers: Other Consumers of WSC	Industry	Total
			$m^3 \times 10^3$			$m^3 \times 10^3$			
(1) Northern District Operated by WSC	Azraq Sources	F	1,141.3	0.021	AB21	75.9	25.3		101.2
				0.024	AD21	86.7	28.9		115.6
				0.02	AD23	7.3	2.4		9.7
	Dhuleil Wells	AL73	2,855.6	0.366	AD52	1,322.5	441.0		1,763.4
				0.440	AE	1,589.8	530.0		2,119.8
	Summayya Well	AD52	821.2	0.025	AF	90.4	30.1		120.5
				0.003	AH	10.9	3.6		14.5
				0.042	AL11	151.8	50.6		202.4
				0.008	AL72	29.0	9.6		38.6
				0.058	AL73	209.5	69.9		279.4
				0.011	F	39.8	13.2		53.0
	Total		4,818.1			3,613.5	1,204.6	-	4,818.1
(2)	Ajlun WS, Spring	AJ	136.0		AJ	136.0	-	-	136.0
(3)	Souf WS, Spring	AL11	117.0		AL11	117.0	-	-	117.0
(4)	Jarash WS, Spring	AL11	365.0		AL11	365.0	-	-	365.0
Tannour System operated by WSC	(5) Tannour, Spring	AH	304.0	0.043	AG	12.3	0.8		13.1
				0.168	AH	48.1	3.0		51.1
				0.145	AF	41.5	2.6		44.1
				0.419	AB22	119.8	7.5		127.3
				0.225	AB23	64.3	4.1		68.4
	Total		304.0			286.0	18.0		304.0
	Ain Deek Spring	AL11	130.5	1.0	AL11	60.0	70.5	-	130.5
Wadi Rajib WSC	(6)			0.188	AB13	14.2			14.2
	Well	AB13	75.5	0.81	AL0	71.3			61.3
	Total		75.5			75.5	-	-	75.5
Salt WS=Spring Well (7)		AN	550.0	-	AM	550.0	-	-	550.0
Cement Factory Fubeis (8)	Mahis Spring	AM	165.0	-					
	Azraq Spring	AM	72.0	-	AM	-	-	300.0	300.0
	Treim Spring	AM	63.0	-					
	Total		300.0	-		-	-	300.0	300.0
Sweileh WS Azraq Spring (9)		AM	597.0	-	AM	597.0	-	-	597.0

Table WS 4-9 (contd.)

Water Supply System		Water Production from Wells and Springs in Area	Quantity	Distribution Factor	Distribution of Produced Water 1975 to Area	for Consumers: Communities	for Consumers: Other Consumers of WSC	Industry	Total
			$m^3 \times 10^3$				$m^3 \times 10^3$		
Zerqa City Public Network	(10) Municipal WS	AL11	3,150.0	-	AL32	3,150.0	-		3,150.0
	Industrial WS	AL11	350		AL32	-	-	350.0	350.0
	(11) Industry WS supplied by own wells	AL11/ AL32	1,150.0	-	AL32	-	-	1,150.0	1,150.0
Refinery Zerqa (12)		AL11	1,150.0	-	AL32	-	-	1,150.0	1,150.0
Ruseifah WS, well (13)		AL32	530.0	-	AL32	530.0	-	-	530.0
Ruseifah Phosphate Mine, well (14)		AL32	500.0	-	AL32			500.0	500.0
Ceramic Awajan, well (15)		AL32	135.0	-	AL32	-	-	135.0	135.0
Amman City Public Network	(16) Municipal WS	AL4/AN	15,278.0	-	AL4	15,278.0	-	-	15,278.0
	Industrial WS	AL4/AN	1,700.0	-	AL4			1,700.0	1,700.0
	Industry (17) supplied by own wells	AL4	2,200.0	-	AL4			2,200.0	2,200.0
Wadi Sir WS, Springs		AN	566.0	-	AN	566.0	-	-	566.0
South of Amman System WSC.	(18) Wells	AL4	1,146.9	0.028	AP	26.7	5.5		32.2
				0.320	CC	304.6	62.4		367.0
				0.001	CA1	1.0	0.2		1.2
				0.440	CD4	418.8	85.7		504.5
				0.098	AL4	93.3	19.1		112.4
				0.098	AN	93.3	19.1		112.4
				0.015	AL32	14.3	2.9		17.2
	Total		1,146.9			952.0	194.9	-	1,146.9
Madaba WS, Mosa Spring (19)		CC	208.0	-	CC	208.0	-	-	208.0
Ghuweir System WSC.	(20) Wells	CD11	648.0	0.188	CE	92.5	29.3		121.8
				0.113	CA3	55.6	17.6		73.2
				0.321	CD11	158.0	50.2		208.2
				0.099	CD82	48.7	15.4		64.1
				0.008	CF2	3.9	1.2		5.1
				0.271	CA4	133.3	42.3		175.6
	Total		648.0			492.0	156.0	-	648.0
Karak WS, Sera Spring (21)		CE	365.0		CE	365.0	-	-	365.0
Tafileh System WSC	(22) Springs	CF1	334.0	0.020	CF11+12	6.4	0.2		6.6
				0.152	CF2	49.7	1.0		50.7
				0.171	DC1+DC2	56.0	1.2		57.2
				0.657	DB	214.9	4.6		219.5
	Total		334.0			327.0	7.0		
Phosphate Mine Wells El Hasa (23)		CF1	2,200.0		CF1			2,200.0	2,200.0
Shaubak Syst. WSC	(24) Mujib Well	G2	78.0	0.045	DF1	3.2	0.3		3.5
				0.524	G2	37.2	3.7		40.9
				0.431	DE	30.6	3.0		33.6
	Total		78.0			71.0	7.0	-	78.0
Ma'an WS Well (25)		G1	304.0		G2	304.0	-	-	304.0
Aqaba Wells (26)		EA1/ED2	1,000.0		EA1	725.0		275.0	1,000.0

served in the whole system. As some areas are supplied from more than one system, the production quantities are indicated separately for each system.

The computed production figures for each area have finally been split up between the different consumer groups in Table WS 4-10. The industrial production (see Sub-chapter IV-3) has been entered separately in the table according to the location of the consumer.

The quantities of water used by the population without a piped water supply have been calculated by multiplication of the population figures from Table WS 4-8 with the unit demand of 13 m^3 per annum per capita as per Sub-chapter IV-2.

4.4 Estimate of the Future Area Demand

The annual domestic and industrial water demand per area for the years 1975, 1985 and 2000 have been estimated in Tables WS 4-10. The domestic demand has been computed by multiplying the number of inhabitants in each group of consumers with the projected annual unit demand as per Sub-chapter IV-2. For the "other consumers" the future demand has been assumed as identical to the recorded present consumption. The industrial demand has been projected as per Sub-chapter IV-3.

A summary of the consumption/demand for the whole country is presented in Table WS 4-10-1. The following conclusions could be drawn by analysing the results of the demand projections:

The present production covers about 55 per cent of the actual need for water, which indicates the inadequacies of the water supply systems and consequently the permanently surpressed consumption at present.

To meet the future requirements of potable water, production must increase by almost four times by 1985, and by six and a half times by the end of the century.

The greatest concentration of large consumers is to be found in the Amman/Zarqa area. The present consumption and also the future demand for this area amount to about 60 per cent of the country's total consumption/demand.

Therefore special emphasis should be put on plans for the development and utilization of the water resources in the Amman/Zarqa basin, bearing in mind the enormous concentration of population, the industrial development and the likely consequences of a continuously inadequate water supply.

4.5 Recommendations for Future Survey of the Domestic/Industrial Water Demand

The domestic unit demand figures and the projected water requirements per area were established as factors to be considered in plans for the utilization of the water resources. They reflect the present state of development in the field of water supply and are based on assumptions of the future demand increase.

As the actual development does not always follow the anticipated trends, it can be expected that the demand increase will differ somewhat from community to community and will altogether deviate to some extent from the projection figures. If the projections in this study are to be considered as guidelines for the development of the water supply in Jordan for the next twenty-five years, a continuous survey of the actual demand in the future is highly recommended.

The existing practice of recording the water quantities produced and billed should be improved. The water supply authorities should be able to prepare fairly accurate annual balances of the water production/consumption of each community, system, and area as it has been done in this study. Consequently the balance tables WS 4-10 in the Annex for the areas where the conditions have changed and also for the country as a whole should be updated.

Annual or biennial reviews of the actual water demand against the background of the long-term projections will facilitate the water supply bodies in planning the construction of new systems or the extensions and improvement of existing ones. These reviews will be extremely useful for the detection of the existing constraints in the country's water supply, for the determination of the extent of the supply's inadequacy, and for the establishment of priorities for the development of the water supply facilities.

V. WASTE WATER DISPOSAL

1. Existing Waste Water Disposal Practices

The general practice for liquid waste disposal throughout the country is the provision of self-contained facilities for each dwelling unit or group of units. A piped sewage system with a treatment plant is in operation only in the City of Amman.

In rural areas the most common disposal unit is the "pit privy" which consists of a manually dug hole, round or rectangular in cross section. Most of the "pit privies" are with unlined walls allowing the liquid component to soak away. Those with stone walls have openings for the percolation of the liquids and their bottoms are normally not sealed. When a "pit privy" is full to capacity, it is filled with earth and abandoned and a new pit is dug.

In larger communities and most of the large cities individual cess-pits are commonly used. They normally consist of a single chamber tank with masonry or concrete walls in which the biological activity takes place and the solids settle. Effluents from cess-pits are discharged directly into the ground through outlet drain pipes or in some cases through unsealed walls and the bottom of the tank. The common practice is to remove the solids accumulated in the cess-pits at intervals by special tank cars. New cess-pits are constructed seldom due to the limited space of land in the densely built-up areas.

The effluents from the individual disposal units normally percolate into the ground, causing bacterial pollution in the surrounding soil. Within densely populated areas the amounts of waste water from domestic consumers is

considerable and it can be expected that the effluents penetrate the water-permeable strata and cause a bacteriological pollution of the groundwater.

Apart from the City of Amman a piped sewerage system only exists in the Town of Salt. This system covers only part of a built-up area, it is under-designed to meet todays requirements and needs reconstruction and modernization.

2. Sewerage System in the City of Amman

A piped sanitary sewerage system has been in operation in Amman since 1970. The Amman Water and Sewerage Authority (AWSA) is responsible for the operation and maintenance as well as for further extensions. There is a gravity flow apart from the waste water in the university area which is pumped to the system. The collected waste water is treated in a biological treatment plant.

The common practice for waste water disposal in the past was the individual cess-pits with discharge of the effluent either to the underground or directly to the Seil, which is the natural water collector for the Amman area. The use of individual waste water units still continues in those quarters of Amman which are not connected to the system. As soon as new laid sewers are operational in the streets, the house owners are obliged to connect the sanitary installations of their houses to the sewerage system. According to the regulations from AWSA a connection of commercial or industrial enterprises to the system can be refused if the quality of the effluents is of a nature causing hazards to the pipe network or the treatment process.

The sanitary sewerage network has been designed for an average sewerage flow of 200 l/c/d with an expected maximum

flow of 260 l/c/d. The biological treatment plant, located at Ain Ghazal, has been constructed in the first stage for an average flow of 60,000 m^3/day with a peak factor of 1.30. According to the inflow data available at the treatment works the average sewage flow in the summer of 1976 amounted to 9,000 - 10,000 m^3/day. It was not possible to establish the number of population served by the sewage system and the treatment plant at that time. Assuming an average domestic consumption of 63 l/c/d, including the consumption of commerce and small industries as estimated in Sub-chapter IV-2, the number of inhabitants connected to the sanitary sewage system would amount to about 150,000. Hence it can be assumed that only a quarter of the population was served in 1976.

If the water consumption of about 125 l/c/d in households, commerce and small industries is reached in 1985, as forecast in Table WS 4-2, then only 50 per cent of the expected population of about 1,000,000 inhabitants could be served, considering the maximum capacity of the existing treatment plant and assuming that the sewage network will be accordingly extended. Therefore an extension of the treatment works will be necessary to meet the requirements in 1985. There is sufficient land available in the area of the treatment works for future extension.

A brief description of the treatment process in Amman treatment works follows:

a) Water track - After the chlorination of the inflowing sewage, large particles are comminuted or removed by screening equipment, the water passes pre-aeration tanks and flows further to the primary sedimentation tanks, activated sludge tanks and the final sedimentation tanks. Finally the treated water is chlorinated and remains in a chlorine contact basin before it is released to Seil Amman.

b) Sludge track - The sludge from the primary and final sedimentation tanks is collected in sludge thickening tanks. The anaerobic treatment follows in the digestion tanks, from where the sludge is conducted to a sludge storage tank and finally to sludge drying beds.

c) Digester gas - The gas produced in the digestion tanks is used for the operation of the air blowers.

The information obtained at the treatment works indicates a BOD of the effluent of about 15 mg/l. BOD or "biological oxygen demand" indicates the amount of oxygen absorbed by a sewage sample in 5 days at 20° C.

The smooth operation of the treatment plant seems to be impeded from time to time. The main problems causing disturbances are outlined below:

a) The high BOD load of the raw water produces large quantities of sludge which causes clogging of pumps and pipes;

b) Air diffusers are often clogged;

c) Digesters are overloaded;

d) The concentrated sludge with very high BOD load delivered by tank cars from the individual cess-pits causes problems in the treatment process.

e) During the rainy season storm water enters the sewage network and also causes disturbances in the operation.

The collection of sludge by the farmers for dunging purposes does not always function smoothly, the main reason being the costs of transport.

3. Intended Development of Sanitary Sewage Systems

Being aware of the critical conditions in the waste water disposal practices in the large cities and towns, the water authorities concerned intend to start with the construction of modern sewage systems and treatment plants. The design of many systems has been completed; the delay in the construction seems to be caused by financial problems.

City of Amman

The Amman Water and Sewage Authority intends to continue the extension of the sanitary sewage system in the City of Amman in order to cover the whole built-up area by the end of the century. In its efforts the authority will certainly rely on financial support from the Government. Concrete plans for extension of the treatment works do not exist at the moment. It is expected that such extension will be required in the mid-nineties.

City of Irbid

There have been plans since 1971 for the construction of a sanitary sewage system and storm water drainage in this city. The design, based on a population of 130,000 inhabitants in the year 2000, seems to be outdated since the population in Irbid has already reached this limit, being about 120,000 in the year 1975. The municipality intends to update the design of the sewage system and the treatment works. The design works are expected to commence in late 1977.

City of Zarqa

The design and the tender documents for a sanitary system and a biological treatment plant have been completed. The system has been designed for a population of 350,000 in-

habitants at the present time, extended to meet the requirements of 770,000 inhabitants in the year 2020. The estimated costs amount to 10,000,000 J.D. based on 1975 prices with an annual inflation rate of 9 per cent. Up to the end of 1976 the problem with the financing had not been settled.

Town of Salt

The construction of a new sanitary sewage system started in early 1977. The design is based on a present population of 30,000 inhabitants. With further extension the system will serve about 100,000 inhabitants in the year 2000. The estimated costs are 1,250,000 J.D., based on 1975 prices, inflated by 9 per cent per year.

Town of Jarash

The design and the tender documents for a sanitary sewage system and a biological treatment plant for 9,500 inhabitants have been completed. Provisions for future extension of the system to serve up to 31,000 inhabitants have also been made. The estimated costs amount to 830,000 J.D. The financing of the project is uncertain at present.

The above-mentioned projects represent practically the whole activity in the field of waste water disposal in Jordan. This review shows the backwardness in this aspect of the modern municipal development. All authorities concerned should be aware of the importance of rapid decisions being made in this respect, in the first instance concerning the allocation of funds to the schemes already designed. It should be borne in mind that a modern urban development is unthinkable without adequate waste water disposal systems. Neglect of this problem will additionally create undesired complications regarding sanitation, water resources pollution and environmental protection.

4. Projection of Waste Water Quantities

The waste water of the domestic and industrial consumers is that portion of the water supply which is discharged into sewers or individual waste water disposal units. The remainder is used up to satisfy miscellaneous household, commercial, municipal and industrial needs. Large portions of the used-up water are lost due to evaporation. In a country such as Jordan, where disposal through sanitary sewage systems is not a common practice, the determination of the waste water quantities for consideration in the water balances should be based on the assumption that these quantities will remain in the terrestrial water circulation either as groundwater or as surface water. The feasibility of their further usage should be determined individually for each particular community or large industrial consumer, considering the specific conditions.

It has been assumed that the following portions of the municipal water consumption are used up:

- 100 per cent of the technical water losses
- 50 per cent of the consumption of commerce and small industries
- 20 l/c/d in the large cities and towns as household needs
- 30 l/c/d in the other towns and communities with the assumption that larger quantities of water will be used for watering gardens, etc.

Perhaps the complete loss of the water quantities classified as "technical water losses" is a somewhat exaggerated assumption, but due to the uncertainties in regard to the nature of this loss it seems to be fairly realistic and anyway on the safe side.

For the large industries it was assumed that 50 per cent of the water quantities supplied will be lost during the processing. As the largest consumers, such as phosphate mines, the potash plant, and the copper project, use the water mainly for the floatation and transportation of the sludge to the sedimentation basins, these losses can be regarded as direct evaporation.

Based on the above assumptions, the waste water "factors" have been calculated. The rounded values of these factors, determining the water quantities available after utilization by the consumers, are given in the table below.

Table WS 5-1 Waste Water Factors

Consumer Group	1975	1985	2000
Amman, Irbid Zerqa, Aqaba	0.60	0.65	0.70
other communities	0.40	0.55	0.60
other consumers of W.S.C.	0.40	0.60	0.70
industry	0.50	0.50	0.50

It is expected that the water used by consumers without a piped supply is wholly used up.

The waste water quantities have been estimated areawise for the present time as well as for the years 1985 and 2000 in Tables WS 4-10.

5. Re-use of Waste Water

As long as the present practice of waste water disposal exists, the effluents from the domestic consumers should be considered as recharge to the groundwater. Therefore a feasible waste water renovation after extended periods of underground storage depends largely on the specific geological and hydrogeological data in the particular area as well as on the present or intended utilization of the groundwater resources. In the further use of these water quantities, possible pollution, e.g. an increased salinity, should be considered and the appropriate treatment provided.

With the gradual establishment of sanitary sewage systems in the communities the nature of waste water use will change. The introduction of modern sewage systems will reduce the amounts of domestic effluents discharged directly into the ground. The waste water will be collected into the sewage network and treated in biological treatment plants. The effluents from the treatment plants are normally discharged into the natural water sources and can be further used for irrigation purposes, as technical water in some industrial processes, or as potable water after a proper treatment. It is of great importance for the water resources utilization that the discharged effluents meet the requirements of waste water standards in order to prevent the natural water sources from pollution with all the environmental damage involved, and to facilitate a further water use. The quality aspects of the effluent are dealt with separately in Chapter VI.

Waste water has been re-used in agriculture for a long time in many countries. On a relatively small scale a present utilization of treated sewage effluent in Jordan can be observed along the Seil in Amman, downstream from the treatment works. In regard to the future projections

of waste water use for irrigation, further investigations are required in order to establish the suitability of the soil, the nature of the crops, and the chemistry of the water used.

The re-use of industrial waste water is largely dependent on the nature of the technological process, the feasibility of post-operational treatment, and the local climatic and geomorphologic conditions. For the largest industrial consumers such as phosphate mines, potash plants etc., it could be assumed that a direct re-use of the waste water is highly unlikely at this stage of development. Data on recycling of industrial water by the projected large industrial enterprises were not available at this stage.

Generally speaking the re-use of waste water is a complex problem with many factors involved and a straight projection of waste water quantities to be utilized should be made only after careful consideration of the natural resources, the socio-economic trends, the environmental protection principles, and the health standards in the particular region.

6. Municipal Stormwater Drainage

A part of the built-up area in Amman is drained by a piped stormwater system. This system collects the rainwater from the streets via gulleys and conducts it to the Seil or the contributory wadis. Often the rainwater enters the sanitary sewage system through open manholes and causes disturbances in the treatment process.

Properly designed municipal stormwater systems do not exist in the other cities and towns. It is common that inundations occur during the rainy season. In Amman the

Seil is partly canalized and there are plans to do this all the way through the city. Similar protection measures should be planned also for the other communities in order to stop the erosion and prevent the watercourses from pollution since a lot of garbage is normally dumped along the stream beds.

It would be rather unrealistic to expect any activities on a large scale in the field of stormwater drainage for some time to come. Efforts in this direction should be encouraged mainly in the Amman/Zerqa region in view of the critical situation with water resources availability and water pollution there.

VI. WATER QUALITY AND WATER POLLUTION CONTROL

1. Water Quality - General

The availability of water for drinking or industrial purposes does not alone give the answer to the problems of water supply. The importance of the water quality and of water pollution control is increasing steadily in present water resources development. The results of population growth and industrial development are reflected in the deteriorating water quality of the previously unaffected raw water sources. In some areas of Jordan such as the Amman/Zarqa region, the situation can be considered as alarming and joint efforts should be recommended to prevent it from becoming worse.

The term "water quality" defines those chemical, physical, biological or radiological characteristics by which the consumers evaluate the acceptability of the water. Therefore this term should be considered relative to the proposed use of the water. In the domestic water supply, a permanent quality control over the water supplied in the public network, according to established standards, is of major importance, and it is executed by the public health authorities. The water quality control of the raw water sources gives valuable data on the characteristics of the water, which could be affected or unaffected by the human-caused pollution. Finally, strict control over the waste water effluents from any origin can prevent pollution and should be considered as an important part of the environmental protection.

2. Water Quality Control in the Existing Water Supply Systems

The bacteriological quality of the water in the domestic supply systems is controlled all over the country by the Ministry of Health, Environmental Health Department.

Water samples are taken by the District Health Officers both from raw water and from chlorinated water in the distribution systems. Normally the samples of clorinated water outnumber the others. The examination of the samples is done in the Ministry's laboratory in Amman.

The sampling is carried out in accordance with a programme. The number of samples to be taken during a certain period of time depends on the number of inhabitants supplied from the particular source as well as on the results of previous examinations of the source. The sampling and the examination of the samples as well as the evaluation of the results is done in accordance with the World Health Organization standards.

If pollution of the water is traced, the sampling and examination is repeated and if the results indicate that the water is unsafe, investigations on the source of pollution are undertaken. By the Public Health Law. No. 21-1971, the Ministry of Health has the power to close down water supply systems in cases where the water is causing a hazard to public health, or to stop effluents from industries etc. in cases where they cause pollution of the raw water sources.

Epidemics due to polluted water have not been reported since 1955, except for one epidemic in a small village in 1960. Individual cases of typhoid, diarrhoea and other diseases are known, but they cannot be related to the consumption of contaminated water.

The results of the bacteriological examination of water samples collected from the water supply systems in 1974, as obtained from the Ministry of Health, are listed below.

Table WS 6-1 Bacteriological Examination of Drinking Water

Location	Total number of samples	Unsafe samples No.	Unsafe samples %
Amman	851	99	11.6
Petrol Refinery	76	3	4.0
Suweileh	72	4	5.0
Aqaba	37	3	8.0
Mahis	18	2	11.0
Tafileh	78	12	15.0
Ruseifeh	122	21	16.0
Fuheis	36	6	16.6
Ma'an	40	7	17.5
Mafraq	38	7	18.0
Irbid	146	29	20.0
Madaba	152	45	29.5
Zerqa	118	38	32.0
Salt	128	47	37.5
Deir Abu-Said	47	19	40.0
Karak	56	35	62.0
South Shuneh	29	26	89.0

The relatively high percentage of unsafe samples could be explained as a result of:

a) deficiencies in the operation of chlorine dosage devices;

b) entrance of polluted water (most probably domestic effluents) into public water supply systems during periods when the systems are not in operation.

Therefore the main efforts of the water supply authorities should be directed in the first instance at the provision of chlorine dosage devices at all storage reservoirs and pumping stations and their proper operation and maintenance. The authorities together with the Ministry of Health should establish guidelines for proper chlorine dosage for different systems with regard to the local conditions in order to satisfy the requirements for chlorine residual in the supplied water. The Ministry of Health should further improve the system of water sampling and tighten controls on the pollution in the water supply systems.

3. Water Quality Control and Pollution of Water Sources

Chemical analyses of ground and surface water samples are undertaken by the National Resources Authority (NRA), Water Quality and Pollution Control Section, in Amman. The evaluation of data on ground water samples has been done in Volume IV, Groundwater Resources. This Subchapter deals with the surface water quality. As a base for analyses and conclusions on the extent of pollution, the results of examination of samples from different wadis have been used.

The examination of the water samples normally includes the following data: electric conductivity, total solids content, sodium-absorption ration, pH-value, chemical oxygen demand, total silicon, calcium, magnesium, sodium, potassium and ammonium content. For the Zarqa River basin data on trace element contents such as zinc, cadmium, lead, iron, chromium, copper, maganese, aluminium

and fluorine were also available. No information was given in the analyses with regard to bacteriological content, colour, turbidity, taste or odour.

For evaluation purposes the examined samples have been grouped according to the location of the water sources and presented on the following tables:

Table WS 6-2-1 Jordan River East Side Wadis
Table WS 6-2-2 River Yarmouk and Dead Sea East Shore Wadis
Table WS 6-3 Zarqa River Basin.

From the lists of samples for each station, samples with minimum and maximum values of "total solids" have been considered in Table WS VI-2.

The analyses of Yarmouk river samples do not indicate any traces of pollution. The water is suitable for drinking purposes, providing that it is given basic treatment. The same applies to the samples from the East Bank wadis.

The analyses of the samples from the Dead Sea east shore wadis indicate a relatively high total dissolved solids content although it is below the maximum permissible level according to international drinking water standards (see Table WS 6-4). The salinity of the water samples from Wadi Hasa (Tannour) and Wadi Mujib could be explained by the salinity of the springs in these areas.

For the Zarqa river basin the samples taken during recent floods on the 20.1.1977 and the 6.2.1977 from several stations along the valley have been examined. The results of water examination are summarized in Table WS 6-3.

It is evident that the content of TDS increases along the wadi, being rather high at Awajan and Zarqa. Bearing in mind the effect of the flood water on the concentration of solids one can assume that under normal conditions

Table WS 6-2-1

RESULTS OF WATER EXAMINATION
JORDAN RIVER EAST SIDE WADIS

Constituent	Unit	River Yarmouk at Maqarin		River Yarmouk at Adasiya		Wadi Wala		Wadi Mujib		Wadi Hasa Tannour		Wadi Hasa Ghor Safi	
		11.68	11.69	3.67	11.64	3.64	6.64	4.65	6.65	12.73	4.68	10.67	3.76
E.C.	mmhos/cm	0.270	0.840	0.235	1.670	0.310	1.180	0.930	1.480	1.500	1.800	0.660	0.920
Total Dissolved Solids	mg/l	173	537	150	1096	198	755	595	947	960	1152	422	588
Calcium (asCa)	mg/l	18.8	70.4	33.8	54.0	44.0	90.0	83.2	112.0	8.40	95.0	48.6	79.2
Magnesium (asMg)	mg/l	10.9	20.4	2.4	53.5	7.3	47.4	36.1	58.4	73.0	86.2	25.9	28.9
Sodium (asNa)	mg/l	13.0	71.3	9.2	225.4	7.8	58.0	80.5	115.0	128.8	139.2	46.0	62.1
Potassium (asK)	mg/l	5.5	9.0	5.5	-	-	-	-	-	4.7	6.2	7.4	7.0
Chloride (asCl)	mg/l	16.7	77.4	14.9	298.2	10.7	142.0	113.6	213.0	203.4	265.5	88.4	101.9
Sulfate ($asSO_4$)	mg/l	17.3	85.4	21.6	189.6	15.8	110.4	-	-	187.2	235.2	64.8	160.3
Carbonate ($asCO_3$)	mg/l	0	0	0	9.0	3.0	0	0	0	14.4	0	0	0
Bicarbonate ($asHCO_3$)	mg/l	109.2	272.7	101.9	259.3	152.5	341.6	274.5	289.8	363.6	344.0	163.5	184.8
Total Cations		2.58	8.53	2.43	16.90	3.14	11.90	10.63	15.40	15.92	18.05	6.75	9.12
Sodium Cations	%	23.26	36.34	16.46	57.99	13.31	29.41	32.90	32.40	36.00	33.52	29.63	29.60
S.A.R.		0.66	1.92	0.40	5.10	0.35	1.70	1.85	2.20	2.50	2.48	1.32	1.50
pH		7.75	7.20	8.05	8.20	8.1	7.8	8.21	7.73	8.30	7.40	7.90	7.66

Table WS 6-2-2

RESULTS OF WATER EXAMINATION
YARMOUK RIVER AND DEAD SEA EAST SHORE WADIS

Constituent	Unit	Wadi Arab		Wadi Ziqlab		Wadi Jurm		Wadi Kufrinja		Wadi Shueib		Wadi Hisban	
		1.64	3.61	11.63	7.63	9.56	10.60	3.69	7.60	3.64	12.73	9.56	8.60
E.C.	mmhos/cm	0.350	0.910	0.380	0.760	0.720	0,880	0.470	0.720	0.390	0.680	0.800	1.390
Total Dissolved Solids	mg/l	224	582	243	486	446	363	301	461	250	435	508	890
Calcium (asCa)	mg/l	22.0	80.0	46.0	62.0	40.0	98.0	54.0	46.0	44.0	64.0	62.0	80.0
Magnesium (asMg)	mg/l	10.9	37.7	12.2	37.7	60.8	60.8	17.0	42.6	12.4	26.8	34.0	48.6
Sodium (asNa)	mg/l	34.5	48.1	16.5	32.9	39.1	39.1	14.7	44.9	13.3	28.8	70.6	143.8
Potassium (asK)	mg/l	-	-	-	-	-	-	-	-	-	4.7	-	-
Chloride (asCl)	mg/l	56.8	102.9	16.0	85.2	71.0	74.6	39.1	81.7	32.0	65.6	127.8	234.3
Sulfate ($asSO_4$)	mg/l	57.5	47.5	7.2	42.2	92.2	57.6	23.5	88.8	-	38.4	92.1	170.4
Carbonate ($asCO_3$)	mg/l	12.0	-	4.5	6.0	9.0	3.0	0	3.0	3.0	3.0	6.0	1.5
Bicarbonate ($asHCO_3$)	mg/l	18.3	323.3	158.6	259.3	244.0	378.2	228.1	213.5	29.3	192.0	201.3	247.0
Total Cations		3.50	9.19	3.80	7.96	8.70	9.60	4.74	7.75	3.68	6.77	8.97	14.25
Sodium Cations	%	42.8	22.7	13.16	19.60	20.00	17.71	13.50	25.20	15.76	18.46	34.00	43.90
S.A.R.		1.30	1.20	0.50	0.70	0.80	0.70	0.40	1.10	0.40	0.76	1.80	3.10
pH		8.8	7.9	8.3	8.2	7.9	8.2	7.9	8.1	8.0	8.1	8.0	8.0

Table WS 6-3 RESULTS OF WATER EXAMINATION

Constituent		Unit	Abdoun		Treatment Plant Amman effluent		Downstream Treatment Plant		Before Phosph. Mines Ruseifah		Ruseifah	
			1.77	2.77	1.77	2.77	1.77	2.77	1.77	2.77	1.77	2.77
E.C.		mmhos/cm	0.390	0.390	1.950	1.860	0.700	0.650	0.630	0.540	0.495	1.000
Total Dissolved Solids		mg/l	250	250	1.248	1.190	448	416	403	346	317	640
Calcium (as Ca)		mg/l	38.0	37.2	78.8	56.0	46.0	48.0	46.8	43.2	40.8	68.0
Magnesium (as Mg)		mg/l	2.9	3.6	23.3	29.2	8.5	5.2	5.3	5.8	5.6	9.2
Sodium (as Na)		mg/l	26.5	28.8	201.2	179.4	80.5	63.2	69.0	46.0	44.0	87.4
Potassium (as K)		mg/l	7.8	9.8	47.2	46.8	17.9	16.4	16.0	12.1	13.3	22.6
Chloride (as Cl)		mg/l	42.6	33.4	236.8	209.5	81.7	67.4	78.8	54.0	51.5	113.6
Sulfate (as SO_4)		mg/l	19.2	23.1	89.3	60.5	38.4	25.0	33.6	11.5	24.0	45.6
Carbonate (as CO_3)		o	o	o	o	o	o	o	o	o	o	o
Bicarbonate (as HCO_3)		mg/l	86.6	134.2	634.4	652.7	231.8	235.5	189.1	183.0	158.5	323.3
Total Cations			3.49	3.66	15.82	14,20	6.96	5.97	6.21	4.95	5.04	8.54
Sodium Cations		%	32.95	34.15	55.31	54.93	50.29	46.06	48.30	40.40	43.65	44.50
S.A.R.			1.12	1.20	5.13	4.85	2.86	2.32	2.54	1.74	1.96	2.63
pH			7.75	7.35	7.65	7.50	7.95	7.48	7.00	7.75	7.60	7.65
Nitrate (as NO_3)		mg/l	28.9	11.5	52.3	0.8	25.0	3.7	21.3	8.8	21.3	1.8
Nitrite (as NO_2)		mg/l	-	-	-	-	-	-	-	-	-	-
Carbon dioxide (as CO_2) free		mg/l	-	-	-	-	-	-	-	-	-	-
Silicon dioxide (as SiO_2)		mg/l	7.7	12.5	24.6	28.0	12.9	12.4	10.8	11.3	7.7	15.2
Amonium (as NH_4)		mg/l	4.5	3.2	50.8	22.9	6.0	1.4	8.0	1.4	8.7	1.4
COD		mg/l	21.8	186.2	158.0	1146.6	1325.7	803.6	858.9	607.6	526.6	803.6
TRACE ELEMENTS	Zinc (Zn)	mg/l	0.80	o	1.32	o	o	1.60	0.13	1.40	o	1.58
	Cadmium (Cd)	mg/l	0.04	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.04
	Lead (Pb)	mg/l	0.06	-	0.26	0.04	-	0.04	0.04	0.33	0.02	0.20
	Iron (Fe)	mg/l	0.02	o	o	0.01	0.02	0.01	0.37	0.02	0.01	14.04
	Chromium (Cr)	mg/l	0.22	0.03	0.08	0.04	0.02	0.06	o	0.08	0.04	0.08
	Copper (Cu)	mg/l	0.13	0.02	0.04	0.03	0.08	0.04	0.02	0.03	0.05	0.06
	Manganese (Mn)	mg/l	1.73	0.50	0.23	0.50	1.37	1.55	0.19	1.38	0.87	1.25
	Aluminium (Al)	mg/l	0.04	o	o	o	o	0.01	0.83	0.02	o	7.08
	Fluorine (F)	mg/l	0.01	o	o	0.01	o	o	0.36	o	0.01	7.80

Table WS 6-3 (contd.) RESULTS OF WATER EXAMINATION

Constituent		Unit	Awajan Bridge		Zerqa Bridge Zerqa		New Jerash Bridge		Ras-El-ein	Treatm. Works		
			1.77	2.77	1.77	2.77	1.77	2.77	2.75	2.75		
E.C.		mmhos/cm	0.520	1.300	0.510	1.200	1.450	0.870	0.850	0.650		
Total Dissolved Solids		mg/l	333	832	326	768	928	557	544	416		
Calcium (as Ca)		mg/l	40.0	79.2	40.0	73.2	94.8	68.0	96.0	60.0		
Magnesium (as Mg)		mg/l	4.1	216.7	5.3	15.6	40.9	16.5	6.1	8.5		
Sodium (as Na)		mg/l	52.9	214.5	49.5	105.8	138.0	81.6	63.2	56.3		
Potassium (as K)		mg/l	14.4	26.9	12.9	25.7	20.2	10.1	16.4	14.0		
Chloride (as Cl)		mg/l	58.2	158.7	58.6	142.4	221.9	111.8	149.4	88.8		
Sulfate (as SO_4)		mg/l	24.0	40.3	38.4	52.8	151.7	77.8	22.1	15.4		
Carbonate (as CO_3)		mg/l	0	0	0	0	0	0	0	0		
Bicarbonate (as HCO3)		mg/l	169.6	461.2	136.6	392.8	320.9	207.4	200.7	203.1		
Total Cations			5.31	11.77	4.92	10.20	14.62	8.57	8.47	6.51		
Sodium Cations		%	43.31	46.73	43.70	45.10	41.04	41.42	32.47	37.63		
S.A.R.			2.00	3.30	1.95	2.92	2.98	2.30	1.69	1.80		
pH			7.30	7.80	7.98	7.85	7.25	7.30	7.10	7.40		
Nitrate (as NO_3)		mg/l	19.2	0	18.3	1.8	13.3	17.3	20.2	18.2		
Nitrite (as NO_2)		mg/l	-	-	-	-	-	-	0.28	0.15		
Carbon dioxide (as CO_2) free		mg/l	-	-	-	-	-	-	11.98	10.98		
Silicon dioxide (as SiO2)		mg/l	8.3	22.0	9.3	17.0	14.5	12.1	0	0		
Amonium (as NH_4)		mg/l	12.5	16.5	6.6	18.3	3.1	2.1	0	0		
COD		mg/l	533.9	1313.2	134.4	1528.8	70.8	176.4	421.6	636.5		
TRACE ELEMENTS	Zinc (Zn)	mg/l	0	2.87	1.93	0	0.31	0.13	0.43	0.63		
	Cadmium (Cd)	mg/l	0.02	0.08	0	0.02	0.01	0	0.02	0.02		
	Lead (Pb)	mg/l	0.02	0.66	0.26	0.02	0.04	0	0.2o	0.14		
	Iron (Fe)	mg/l	0.01	37.59	0.03	0.02	0.37	0	2.44	6.39		
	Chromium (Cr)	mg/l	0.04	0.25	0.27	0.04	0	0.04	0.02	0.03		
	Copper (Cu)	mg/l	0.08	0.35	0.08	0.06	0.01	0.04	0.05	0.05		
	Manganese (Mn)	mg/l	0.62	2.88	1.90	1.12	0.67	0.23	0.51	1.18		
	Aluminium (Al)	mg/l	0.01	31.66	0.04	0.01	0.33	0	2.08	3.33		
	Fluorine (F)	mg/l	0	17.60	0.05	0	0.35	0	1.28	1.72		

the TDS content is even higher. In their study on Amman Water Supply, the Swedish consultants VBB established an average TDS content of 950 ppm at the site of King Talal Dam.

The content of trace elements in the samples indicates heavy chemical pollution especially at Awajan bridge downstream of the industrial area Ruseifah. Extremely high contents of cadmium, manganese, iron, lead, chromium, aluminium and fluorine show the effect of the industrial effluents which are discharged directly into the river. As under normal conditions there is no basic flow in the upper part of the valley,the discharge of industrial and domestic effluents into the Zarqa river causes great concern. Additional sources of pollution are the solid wastes dumped along the river bed, and oil, petrol, greases and toxic chemicals dumped from workshops and garages in Amman, Ruseifah and Zerqa.

In the town of Salt heavy biological pollution is evident although the results of water examination were not available. The domestic effluents from the obsolete sewage system mix with the groundwater in Wadi Shueib and contaminate the spring water. Infiltration from the individual cess-pits also contributes to the pollution.

In the towns of Jarash, Ajlun, Suweileh, Wadi Sir, and other towns pollution of ground and surface water is caused mainly by the domestic effluents and the uncontrolled dumping of garbage along the watercourses. The water supply originates from springs or wells located in the built-up areas.

4. Preventive Measures for Protection of Water Sources

In view of the chemical and biological pollution of the water sources joint efforts are needed to organize and regulate the waste water disposal practices and to stop further pollution. Below are some proposals for preventive measures in this respect.

Sanitary Sewerage Network

The sewerage system in Amman should be extended to cover the whole built-up area. With the gradual extension of the network the individual disposal units should be abandoned and the discharge of effluents into the ground or directly into Seil Amman should cease.

First priority in the allocation of funds should be given to the projects for construction of sanitary sewerage systems in Zarqa, Irbid, Jarash, Ajlun and other large towns.

Treatment Plants

The treatment of the domestic and municipal sewage should be done in properly designed and operated treatment works. Strict controls on the quality of the treated effluents should be established. In no case should the storm water or concentrated industrial effluents be allowed to enter the network and the treatment plant.

Discharge of Sewage

The discharge of sewage directly into the watercourses from premises situated nearby should be stopped. In cases where there is no sanitary sewage system the effluents should be discharged in properly built cesspits or septic tanks.

Discharge of Industrial Effluents

The water authorities or a supreme control body should refuse permission to discharge industrial effluent which does not comply with the established standard for effluents to the streams, unless approved treatment is provided. If such permission is granted the control authority should regularly check the discharge of treated effluent and should be able to stop the discharge in the case of unsatisfactory analyses.

Dumping or Disposal of Solid Wastes

The dumping of solid wastes, garbage etc. along the watercourses should be prohibited. The disposal of solid wastes should be effected in such way that it does not cause any hazard to the groundwater. In the location of a dumping site the local geological and hydrogeological conditions should be taken into account.

Cleansing of the Watercourses through built-up Areas

The areas around the watercourses passing through built-up areas should be cleaned of all dumped wastes. Workshops, storage areas etc. situated wholly or partly on the lower river terrace should be evacuated. In the urban development plans provisions should be made for the streams to be canalized as already done in the Seil in Amman. The concreting of the river bed and banks will prevent infiltration of polluted water into the aquifer.

Storage of Chemicals, Toxic Substances etc.

Storage tanks for petrol and oil should be inspected regularly for leakages. Oil and grease traps should be provided at all discharge points from petrol stations, factories, workshops, etc. These traps should be regularly emptied and this should be controlled by an appointed control body.

5. Recommendations for Water Pollution Control

The overall control of water pollution and waste water disposal should be executed by the supreme control body as part of a national water resources policy. In the first instance this authority should establish standards for the acceptability of water for different purposes as well

as for waste water discharged from the consumers. It should coordinate the functions of all agencies involved in the direct control and examination of water quality and should have legal power to intervene immediately when the circumstances require it.

The functions of the supreme body should be based on standards soundly reflecting the local conditions in the country and taking account of the established international or foreign standards and regulations. The standards should be practical for the present conditions but they should be further improved and made stricter if and when future developments allow it.

Below are some recommendations which could be considered as guidelines for the establishment of local standards. They are based on international standards issued by the World Health Organization, the Arab Organization for Standardization and Methodology, and U.S., and western European standards institutions.

Standards for drinking water

These recommendations are based on the "International Standards for Drinking Water" of WHO, 1971, and the "Arab Standard Specifications, ASMO Recommendation" No. 2, 1971, of the Arab League. They are presented in Table WS 6-4.

Standards for acceptance of effluents into sewers

pH	6.5 to 9.0
Temperature ^{o}C	30 after mixing
BOD, 5 days, 20^{o} C, mg/l	1,500
COD (chemical oxygen demand)	2,500
Suspended solids, mg/l	1,000

The wastes must be free of oil, petrol, kerosene and greases. The wastes should not include any toxic materials. The wastes must be free of animal and vegetable oil and fat - except in small quantities which will not cause any hazard for the treatment process.

Standards for acceptance of effluents to watercourse

pH		6.5 to 9.0
Temperature, ^{o}C		30
BOD, 5 days, 20^{o} C,	mg/l	30
Suspended solids,	mg/l	not exceeding 5
Cd, total	mg/l	1
Pb, total	mg/l	1
Cu, total	mg/l	1
Ni, total	mg/l	1
Zu, total	mg/l	2
Fe, total	mg/l	1
free Cl_2	mg/l	0.5
NH_3, free	mg/l	0.1

The effluents must be free of oil, petrol, kerosene and greases.
The effluents should not include any toxic materials.
The effluents must be free of animal and vegetable oil and fat.
All effluent containing a significant amount of pathogens should undergo the appropriate chlorination.
Chlorine dosages must be adjusted according to the specific conditions.

Table WS 6-4 DRINKING WATER STANDARDS

Upper Limit in Water Samples	Units	Highest Desirable Level		Maximum Permissible Level	
		ASS	WHO	ASS	WHO
Coliform organisms	MPN/100 ml	10 (3)	0	10 (3)	0 (4)
E. Coli	per 100 ml		0		0
Virus	per liter		0		0
Arsenic (as As)	mg/l			0.05	0.05
Chromium (as Cr) hexavalent	mg/l			0.05	
Cadmium (as Cd)	mg/l			0.01	0.01
Barium (as Ba)				1.0	
Cyanide (as CN)	mg/l			0.02	0.05
Lead (as Pb)	mg/l			0.05	0.10
Mercury total (as Hg)	mg/l			0.01	0.001
Selenium (as Se)	mg/l				0.01
Fluorides (as F)	mg/l		0.6 to 0.9	1.5	0.8 to 1.7
Nitrates (as NO_3)	mg/l		45	40	
Color	Pt-Co units	5	5	50	50
Objectionable odor					0
Objectionable taste					0
Suspended matter (turbidity)	turbidity units	5	5	25	25
Total solids	mg/l	500	500	1500	1500
pH			7.0 to 8.5		6.5 to 9.2
Anionic detergents	mg/l		0.2		1.0
Surfactants	mg/l	0.5		1.0	
Mineral oil	mg/l		0.01		0.30
Phenolic compounds	mg/l	0.001	0.001	0.002	0.002
Total hardness (as $CaCO_3$)	mg/l		100		500
Calcium (as Ca)	mg/l	75	75	200	200

...contd.

Table WS 6-4 (contd.)

Upper Limit in Water Samples	Units	Highest Desirable Level		Maximum Permissible Level	
		ASS	WHO	ASS	WHO
Chloride (as Cl)	mg/l	200	200	600	600
Copper (as Cu)	mg/l	1.0	0.05	1.5	1.5
Iron (as Fe)	mg/l	0.3	0.1	1.0	1.0
Magnesium (as Mg)	mg/l	50	30 to 150	150	150
Manganese (as Mn)	mg/l	0.1	0.05	0.5	0.5
Sulfate (as SO_4)	mg/l	200	200	400	400
Zinc (as Zn)	mg/l	5	5	15	15
Carbon chloroform extract	mg/l	0.2		0.5	

ASS - "Arab Standard Specifications, ASMO Recommendation No. 2, 1971. Drinking Water and Standard Methods for Testing and Analysis, Arab League. Arab Organization for Standardization and Methodology, UDC, 543.3"

WHO - "International Standards for Drinking Water, Third Edition, World Health Organization, Geneva, 1971"

REFERENCES

1. Feasibility Study for Amman Water Supply and Sewerage Facilities. November 1976
VBB/Fawzi & Associates, Amman

2. Water Resources Study for Amman Water Supply
November 1976
VBB/Fawzi & Associates, Amman

3. Aqaba Water Supply Feasibility Study,
Preliminary Report on Water Demand, October 1976
Howard Humphreys & Sons/Peat Marwiac Mitchell & Co.

4. Irbid-Yarmouk Water Supply, Crown Agents, 1976.

Annex

SUMMARY TABLES

"Municipal and Industrial Water Supply
Consumption/Demand 1975 - 2000"

TABLE WS 4-10-1

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—	22,920	1.3	2,480	22,920	—	0.6	13,750	1,150
	communities	WSC supply	piped	—	—	5,830	1.3	630	5,830	—	0.4	2,330	195
	other consumers	WSC supply	piped	—	—	1,640	1.3	180	1,640	—	0.4	660	55
	industry		piped	—	—	9,960	1.0	830	9,960	—	0.5	4,980	415
	un-piped supply			410.3	13.0	5,330	1.0	440	5,330	—	0.0	—	—
	Total					45,680	1.20	4,560	45,680		0.47	21,720	1,815
Demand 1975	City / Town of			925.8		44,530	1.4	5,195			0.6	26,720	2,230
	communities	50,000 - 3,000	piped	373.7	34.0	12,710	1.5	1,590			0.4	5,080	425
	communities	< 3,000	piped	242.2	32.5	7,870	1.6	1,050			0.4	3,150	260
	other consumers		piped	—	—	1,680	1.5	210			0.4	670	55
	industry		piped	—	—	9,960	1.0	830			0.5	4,980	415
	un-piped supply			410.3	13.0	5,330	1.0	440			0.0	—	—
	Total			1952.0		82,080		9,320			0.49	40,600	3,380
Demand 1985	City / Town of (see below)			1588.5		91,380	1.4	10,660			0.65	59,400	4,950
	communities	50,000 - 3,000	piped	561.1	43.5	24,410	1.5	3,050			0.55	13,420	1,120
	communities	< 3,000	piped	371.1	39.0	14,470	1.6	1,930			0.55	7,960	660
	other consumers		piped	—	—	1,680	1.5	210			0.6	1,000	80
	industry		piped	—	—	55,000	1.0	4,580			0.5	27,500	2,300
	un-piped supply			222.3	13.0	2,890	1.0	240			0.0	—	—
	Total			2743.0		189,830	1.30	20,690			0.57	109,280	9,110
Demand 2000	City / Town of (see below)			2948.4		170,740	1.4	19,920			0.7	119,520	9,960
	communities	50,000 - 3,000	piped	830.8	50.7	42,120	1.5	5,260			0.6	25,270	2,110
	communities	< 3,000	piped	475.5	44.2	21,020	1.6	2,800			0.6	12,610	1,050
	other consumers		piped	—	—	1,680	1.5	210			0.7	1,180	100
	industry		piped	—	—	61,320	1.0	5,110			0.5	30,660	2,560
	un-piped supply			190.6	13.0	2,480	1.0	210			0.0	—	—
	Total			4445.3		299,360		33,510				189,240	15,780

Demand City / Town	1975			1985			2000		
	m^3/c per year	inhabitant (x 10^3)	total (m^3 x 10^3)	m^3/c per year	inhabitant (x 10^3)	total (m^3 x 10^3)	m^3/c per year	inhabitant (x 10^3)	total (m^3 x 10^3)
Amman	47.8	606.6	28995.5	57.3	1040.8	59637.8	57.7	2014.2	116219.3
Zerqa	47.8	184.0	8795.2	57.3	333.2	19092.4	57.7	558.3	32213.9
Irbid	47.8	119.1	5693.0	57.3	194.3	11133.4	57.7	349.9	20189.2
Aqaba	64.9	16.1	1045.0	74.8	20.2	1511.0	81.4	26.0	2116.4
Total		925.8	44528.7		1588.5	91374.6		2948.4	170738.8

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Total

TABLE WS 4-10-2

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			33.7	13.0	438.1	1.0	36.5	438.1	—	0.0	—	—
	Total			33.7		438.1		36.5	438.1			-	-
Demand 1975	City / Town of			-	-	-	1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	-	34.0	-	1.5				0.4		
	communities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—	-	1.5				0.4		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			33.7	13.0	438.1	1.0	36.5			0.0	—	—
	Total			33.7		438.1		36.5				-	-
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	14.0	43.5	609.0	1.5	76.1			0.55	335.0	27.9
	communities	< 3,000 ⊗	piped	5.9	39.0	230.1	1.6	30.7			0.55	126.5	10.5
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			46.5	13.0	604.5	1.0	50.4			0.0	—	—
	Total			66.4		1,443.6		157.2				461.5	38.4
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	49.0	50.7	2,484.3	1.5	310.5			0.6	1,490.6	124.2
	communities	< 3,000 ⊗	piped	20.2	44.2	892.8	1.6	119.0			0.6	535.7	44.6
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			42.0	13.0	546.0	1.0	45.5			0.0	—	—
	Total			111.2		3,923.1		475.0				2,026.3	168.8

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº: AB 12

TABLE 4-10-3

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3	-		—	0.6		
	communities	WSC supply	piped	—	—	14.2	1.3	1.5	14.2	—	0.4	5.7	0.5
	other consumers	WSC supply	piped	—	—	-	1.3	-		—	0.4		
	industry	WSC supply	piped	—	—	-	1.0	-		—	0.5		
	un-piped supply			10.6	13.0	137.8	1.0	11.5	131.8	—	0.0	—	—
	Total					152.0		13.0	152.0			5.7	0.5
Demand 1975	City / Town of			-			1.4				0.6		
	communities	50,000 - 3,000 ⊛	piped	-	34.0		1.5				0.4		
	communities	< 3,000 ⊛	piped	1.3	32.5	42.3	1.6	5.6			0.4	16.9	1.4
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			10.6	13.0	137.8	1.0	11.8			0.0	—	—
	Total			11.9		180.1		17.1				16.9	1.4
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊛	piped	8.9	43.5	387.2	1.5	48.4			0.55	212.9	17.7
	communities	< 3,000 ⊛	piped	2.8	39.0	109.2	1.6	14.6			0.55	60.0	5.0
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			11.7	13.0	152.1	1.0	12.7			0.0	—	—
	Total			23.4		648.5		75.7				272.9	22.7
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊛	piped	20.5	50.7	1,039.3	1.5	130.0			0.6	623.6	52.0
	communities	< 3,000 ⊛	piped	8.2	44.2	362.4	1.6	48.3			0.6	217.4	18.1
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			10.5	13.0	136.5	1.0	11.4			0.0	—	—
	Total			39.2		1,538.2		189.7				841.0	70.1

⊛ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AB 13

TABLE WS 4-10-4

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9 (8+9=5)	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City/Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			4.9	13.0	63.7	1.0	5.3	63.7	—	0.0	—	—
	Total			-		63.7		5.3	63.7			-	-
Demand 1975	City/Town of			-	-	-	1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	-	34.0	-	1.5				0.4		
	communities	< 3,000 ⊗	piped	-	32.5	-	1.6				0.4		
	other consumers		piped	—	—	-	1.5				0.4		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			4.9	13.0	63.7	1.0	5.3			0.0	—	—
	Total			4.9		63.7		5.3				-	-
Demand 1985	City/Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	-	43.5	-	1.5				0.55		
	communities	< 3,000 ⊗	piped	4.8	39.0	187.2	1.6	24.9			0.55	102.9	8.6
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			4.8	13.0	62.4	1.0	5.2			0.0	—	—
	Total			9.6		249.6		30.1				102.9	8.6
Demand 2000	City/Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	5.0	50.7	253.5	1.5	31.7			0.6	152.1	12.7
	communities	< 3,000 ⊗	piped	6.6	44.2	291.7	1.6	38.9			0.6	175.0	14.6
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			4.5	13.0	58.5	1.0	4.9			0.0	—	—
	Total			16.1		603.7		75.5				327.1	27.3

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AB 14

TABLE WS 4-10-5

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			10.3	13.0	133.9	1.0	11.2	133.9	—	0.0	—	—
	Total			-		133.9		11.2	133.9				
Demand 1975	City / Town of			-	-	-	1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	-	34.0	-	1.5				0.4		
	communities	< 3,000 ⊗	piped	-	32.5	-	1.6				0.4		
	other consumers		piped	—	—	-	1.5				0.4		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			10.3	13.0	133.9	1.0	11.2			0.0	—	—
	Total			10.3		133.9		11.2					
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	4.3	43.5	187.0	1.5	23.4			0.55	102.9	8.6
	communities	< 3,000 ⊗	piped	9.9	39.0	386.1	1.6	51.5			0.55	212.3	17.7
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			6.1	13.0	79.3	1.0	6.6			0.0	—	—
	Total			20.3		652.4		81.5				315.2	26.3
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	15.0	50.7	760.5	1.5	95.1			0.6	456.3	38.0
	communities	< 3,000 ⊗	piped	15.0	44.2	663.0	1.6	88.4			0.6	397.8	33.1
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			4.0	13.0	52.0	1.0	4.3			0.0	—	—
	Total			34.0		1,475.5		187.8				854.1	71.1

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AB 15

TABLE WS 4-10-6

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	75.9	1.3	8.2	75.9	—	0.4	30.4	2.6
	other consumers	WSC supply	piped	—	—	25.3	1.3	2.7	25.3	—	0.4	10.1	0.8
	industry		piped	—	—	-	1.0			—	0.5		
	un-piped supply			2.7	13.0	35.1	1.0	2.9	35.1	—	0.0	—	—
	Total			-		136.3		13.8	136.3			40.5	3.4
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊛	piped	7.4	34.0	251.6	1.5	31.4			0.4	100.6	8.4
	communities	< 3,000 ⊛	piped	0.6	32.5	19.5	1.6	2.6			0.4	7.8	0.7
	other consumers		piped	—	—	26.0	1.5	3.2			0.4	10.4	0.9
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.7	13.0	35.1	1.0	2.9			0.0	—	—
	Total			10.7		332.2		40.1				118.8	10.0
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊛	piped	9.2	43.5	400.2	1.5	50.0			0.55	220.1	18.3
	communities	< 3,000 ⊛	piped	0.8	39.0	31.2	1.6	4.1			0.55	17.2	1.4
	other consumers		piped	—	—	26.0	1.5	3.2			0.6	15.6	1.3
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			1.8	13.0	23.4	1.0	2.0			0.0	—	—
	Total			11.8		480.8		59.3				252.9	21.0
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊛	piped	10.0	50.7	507.0	1.5	63.4			0.6	304.2	25.4
	communities	< 3,000 ⊛	piped	1.8	44.2	79.6	1.6	10.6			0.6	47.8	4.0
	other consumers		piped	—	—	26.0	1.5	2.2			0.7	18.2	1.5
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			1.0	13.0	13.0	1.0	1.1			0.0	—	—
	Total			12.8		625.6		77.3				370.2	30.9

⊛ inhabitant

Industry	Cons.: 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AB 21

TABLE WS 4-10-7

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{12}$ x 6	8	9	10	11= 5x10	12= $\frac{11}{12}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	119.8	1.3	12.9	119.8	—	0.4	47.9	4.0
	other consumers	WSC supply	piped	—	—	7.5	1.3	0.8	7.5	—	0.4	3.0	0.2
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.1	13.0	1.3	1.0	0.1	1.3	—	0.0	—	—
	Total			-		128.6		13.8	128.6			50.9	4.2
Demand 1975	City / Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped	10.9	34.0	370.6	1.5	46.3			0.4	148.2	12.3
	comm-unities	< 3,000 ⊗	piped	0.8	32.5	26.0	1.6	3.5			0.4	10.4	0.9
	other consumers		piped	—	—	8.0	1.5	1.0			0.4	3.2	0.3
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.1	13.0	1.3	1.0	0.1			0.0	—	—
	Total			11.8		405.9		50.9				161.8	13.5
Demand 1985	City / Town of			-		-	1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped	12.1	43.5	526.4	1.5	65.8			0.55	289.5	24.1
	comm-unities	< 3,000 ⊗	piped	1.1	39.0	42.9	1.6	5.8			0.55	23.6	2.0
	other consumers		piped	—	—	8.0	1.5	1.0			0.6	4.8	0.4
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			-	13.0		1.0				0.0	—	—
	Total			13.2		577.3		72.6				317.9	26.5
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	13.2	50.7	669.2	1.5	83.6			0.6	401.5	33.5
	comm-unities	< 3,000 ⊗	piped	1.2	44.2	53.1	1.6	7.1			0.6	31.9	2.6
	other consumers		piped	—	—	8.0	1.5	1.0			0.7	5.6	0.5
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			-	13.0	-	1.0	-			0.0	—	—
	Total			14.4		730.3		91.7				439.0	36.6

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975 - 2000

Origin of Water / Waste Water

Area Nº.: AB 22

TABLE WS 4-10-8

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9 (8+9=5)	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	64.3	1.3	6.9	64.3	—	0.4	25.7	2.2
	other consumers	WSC supply	piped	—	—	4.1	1.3	0.4	4.1	—	0.4	1.6	0.1
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.5	13.0	6.5	1.0	0.5	6.5	—	0.0	—	—
	Total			-		74.9		7.8	74.9			27.3	2.3
Demand 1975	City / Town of			-	-		1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped	-	34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped	6.3	32.5	205.0	1.6	27.3			0.4	82.0	6.8
	other consumers		piped	—	—	5.0	1.5	0.6			0.4	2.0	0.2
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.5	13.0	6.5	1.0	0.5			0.0	—	—
	Total			6.8		216.5		28.4				84.0	7.0
Demand 1985	City / Town of			-		-	1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped	-	43.5	-	1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	7.1	39.0	276.9	1.6	36.9			0.55	152.3	12.6
	other consumers		piped	—	—	5.0	1.5	0.6			0.6	3.0	0.2
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			0.4	13.0	5.2	1.0	0.4			0.0	—	—
	Total			7.5		287.1		37.9				155.3	12.8
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	4.0	50.7	202.8	1.5	25.4			0.6	121.7	10.1
	comm-unities	< 3,000 ⊗	piped	4.2	44.2	185.6	1.6	24.7			0.6	111.4	9.3
	other consumers		piped	—	—	5.0	1.5	0.6			0.7	3.5	0.3
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			-	13.0	-	1.0	-			0.0	—	—
	Total			8.2		393.4		50.7				236.6	19.7

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº: AB 23

TABLE WS 4-10-9

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			6.0	13.0	78.0	1.0	6.5	15.6	—	0.0	—	—
	Total			-		78.0		6.5	15.6			-	-
Demand 1975	City / Town of			-	-		1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	-	34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped	-	32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			6.0	13.0	78.0	1.0	6.5			0.0	—	—
	Total			6.0		78.0		6.5					
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	2.5	43.5	108.7	1.5	13.6			0.55	59.8	4.9
	communities	< 3,000 ⊗	piped	0.6	39.0	23.4	1.6	3.1			0.55	12.9	1.1
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			3.0	13.0	39.0	1.0	3.2			0.0	—	—
	Total			6.1		171.1		19.9				72.7	6.0
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	4.0	50.7	202.8	1.5	25.4			0.6	121.7	10.1
	communities	< 3,000 ⊗	piped	1.5	44.2	66.3	1.6	8.8			0.6	39.8	3.3
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			1.0	13.0	13.0	1.0	1.1			0.0	—	—
	Total			6.5		282.1		35.3				161.5	13.4

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AB 24

TABLE WS 4-10-10

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			1.2	13.0	15.6	1.0	1.3	15.6	—	0.0	—	—
	Total			-		15.6		1.3	15.6			-	-
Demand 1975	City / Town of			-			1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	-	34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped	-	32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			1.2	13.0	15.6	1.0	1.3			0.0	—	—
	Total			1.2		15.6		1.3				-	-
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	-	43.5	-	1.5				0.55		
	communities	< 3,000 ⊗	piped	0.4	39.0	15.6	1.6	2.0			0.55	8.6	0.7
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			0.9	13.0	11.7	1.0	1.0			0.0	—	—
	Total			1.3		27.3		3.0				8.6	0.7
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	communities	< 3,000 ⊗	piped	1.4	44.2	61,9	1.6	8.2			0.6	37.1	3.1
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			-	13.0	-	1.0	-			0.0	—	—
	Total			1.4		61.9		8.2				37.1	3.1

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AB 25

TABLE WS 4-10-11

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9 (8+9=5)	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			2.2	13.0	28.6	1.0	2.3	28.6	—	0.0	—	—
	Total			-		28.6		2.3	28.6			-	-
Demand 1975	City / Town of			-			1.4				0.6		
	comm-unities	50,000 ⊗ - 3,000	piped	-	34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped	-	32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.2	13.0	28.6	1.0	2.3			0.0	—	—
	Total			2.2		28.6		2.3				-	-
Demand 1985	City / Town of			-		-	1.4				0.65		
	comm-unities	50,000 ⊗ - 3,000	piped	-	43.5	-	1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	1.3	39.0	50.7	1.6	6.8			0.55	27.9	2.3
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			1.3	13.0	16.9	1.0	1.4			0.0	—	—
	Total			2.6		67.6		8.2				27.9	2.3
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 ⊗ - 3,000	piped	-	50.7	-	1.5	-			0.6	-	-
	comm-unities	< 3,000 ⊗	piped	2.1	44.2	92.8	1.6	12.4			0.6	55.7	4.6
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			1.0	13.0	13.0	1.0	1.1			0.0	—	—
	Total			3.1		105.8		13.5				55.7	4.6

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AB 26

TABLE WS 4-10-12

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	86.7	1.3	9.3	86.7	—	0.4	34.7	2.9
	other consumers	WSC supply	piped	—	—	28.9	1.3	3.2	28.9	—	0.4	11.6	1.0
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			6.2	13.0	80.6	1.0	6.7	80.6	—	0.0	—	—
	Total			-		196.2		19.2	196.2			46.3	3.9
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	1.1	34.0	37.4	1.5	4.7			0.4	15.0	1.2
	communities	< 3,000 ⊗	piped	7.8	32.5	253.5	1.6	33.8			0.4	101.4	8.5
	other consumers		piped	—	—	29.0	1.5	3.6			0.4	11.6	1.0
	industry		piped	—	—		1.0				0.5		
	un-piped supply			6.2	13.0	80.6	1.0	6.7			0.0	—	—
	Total			15.1		400.5		48.8				128.0	10.7
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	5.8	43.5	252.3	1.5	31.5			0.55	138.8	11.6
	communities	< 3,000 ⊗	piped	9.4	39.0	366.6	1.6	48.9			0.55	201.6	16.8
	other consumers		piped	—	—	29.0	1.5	3.6			0.6	17.4	1.4
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			1.7	13.0	22.1	1.0	1.8			0.0	—	—
	Total			16.9		670.0		85.8				357.8	29.8
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	9.5	50.7	481.6	1.5	60.21			0.6	289.0	24.0
	communities	< 3,000 ⊗	piped	7.5	44.2	331.5	1.6	44.2			0.6	198.9	16.6
	other consumers		piped	—	—	29.0	1.5	3.6			0.7	20.3	1.7
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			1.5	13.0	19.5	1.0	1.6			0.0	—	—
	Total			18.5		861.6		109.6				508.2	42.3

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AD 21

TABLE WS 4-10-13

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	7.3	1.3	0.8	7.3	—	0.4	2.9	0.2
	other consumers	WSC supply	piped	—	—	2.4	1.3	0.3	2.4	—	0.4	1.0	0.1
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			8.3	13.0	107.9	1.0	8.9	107.9	—	0.0	—	—
	Total			-		117.6		10.0	117.7			3.9	0.3
Demand 1975	City / Town of			-			1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	-	34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped	0.7	32.5	22.8	1.6	3.0			0.4	9.1	0.8
	other consumers		piped	—	—	3.0	1.5	0.4			0.4	1.2	0.1
	industry		piped	—	—		1.0				0.5		
	un-piped supply			8.3	13.0	107.9	1.0	9.0			0.0	—	—
	Total			9.0		133.7		12.4				10.3	0.9
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	1.8	43.5	78.3	1.5	9.8			0.55	43.0	3.6
	communities	< 3,000 ⊗	piped	3.2	39.0	124.8	1.6	16.6			0.55	68.6	5.8
	other consumers		piped	—	—	3.0	1.5	0.4			0.6	1.8	0.5
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			5.0	13.0	65.0	1.0	5.4			0.0	—	—
	Total			10.0		271.1		32.2				113.4	9.9
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	4.0	50.7	202.8	1.5	25.0			0.6	121.7	10.1
	communities	< 3,000 ⊗	piped	4.5	44.2	198.9	1.6	26.5			0.6	119.3	9.9
	other consumers		piped	—	—	3.0	1.5	0.4			0.7	2.1	0.2
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			2.5	13.0	32.5	1.0	2.7			0.0	—	—
	Total			11.0		437.2		54.6				243.1	20.2

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº: AD 23

TABLE WS 4-10-14

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	1,322.4	1.3	143.2	1,322.4	—	0.4	529.0	44.1
	other consumers	WSC supply	piped	—	—	441.0	1.3	47.7	441.0	—	0.4	176.4	14.7
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			15.6	13.0	202.8	1.0	16.9	202.8	—	0.0	—	—
	Total			-		1,966.2		207.8	1,966.2			705.4	58.8
Demand 1975	City Town of			-			1.4				0.6		
	communities	50,000 - 3,000 ⊛	piped	89.8	34.0	3,053.2	1.5	381.6			0.4	1,221.3	101.8
	communities	< 3,000 ⊛	piped	43.3	32.5	1,407.2	1.6	187.6			0.4	562.9	46.9
	other consumers		piped	—	—	441.0	1.5	55.1			0.4	.176.4	14.7
	industry		piped	—	—		1.0				0.5		
	un-piped supply			15.6	13.0	202.8	1.0	16.9			0.0	—	—
	Total			148.7		5,104.2		641.2				1,960.6	163.4
Demand 1985	City Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊛	piped	101.0	43.5	4,393.5	1.5	549.2			0.55	2,416.4	201.4
	communities	< 3,000 ⊛	piped	49.0	39.0	1,911.0	1.6	254.8			0.55	1,051.0	87.6
	other consumers		piped	—	—	441.0	1.5	55.1			0.6	264.6	22.0
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			16.9	13.0	219.7	1.0	18.3			0.0	—	—
	Total			166.9		6,965.2		877.4				3,732.0	311.0
Demand 2000	City Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊛	piped	120.0	50.7	6,084.0	1.5	760.5			0.6	3,650.4	304.2
	communities	< 3,000 ⊛	piped	58.6	44.2	2,590.1	1.6	345.3			0.6	1,554.1	129.5
	other consumers		piped	—	—	441.0	1.5	55.1			0.7	308.7	25.7
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			15.0	13.0	195.0	1.0	16.2			0.0	—	—
	Total			193.6		9,310.1		1,177.1				5,513.2	459.4

⊛ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AD 52

TABLE WS 4-10-15

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	1,589.8	1.3	172.2	1,589.8	—	0.4	635.9	53.0
	other consumers	WSC supply	piped	—	—	530.0	1.3	57.4	530.0	—	0.4	212.0	17.7
	industry		piped	—	—	-	1.0			—	0.5		
	un-piped supply			14.0	13.0	182.0	1.0	15.2	182.0	—	0.0	—	—
	Total			-		2,301.8		244.8	2,301.8			847.9	70.7
Demand 1975	City / Town of Irbid			119.1	47.8	5,693.0	1.4	664.2			0.6	3,415.8	284.6
	communities	50,000 - 3,000 ⊗	piped	14.0	34.0	476.0	1.5	59.5			0.4	190.4	15.9
	communities	< 3,000 ⊗	piped	22.9	32.5	744.3	1.6	99.3			0.4	297.7	24.8
	other consumers		piped	—	—	530.0	1.5	66.2			0.4	212.0	17.7
	industry		piped	—	—		1.0				0.5		
	un-piped supply			14.0	13.0	182.0	1.0	15.2			0.0	—	—
	Total			170.0		7,625.3		904.4				4,115.9	343.0
Demand 1985	City / Town of Irbid			194.3	57.3	11,133.4	1.4	1,298.9			0.65	7,236.8	603.0
	communities	50,000 - 3,000 ⊗	piped	16.7	43.5	726.5	1.5	90.8			0.55	399.6	33.3
	communities	< 3,000 ⊗	piped	27.2	39.0	1,060.8	1.6	141.4			0.55	583.4	48.6
	other consumers		piped	—	—	530.0	1.5	66.2			0.6	318.0	26.5
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			4.9	13.0	63.7	1.0	5.3			0.0	—	—
	Total			243.1		13,514.4		1,602.6				8,537.8	711.4
Demand 2000	City / Town of Irbid			349.9	57.7	20,189.2	1.4	2,355.4			0.7	14,132.4	1,177.7
	communities	50,000 - 3,000 ⊗	piped	30.0	50.7	1,521.0	1.5	190.1			0.6	912.6	76.1
	communities	< 3,000 ⊗	piped	23.6	44.2	1,043.1	1.6	139.1			0.6	625.9	52.1
	other consumers		piped	—	—	530.0	1.5	66.2			0.7	371.0	30.9
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			3.5	13.0	45.5	1.0	3.8			0.0	—	—
	Total			407.0		23,328.8		2,754.6				16,041.9	1,336.8

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975 - 2000
Origin of Water / Waste Water

Area Nº.: AE

TABLE WS 4-10-16

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
									8+9=5				
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	90.4 41.5	1.3	14.2	131.9	—	0.4	52.8	4.4
	other consumers	WSC supply	piped	—	—	30.1 2.6	1.3	3.5	32.7	—	0.4	13.1	1.1
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			7.3	13.0	94.9	1.0	7.9	94.9	—	0.0	—	—
	Total			-		259.5		25.6	259.5			65.9	5.5
Demand 1975	City / Town of			-			1.4				0.6		
	communities	50,000 - 3,000 ⊛	piped	5.9	34.0	200.6	1.5	25.1			0.4	80.2	6.7
	communities	< 3,000 ⊛	piped	7.3	32.5	237.3	1.6	31.6			0.4	94.9	7.9
	ether consumers		piped	—	—	33.0	1.5	4.1			0.4	13.2	1.1
	industry		piped	—	—		1.0				0.5		
	un-piped supply			7.3	13.0	94.9	1.0	8.0			0.0	—	—
	Total			20.5		565.8		68.8				188.3	15.7
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊛	piped	9.0	43.5	391.5	1.5	48.9			0.55	215.3	17.9
	communities	< 3,000 ⊛	piped	11.2	39.0	436.8	1.6	58.2			0.55	240.2	20.0
	other consumers		piped	—	—	33.0	1.5	4.1			0.6	19.8	1.6
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			2.2	13.0	28.6	1.0	2.4			0.0	—	—
	Total			22.4		889.9		113.6				475.3	39.5
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊛	piped	11.0	50.7	557.7	1.5	69.7			0.6	334.6	27.9
	communities	< 3,000 ⊛	piped	10.9	44.2	481.8	1.6	64.2			0.6	289.1	24.1
	other consumers		piped	—	—	33.0	1.5	4.1			0.7	23.1	1.9
	industry		piped	—	—	-	1.0	-			0.5		
	un-piped supply			2,0	13.0	26.0	1.0	2.2			0.0	—	—
	Total			23.9		1,098.5		140.2				646.8	53.9

⊛ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AF.

TABLE WS 4-10-17

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	12.3	1.3	1.3	12.3	—	0.4	4.9	0.4
	other consumers	WSC supply	piped	—	—	0.8	1.3	8.6	0.8	—	0.4	0.3	-
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.2	13.0	2.6	1.0	0.2	2.6	—	0.0	—	—
	Total			-		15.7		10.1	15.7			5.2	0.4
Demand 1975	City / Town of			-	-		1.4				0.6		
	communities	50,000 - 3,000 ⊛	piped	-	34.0		1.5				0.4		
	communities	< 3,000 ⊛	piped	1.2	32.5	39.0	1.6	5.2			0.4	15.6	1.3
	other consumers		piped	—	—	1.0	1.5	0.1			0.4	0.4	
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.2	13.0	2.6	1.0	0.2			0.0	—	—
	Total			1.4		42.6		5.5				16.0	1.3
Demand 1985	City / Town of			-			1.4				0.65		
	communities	50,000 - 3,000 ⊛	piped	-	43.5		1.5				0.55		
	communities	< 3,000 ⊛	piped	1.5	39.0	58.5	1.6	7.8			0.55	32.1	2.7
	other consumers		piped	—	—	1.0	1.5	0.1			0.6	0.6	-
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			0.1	13.0	1.3	1.0	0.1			0.0	—	—
	Total			1.6		60.8		8.0				32.7	2.7
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊛	piped	-	50.7	-	1.5	-			0.6	-	-
	communities	< 3,000 ⊛	piped	1.7	44.2	75.1	1.6	10.0			0.6	45.1	3.8
	other consumers		piped	—	—	1.0	1.5	[illegible]			0.7	0.7	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			-	13.0	-	1.0	-			0.0	—	—
	Total			1.7		76.1		10.1				45.8	3.8

⊛ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AG

TABLE WS 4-10-18

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 8+9=5	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	10.9 48.1	1.3	6.4	59.0	—	0.4	23.6	2.0
	other consumers	WSC supply	piped	—	—	3.6 3.0	1.3	0.7	6.6	—	0.4	2.6	0.2
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			9.8	13.0	127.4	1.0	10.6	127.4	—	0.0	—	—
	Total			-		193.0		17.7	193.0			26.2	2.2
Demand 1975	City / Town of			-			1.4				0.6		
	communities	50,000 - 3,000 ⊛	piped	3.6	34.0	122.4	1.5	15.3			0.4	48.9	4.1
	communities	< 3,000 ⊛	piped	1.1	32.5	35.8	1.6	4.8			0.4	14.3	1.2
	other consumers		piped	—	—	7.0	1.5	0.9			0.4	2.8	0.2
	industry		piped	—	—		1.0				0.5		
	un-piped supply			9.8	13.0	127.4	1.0	10.6			0.0	—	—
	Total			14.5		292.6		31.6				66.0	5.5
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊛	piped	3.8	43.5	165.3	1.5	20.7			0.55	90.9	7.6
	communities	< 3,000 ⊛	piped	7.7	39.0	300.3	1.6	40.0			0.55	165.1	13.8
	other consumers		piped	—	—	7.0	1.5	0.9			0.6	4.2	0.3
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			2.8	13.0	36.4	1.0	3.0			0.0	—	—
	Total			14.3		509.0		64.6				260.2	21.7
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊛	piped	4.0	50.7	202.8	1.5	25.3			0.6	164.9	13.7
	communities	< 3,000 ⊛	piped	7.4	44.2	327.1	1.6	43.6			0.6	196.3	16.3
	other consumers		piped	—	—	7.0	1.5	0.9			0.7	4.9	0.4
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			2.0	13.0	26.0	1.0	2.2			0.0	—	—
	Total			13.4		562.9		72.0				365.8	30.4

⊛ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AH

TABLE WS 4-10-19

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of Ajlun			—	—	136.0	1.3	14.7	136.0	—	0.6	81.6	6.8
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			13.5	13.0	175.5	1.0	14.6	175.5	—	0.0	—	—
	Total			-		311.5		29.3	311.5			81.6	6.8
Demand 1975	City / Town of			-			1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped	4.0	34.0	136.0	1.5	17.0			0.4	54.4	4.5
	comm-unities	< 3,000 ⊗	piped	-	32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			13.5	13.0	175.5	1.0	14.6			0.0	—	—
	Total			17.5		311.5		31.6				54.4	4.5
Demand 1985	City / Town of			-		-	1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped	10.0	43.5	435.0	1.5	54.4			0.55	239.2	20.0
	comm-unities	< 3,000 ⊗	piped	3.0	39.0	117.0	1.6	15.6			0.55	64.3	5.4
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			3.2	13.0	41.6	1.0	3.5			0.0	—	—
	Total			16.2		593.6		73.5				303.5	25.4
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	8.0	50.7	405.6	1.5	50.7			0.6	243.4	20.3
	comm-unities	< 3,000 ⊗	piped	2.3	44.2	101.7	1.6	13.6			0.6	61.0	5.1
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			3.0	13.0	39.0	1.0	3.2			0.0	—	—
	Total			13.3		546.3		67.5				304.4	25.4

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AI

TABLE WS 4-10-20

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			1.5	13.0	19.5	1.0	1.6	19.5	—	0.0	—	—
	Total			-		19.5		1.6	19.5			-	-
Demand 1975	City Town of			-			1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	-	34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped	-	32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			1.5	13.0	19.5	1.0	1.6			0.0	—	—
	Total			1.5		19.5		1.6				-	-
Demand 1985	City Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	-	43.5	-	1.5				0.55		
	communities	< 3,000 ⊗	piped	0.7	39.0	27.3	1.6	3.6			0.55	15.0	1.3
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			0.7	13.0	9.1	1.0	0.8			0.0	—	—
	Total			1.4		36.4		4.4				15.0	1.3
Demand 2000	City Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	communities	< 3,000 ⊗	piped	0.6	44.2	26.5	1.6	3.5			0.6	15.9	1.3
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			0.6	13.0	7.8	1.0	0.7			0.0	—	—
	Total			1.2		34.3		4.2				15.9	1.3

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AK

TABLE WS 4-10-21

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	61.3	1.3	6.6	61.3	—	0.4	24.5	2.0
	other consumers	WSC supply	piped	—	—	-	1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			8.6	13.0	111.8	1.0	9.3	111.8	—	0.0	—	—
	Total			-		173.1		15.9	173.1			24.5	2.0
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊛	piped	3.9	34.0	132.6	1.5	16.6			0.4	53.0	4.4
	communities	< 3,000 ⊛	piped	1.7	32.5	55.2	1.6	7.4			0.4	22.1	1.8
	other consumers		piped	—	—	-	1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			8.6	13.0	111.8	1.0	9.3			0.0	—	—
	Total			14.2		299.6		33.3				75.1	6.2
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊛	piped	17.2	43.5	748.2	1.5	93.5			0.55	411.5	34.3
	communities	< 3,000 ⊛	piped	5.2	39.0	202.8	1.6	27.0			0.55	111.5	9.3
	other consumers		piped	—	—	-	1.5				0.6		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			5.6	13.0	72.8	1.0	6.0			0.0	—	—
	Total			28.0		1023.8		126.5				523.0	43.6
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊛	piped	29.0	50.7	1470.3	1.5	183.8			0.6	882.2	73.5
	communities	< 3,000 ⊛	piped	13.8	44.2	610.0	1.6	81.3			0.6	366.0	30.5
	other consumers		piped	—	—	-	1.5				0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			4.0	13.0	52.0	1.0	4.3			0.0	—	—
	Total			46.8		2132.3		269.4				1248.2	104.0

⊛ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: ALo

TABLE WS 4-10-22

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of South Jarash			—	—	482.0	1.3	52.2	482.0	—	0.6	289.2	24.1
	communities	WSC supply	piped	—	—	211.8	1.3	22.9	211.8	—	0.4	84.7	7.1
	other consumers	WSC supply	piped	—	—	50.6 70.5	1.3	13.1	121.1	—	0.4	48.4	4.0
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			25.0	13.0	325.0	1.0	27.1	325.0	—	0.0	—	—
	Total			-		1,139.9		115.3	1,139.9			422.3	35.2
Demand 1975	City / Town of			-			1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped	30.0	34.0	1,020.0	1.5	127.5			0.4	408.0	34.0
	comm-unities	< 3,000 ⊗	piped	16.0	32.5	520.0	1.6	69.3			0.4	208.0	17.3
	other consumers		piped	—	—	121.0	1.5	15.1			0.4	48.4	4.0
	industry		piped	—	—		1.0				0.5		
	un-piped supply			25.0	13.0	325.0	1.0	27.0			0.0	—	—
	Total			71.0		1,986.0		238.9				664.4	55.3
Demand 1985	City / Town of			-			1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped	40.9	43.5	1,779.1	1.5	222.4			0.55	978.5	81.5
	comm-unities	< 3,000 ⊗	piped	20.2	39.0	787.8	1.6	105.0			0.55	433.3	36.1
	other consumers		piped	—	—	121.0	1.5	15.1			0.6	72.6	6.0
	industry		piped	—	—		1.0				0.5		
	un-piped supply			15.3	13.0	198.9	1.0	16.6			0.0	—	—
	Total			76.4		2,886.8		359.1				1,484.4	123.6
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	55.0	50.7	2,788.5	1.5	348.6			0.6	1,673.1	139.4
	comm-unities	< 3,000 ⊗	piped	21.0	44.2	928.2	1.6	123.8			0.6	556.9	46.4
	other consumers		piped	—	—	121.0	1.5	15.1			0.7	84.7	7.1
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			14.3	13.0	185.9	1.0	15.5			0.0	—	—
	Total			90.3		4,023.6		503.0				2,314.7	192.9

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AL 11

TABLE WS 4-10-23

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			51.9	13.0	674.7	1.0	56.2	674.7	—	0.0	—	—
	Total			-		674.7		56.2	674.7				
Demand 1975	City / Town of			-			1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped	-	34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped	-	32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			51.9	13.0	674.7	1.0	56.2			0.0	—	—
	Total			51.9		67 .7		56.2					
Demand 1985	City / Town of			-		-	1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped	31.7	43.5	1,379.0	1.5	172.4			0.55	758.4	63.2
	comm-unities	< 3,000 ⊗	piped	1.9	39.0	74.1	1.6	9.9			0.55	40.7	3.4
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			22.4	13.0	291.2	1.0	24.3			0.0	—	—
	Total			56.0		1,744.3		206.6				799.1	66.6
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	33.0	50.7	1,673.1	1.5	209.1			0.6	1,003.9	83.7
	comm-unities	< 3,000 ⊗	piped	6.5	44.2	287.3	1.6	38.3			0.6	172.4	14.4
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			19.0	13.0	247.0	1.0	20.6			0.0	—	—
	Total			58.5		2,207.4		268.0				1,176.3	98.1

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AL 21

TABLE WS 4-10-24

year	CONSUMERS				Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
						per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
					No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2				3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of				—	—		1.3			—	0.6		
	communities	WSC supply	piped		—	—		1.3			—	0.4		
	other consumers	WSC supply	piped		—	—		1.3			—	0.4		
	industry		piped		—	—		1.0			—	0.5		
	un-piped supply				12.7	13.0	165.1	1.0	13.7	165.1	—	0.0	—	—
	Total				-		165.1		13.7	165.1				
Demand 1975	City / Town of							1.4				0.6		
	communities	50,000 - 3,000 ⊛	piped			34.0		1.5				0.4		
	communities	< 3,000 ⊛	piped			32.5		1.6				0.4		
	other consumers		piped		—	—		1.5				0.4		
	industry		piped		—	—		1.0				0.5		
	un-piped supply				12.7	13.0	165.1	1.0	13.7			0.0	—	—
	Total				12.7		165.1		13.7					
Demand 1985	City / Town of							1.4				0.65		
	communities	50,000 - 3,000 ⊛	piped			43.5		1.5				0.55		
	communities	< 3,000 ⊛	piped		7.1	39.0	276.9	1.6	36.9			0.55	152.3	12.7
	other consumers		piped		—	—		1.5				0.6		
	industry		piped		—	—		1.0				0.5		
	un-piped supply				4.7	13.0	61.1	1.0	5.1			0.0	—	—
	Total				11.8		338.0		42.0				152.3	12.7
Demand 2000	City / Town of							1.4				0.7		
	communities	50,000 - 3,000 ⊛	piped		-	50.7	-	1.5	-			0.6	-	-
	communities	< 3,000 ⊛	piped		8.0	44.2	353.6	1.6	47.1			0.6	212.2	17.7
	other consumers		piped		—	—	-	1.5	-			0.7	-	-
	industry		piped		—	—	-	1.0	-			0.5	-	-
	un-piped supply				2.5	13.0	32.5	1.0	2.7			0.0	—	—
	Total				10.5		386.1		49.8				212.2	17.7

⊛ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AL 22/23

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9 = 5 - 8	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.2	13.0	2.6	1.0	0.2	2.6	—	0.0	—	—
	Total			-		2.6		0.2	2.6				
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.2	13.0	2.6	1.0	0.2			0.0	—	—
	Total			0.2		2.6		0.2					
Demand 1985	City / Town of			-		-	1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	-	43.5	-	1.5				0.55		
	communities	< 3,000 ⊗	piped	0.1	39.0	3.9	1.6	0.5			0.55	2.1	0.2
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.1	13.0	1.3	1.0	0.1			0.0	—	—
	Total			0.2		5.2		0.6				2.1	0.8
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped		50.7		1.5				0.6		
	communities	< 3,000 ⊗	piped	0.2	44.2	8.8	1.6	1.2			0.6	5.3	0.4
	other consumers		piped	—	—	-	1.5				0.7		
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			0.2	13.0	2.6	1.0	0.2			0.0	—	—
	Total			0.4		11.4		1.4				5.3	0.4

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AL 31

TABLE WS 4-10-26

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City Town of Zerqa Ruseifah			—	—	3,650.0	1.3	395.4	3,650.0	—	0.6	2,190.0	182.5
	communities	WSC supply	piped	—	—	14.3	1.3	1.6	14.3	—	0.4	5.7	0.5
	other consumers	WSC supply	piped	—	—	2.9	1.3	0.3	2.9	—	0.4	1.2	0.1
	industry		piped	—	—	3,285.0	1.0	273.8	3,285.0	—	0.5	1,642.5	136.9
	un-piped supply			56.0	13.0	728.0	1.0	60.6	728.0	—	0.0	—	—
	Total			-		7,680.2		731.7	7,680.2			3,839.4	320.0
Demand 1975	City Town of Zerqa			184.0	47.8	8,795.2	1.4	1,026.1			0.6	5,277.1	439.8
	communities	50,000 - 3,000 ⊗	piped	43.0	34.0	1,462.0	1.5	182.8			0.4	584.8	48.7
	communities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—	3.0	1.5	0.4			0.4	1.2	0.1
	industry		piped	—	—	3,285.0	1.0	273.8			0.5	1,642.5	136.9
	un-piped supply			56.0	13.0	728.0	1.0	60.7			0.0	—	—
	Total			283.0		14,273.2		1,543.8				7,505.6	626.7
Demand 1985	City Town of Zerqa			333.2	57.3	19,092.4	1.4	2,227.4			0.65	12,410.0	1,034.2
	communities	50,000 - 3,000 ⊗	piped	60.0	43.5	2,610.0	1.5	326.2			0.55	1,435.5	119.6
	communities	< 3,000 ⊗	piped	15.2	39.0	592.8	1.6	79.0			0.55	326.0	27.2
	other consumers		piped	—	—	3.0	1.5	0.4			0.6	1.8	0.1
	industry		piped	—	—	8,900.0	1.0	741.7			0.5	4,450.0	370.8
	un-piped supply			8.4	13.0	109.2	1.0	9.1			0.0	—	—
	Total			416.8		31,307.4		3,383.8				18,623.3	1,551.9
Demand 2000	City Town of Zerqa			558.3	57.7	32,213.9	1.4	3,758.3			0.7	22,549.7	1,879.1
	communities	50,000 - 3,000 ⊗	piped	100.0	50.7	5,070.0	1.5	633.8			0.6	3,042.0	253.5
	communities	< 3,000 ⊗	piped	35.1	44.2	1,551.4	1.6	206.9			0.6	930.8	77.6
	other consumers		piped	—	—	3.0	1.5	0.4			0.7	2.1	0.2
	industry		piped	—	—	17.300.0	1.0	1.441.7			0.5	8.650.0	720.8
	un-piped supply			7.5	13.0	97.5	1.0	8.1			0.0	—	—
	Total			700.9		56,235.8		6,049.2				35,174.6	2.931.2

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			
Zerqa networks	350	350	-	-
" private wells	1,150	1,150	2,500	10,900
Phosphate Rus.	500	500	4,000	4,000
Refinery	1,150	1,150	2,100	2,100
Yayuz	-	-	-	-
Ceramic Factory	135	135	300	300
Total	3,285	3,285	8,900	17,300

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975 - 2000

Origin of Water / Waste Water

Area Nº.: AL 32

TABLE WS 4-10-27

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City Town of Amman			—	—	15,278.0	1.3	1,655.1	15,278.0	—	0.6	9,166.8	763.9
	communities	WSC supply	piped	—	—	93.3	1.3	10.1	93.3	—	0.4	37.3	3.1
	other consumers	WSC supply	piped	—	—	19.1	1.3	2.1	19.1	—	0.4	7.6	0.6
	industry		piped	—	—	3,900.0	1.0	325.0	3,900.0	—	0.5	1,950.0	162.5
	un-piped supply			40.5	13.0	526.5	1.0	43.9	526.5	—	0.0	—	—
	Total			-		19,816.9		2,036.2	19.816.9			11,161.7	930.1
Demand 1975	City Town of Amman			606,6	47.8	28,995.5	1.4	3,382.8			0.6	17,397.3	1,449.8
	communities	50,000 - 3,000 ⊗	piped	9.0	34.0	306.0	1.5	38.2			0.4	122.4	10.2
	communities	< 3,000 ⊗	piped	0.5	32.5	16.3	1.6	2.2			0.4	6.5	0.5
	other consumers		piped	—	—	20.0	1.5	2.5			0.4	8.0	0.7
	industry		piped	—	—	3,900.0	1.0	325.0			0.5	1,950.0	162.5
	un-piped supply			40.5	13.0	526.5	1.0	43.9			0.0	—	—
	Total			656.6		33,764.3		3,794.6				19,484.2	1,623.7
Demand 1985	City Town of Amman			1,040.8	57.3	59,637.8	1.4	6,957.8			0.65	38,764.6	3,230.4
	communities	50,000 - 3,000 ⊗	piped	19.7	43.5	857.0	1.5	107.1			0.55	471.3	39.3
	communities	< 3,000 ⊗	piped	1.3	39.0	50.7	1.6	6.8			0.55	27.9	2.3
	other consumers		piped	—	—	20.0	1.5	2.5			0.6	12.0	1.0
	industry		piped	—	—	6,000.0	1.0	500.0			0.5	3,000.0	250.0
	un-piped supply			1.6	13.0	20.8	1.0	1.7			0.0	—	—
	Total			1,063.4		66,586.3		7.575.9				42,275.8	3,523.0
Demand 2000	City Town of Amman			2,014.2	57.7	116,219.3	1.4	13,558.9			0.7	81,353.5	6,779.5
	communities	50,000 - 3,000 ⊗	piped	25.0	50.7	1,267.5	1.5	158.4			0.6	760.5	63.4
	communities	< 3,000 ⊗	piped	5.4	44.2	238.7	1.6	31.8			0.6	143.2	11.9
	other consumers		piped	—	—	20.0	1.5	2.5			0.7	14.0	1.2
	industry		piped	—	—	8,900.0	1.0	741.7			0.5	4.450.0	370.8
	un-piped supply			1.0	13.0	13.0	1.0	1.1			0.0	—	—
	Total			2,045.6		126,658.5		14,494.4				86,721.0	7,226.8

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			
AMMAN NETWORKS	1,700	1,700	-	-
AMMAN PRIVATE WELLS	2,200	2,000	6,000	8,900
TOTAL	3,900	3,900	6,000	8,900

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AL41/42

TABLE WS 4-10-28

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	29.0	1.3	3.1	29.0	—	0.4	11.6	1.0
	other consumers	WSC supply	piped	—	—	9.6	1.3	1.0	9.6	—	0.4	3.8	0.3
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			1.2	13.0	15.6	1.0	1.3	15.6	—	0.0	—	—
	Total					54.2		5.4	54.2			15.4	1.3
Demand 1975	City / Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped	1.2	32.5	39.0	1.6	5.2			0.4	15.6	1.3
	other consumers		piped	—	—	10.0	1.5	1.2			0.4	4.0	0.3
	industry		piped	—	—		1.0				0.5		
	un-piped supply			1.2	13.0	15.6	1.0	1.3			0.0	—	—
	Total			2.4		64.6		7.7				19.6	1.6
Demand 1985	City / Town of						1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	2.0	39.0	78.0	1.6	10.4			0.55	42.9	3.6
	other consumers		piped	—	—	10.0	1.5	1.2			0.6	6.0	0.5
	industry		piped	—	—		1.0				0.5		
	un-piped supply			1.3	13.0	16.9	1.0	1.4			0.0	—	—
	Total			3.3		104.9		13.0				48.9	4.1
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	-	50.7		1.5	-			0.6		-
	comm-unities	< 3,000 ⊗	piped	3.9	44.2	172.4	1.6	23.0			0.6	103.4	8.6
	other consumers		piped	—	—	10.0	1.5	1.2			0.7	7.0	0.6
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			1.0	13.0	13.0	1.0	1.1			0.0	—	—
	Total			4.9		195.4		25.3				110.4	9.2

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº: AL 72

TABLE WS 4-10-29

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	209.5	1.3	22.7	209.5	—	0.4	83.8	7.0
	other consumers	WSC supply	piped	—	—	69.9	1.3	7.6	69.9	—	0.4	28.0	2.3
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			2.0	13.0	26.0	1.0	2.2	26.0	—	0.0	—	—
	Total					305.4		32.5	305.4			111.8	9.3
Demand 1975	City / Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped	-	34.0	-	1.5				0.4		
	comm-unities	< 3,000 ⊗	piped	21.2	32.5	689.0	1.6	91.9			0.4	275.6	23.0
	other consumers		piped	—	—	70.0	1.5	8.8			0.4	28.0	2.3
	industry		piped	—	—	-	1.0				0.5		
	un-piped supply			2.0	13.0	26.0	1.0	2.2			0.0	—	—
	Total			23.2		785.0		102.9				303.6	25.3
Demand 1985	City / Town of			-			1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped	-	43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	27.5	39.0	1,072.5	1.6	143.0			0.55	589.9	49.2
	other consumers		piped	—	—	70.0	1.5	8.8			0.6	42.0	3.5
	industry		piped	—	—		1.0				0.5		
	un-piped supply			3.0	13.0	39.0	1.0	3.2			0.0	—	—
	Total			30.5		1,181.5		155.0				631.9	52.7
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	10.0	50.7	507.0	1.5	69.1			0.6	304.2	25.3
	comm-unities	< 3,000 ⊗	piped	32.8	44.2	1,449.8	1.6	193.3			0.6	869.9	72.5
	other consumers		piped	—	—	70.0	1.5	8.8			0.7	49.0	4.1
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			3.0	13.0	39.0	1.0	3.2			0.0	—	—
	Total			45.8		2,065.8		274.4				1,223.1	101.9

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AL 73

TABLE WS 4-10-30

year	CONSUMERS				Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
						per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
					No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2				3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City Town of Salt Suweileh				—	—	1,147.0	1.3	124.2	1,147.0	—	0.6	688.2	57.4
	communities	WSC supply	piped		—	—		1.3			—	0.4		
	other consumers	WSC supply	piped		—	—		1.3			—	0.4		
	industry		piped		—	—	300.0	1.0	25.0	300.0	—	0.5	150.0	12.5
	un-piped supply				7.4	13.0	96.2	1.0		96.2	—	0.0	—	—
	Total						1,543.2		149.2	1.543.2			838.2	69.9
Demand 1975	City Town of							1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		44.0	34.0	1,496.0	1.5	187.0			0.4	598.4	49.8
		< 3,000 ⊗	piped			32.5		1.6				0.4		
	other consumers		piped		—	—		1.5				0.4		
	industry		piped		—	—	300.0	1.0	25.0			0.5	150.0	12.5
	un-piped supply				7.4	13.0	96.2	1.0	8.1			0.0	—	—
	Total				51.4		1,892.2		220.1				748.4	62.3
Demand 1985	City Town of							1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		50.9	43.5	2,214.1	1.5	276.8			0.55	1,217.8	101.4
		< 3,000 ⊗	piped		1.8	39.0	70.2	1.6	9.4			0.55	38.6	3.2
	other consumers		piped		—	—		1.5				0.6		
	industry		piped		—	—	600.0	1.0	50.0			0.5	300.0	25.0
	un-piped supply				5.9	13.0	76.7	1.0	6.4			0.0	—	—
	Total				58.6		2,961.0		342.6				1,556.4	129.6
Demand 2000	City Town of							1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped		60.0	50.7	3,042.0	1.5	300.2			0.6	1,825.2	152.1
		< 3,000 ⊗	piped		3.7	44.2	163.5	1.6	21.8			0.6	98.1	8.2
	other consumers		piped		—	—		1.5				0.7		
	industry		piped		—	—	600.0	1.0	50.0			0.5	300.0	25.0
	un-piped supply				4.5	13.0	58.5	1.0	4.9			0.0	—	—
	Total				68.2		3,864.0		456.9				2,223.3	185.3

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			
Cement Factory	300	300	600	600
Total	300	300	600	600

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: AM

TABLE WS 4-10-31

year	CONSUMERS				Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
						per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
					No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2				3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of Wadi Sir				—	—	566.0	1.3	61.4	566.0	—	0.6	339.6	28.3
	communities	WSC supply	piped		—	—	93.3	1.3	10.2	93.3	—	0.4	37.3	3.1
	other consumers	WSC supply	piped		—	—	19.1	1.3	2.1	19.1	—	0.4	7.6	0.6
	industry		piped		—	—		1.0			—	0.5		
	un-piped supply					13.0		1.0			—	0.0	—	—
	Total						678.4		73.7	678.4			384.5	32.0
Demand 1975	City / Town of							1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		16.6	34.0	564.4	1.5	70.6			0.4	225.8	18.8
	communities	< 3,000 ⊗	piped		7.9	32.5	256.8	1.6	34.3			0.4	102.8	8.6
	other consumers		piped		—	—	20.0	1.5	2.5			0.4	8.0	0.6
	industry		piped		—	—		1.0				0.5		
	un-piped supply					13.0		1.0				0.0	—	—
	Total				24.5		841.2		107.4				336.6	28.0
Demand 1985	City / Town of							1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped		22.5	43.5	978.8	1.5	122.4			0.55	538.4	44.8
	communities	< 3,000 ⊗	piped		10.7	39.0	417.3	1.6	55.6			0.55	229.6	19.2
	other consumers		piped		—	—	20.0	1.5	2.5			0.6	12.0	1.0
	industry		piped		—	—		1.0				0.5		
	un-piped supply					13.0		1.0				0.0	—	—
	Total				33.2		1,416.1		180.5				780.0	65.0
Demand 2000	City / Town of							1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped		35.8	50.7	1,815.1	1.5	226.9			0.6	1,089.1	90.8
	communities	< 3,000 ⊗	piped		15.0	44.2	663.0	1.6	88.4			0.6	397.8	33.1
	other consumers		piped		—	—	20.0	1.5	2.5			0.7	14.0	1.2
	industry		piped		—	—		1.0				0.5		
	un-piped supply					13.0		1.0				0.0	—	—
	Total				50.8		2,498.1		317.8				1,500.9	125.1

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AN

TABLE WS 4-10-32

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	26.7	1.3	2.8	26.7	—	0.4	10.7	0.9
	other consumers	WSC supply	piped	—	—	5.5	1.3	0.6	5.5	—	0.4	2.2	0.2
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.3	13.0	3.9	1.0	0.4	3.9	—	0.0	—	—
	Total					36.1		3.8	36.1			12.9	1.1
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped	2.7	32.5	87.8	1.6	11.8			0.4	35.2	2.9
	other consumers		piped	—	—	6.0	1.5	0.8			0.4	2.4	0.2
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.3	13.0	3.9	1.0	0.4			0.0	—	—
	Total			3.0		97.7		13.0				37.6	3.1
Demand 1985	City / Town of			-			1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	-	43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped	3.1	39.0	120.9	1.6	16.2			0.55	66.4	5.6
	other consumers		piped	—	—	6.0	1.5	0.8			0.6	3.6	0.3
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.4	13.0	5.2	1.0	0.4			0.0	—	—
	Total			3.5		132.1		17.4				70.0	5.9
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped		50.7		1.5				0.6		
	communities	< 3,000 ⊗	piped	4.1	44.2	181.2	1.6	24.2			0.6	108.7	9.1
	other consumers		piped	—	—	6.0	1.5	0.8			0.7	4.2	0.4
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			4.1		187.2		25.0				112.9	9.5

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: AP 1/2

TABLE WS 4-10-33

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	1.0	1.3	0.1	1.0	—	0.4	0.4	
	other consumers	WSC supply	piped	—	—	0.2	1.3		0.2	—	0.4	0.1	
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			2.9	13.0	37.7	1.0	3.1	37.7	—	0.0	—	—
	Total					38.9		3.2	38.9			0.5	
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped	0.1	32.5	3.2	1.6	0.4			0.4	1.3	0.1
	other consumers		piped	—	—	1.0	1.5	0.2			0.4	0.4	
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.9	13.0	37.7	1.0	3.2			0.0	—	—
	Total			3.0		41.9		3.8				1.7	0.1
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped	1.2	39.0	46.8	1.6	6.2			0.55	25.8	2.2
	other consumers		piped	—	—	1.0	1.5	0.2			0.6	0.6	
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.7	13.0	35.1	1.0	2.9			0.0	—	—
	Total			3.9		82.9		9.3				26.4	2.2
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped		50.7		1.5				0.6		
	communities	< 3,000 ⊗	piped	3.4	44.2	150.3	1.6	20.0			0.6	90.2	7.5
	other consumers		piped	—	—	1.0	1.5	0.2			0.7	0.7	
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.0	13.0	26.0	1.0	2.2			0.0	—	—
	Total			5.4		177.3		22.4				90.9	7.5

inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: CA 1

TABLE WS 4-10-34

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9 8+9=5	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City/Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.6	13.0	7.8	1.0	0.6	7.8	—	0.0	—	—
	Total			-		7.8		0.6	7.8				
Demand 1975	City/Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.6	13.0	7.8	1.0	0.6			0.0	—	—
	Total			0.6		7.8		0.6					
Demand 1985	City/Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped	0.2	39.0	7.8	1.6	1.0			0.55	4.3	0.3
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.4	13.0	5.2	1.0	0.4			0.0	—	—
	Total			0.6		13.0		1.4				4.3	0.3
Demand 2000	City/Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped		50.7		1.5				0.6		
	communities	< 3,000 ⊗	piped	0.6	44.2	26.5	1.6	3.5			0.6	15.9	1.3
	other consumers		piped	—	—		1.5				0.7		
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			0.6		26.5		3.5				15.9	1.3

inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: CA 2

TABLE WS 4-10-35

year	CONSUMERS				Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
						per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
					No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2				3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 8+9=5	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of				—	—	55.6	1.3	6.0	55.6	—	0.6	33.4	2.8
	communities	WSC supply	piped		—	—	17.6	1.3	1.9	17.6	—	0.4	7.0	0.6
	other consumers	WSC supply	piped		—	—		1.3			—	0.4		
	industry		piped		—	—		1.0			—	0.5		
	un-piped supply				-	13.0		1.0			—	0.0	—	—
	Total						73.2		7.9	73.2			40.4	3.4
Demand 1975	City / Town of							1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped			34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped		9.3	32.5	302.2	1.6	40.3			0.4	120.9	10.0
	other consumers		piped		—	—	18.0	1.5	2.2			0.4	7.2	0.6
	industry		piped		—	—		1.0				0.5		ä
	un-piped supply					13.0		1.0				0.0	—	—
	Total				9.3		320.2		42.5				128.1	10.6
Demand 1985	City / Town of							1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped			43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped		10.1	39.0	393.9	1.6	52.5			0.55	246.7	20.6
	other consumers		piped		—	—	18.0	1.5	2.2			0.6	10.8	0.9
	industry		piped		—	—		1.0				0.5		
	un-piped supply					13.0		1.0				0.0	—	—
	Total				10.1		411.9		54.7				257.5	21.5
Demand 2000	City / Town of							1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped			50.7		1.5				0.6		
	communities	< 3,000 ⊗	piped		10.5	44.2	464.1	1.6	61.9			0.6	278.5	23.2
	other consumers		piped		—	—	18.0	1.5	2.2			0.7	12.6	1.0
	industry		piped		—	—		1.0				0.5		
	un-piped supply					13.0		1.0				0.0	—	—
	Total				10.5		482.1		64.1				291.1	24.2

inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: CA 3

TABLE WS 4-10-36

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City/Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	133.3	1.3	14.4	133.3	—	0.4	53.3	4.4
	other consumers	WSC supply	piped	—	—	42.3	1.3	4.6	42.3	—	0.4	16.9	1.4
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			-	13.0		1.0			—	0.0	—	—
	Total					175.6		19.0	175.6			70.2	5.8
Demand 1975	City/Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊛	piped	8.8	34.0	299.2	1.5	37.4			0.4	119.7	10.0
	communities	< 3,000 ⊛	piped	5.8	32.5	188.5	1.6	25.1			0.4	75.4	6.3
	other consumers		piped	—	—	43.0	1.5	5.4			0.4	17.2	1.4
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			14.6		530.7		67.9				212.3	17.7
Demand 1985	City/Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊛	piped	10.6	43.5	461.1	1.5	57.6			0.55	253.6	21.1
	communities	< 3,000 ⊛	piped	7.0	39.0	273.0	1.6	36.4			0.55	150.1	12.5
	other consumers		piped	—	—	43.0	1.5	5.4			0.6	25.8	2.2
	industry		piped	—	—	9000.0	1.0	750.0			0.5	4.500.0	375.0
	un-piped supply				13.0		1.0				0.0	—	—
	Total			17.6		9777.1		849.4				4.929.5	408.6
Demand 2000	City/Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊛	piped	14.3	50.7	725.0	1.5	90.6			0.6	435.0	36.2
	communities	< 3,000 ⊛	piped	8.0	44.2	353.6	1.6	47.1			0.6	212.2	17.7
	other consumers		piped	—	—	43.0	1.5	5.4			0.7	30.1	2.5
	industry		piped	—	—	9000.0	1.0	750.0			0.5	4.500.0	375.0
	un-piped supply				13.0		1.0				0.0	—	—
	Total			22.3		10,121.6		893.1				5,177.3	431.4

⊛ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			
Potash Plant - Dead See			9,000	9,000

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: CA 4

TABLE WS 4-10-37

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of Madaba			—	—	208.0	1.3	22.6	208.0	—	0.6	124.8	10.4
	communities	WSC supply	piped	—	—	304.6	1.3	32.9	304.6	—	0.4	121.8	10.2
	other consumers	WSC supply	piped	—	—	62.4	1.3	6.8	62.4	—	0.4	25.0	2.0
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			1.7	13.0	22.1	1.0	1.8	22.1	—	0.0	—	—
	Total					597.1		64.1	597.1			271.6	22.6
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	27.3	34.0	928.2	1.5	116.0			0.4	371.3	30.9
	communities	< 3,000 ⊗	piped	3.5	32.5	113.8	1.6	15.2			0.4	45.6	3.8
	other consumers		piped	—	—	63.0	1.5	7.8			0.4	25.2	2.1
	industry		piped	—	—		1.0				0.5		
	un-piped supply			1.7	13.0	22.1	1.0	1.8			0.0	—	—
	Total			32.5		1,127.1		140.8				442.1	36.8
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	32.3	43.5	1,405.0	1.5	175.6			0.55	772.8	64.4
	communities	< 3,000 ⊗	piped	4.2	39.0	163.8	1.6	21.9			0.55	90.0	7.5
	other consumers		piped	—	—	63.0	1.5	7.9			0.6	37.8	3.2
	industry		piped	—	—		1.0				0.5		
	un-piped supply			1.9	13.0	24.7	1.0	2.1			0.0	—	—
	Total			38.4		1,656.5		207.5				900.6	75.1
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	38.3	50.7	1,941.8	1.5	242.7			0.6	1,165.1	97.1
	communities	< 3,000 ⊗	piped	6.0	44.2	265.2	1.6	35.4			0.6	159.1	13.3
	other consumers		piped	—	—	63.0	1.5	7.9			0.7	44.1	3.7
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.0	13.0	26.0	1.0	2.2			0.0	—	—
	Total			46.3		2,296.0		288.2				1,368.3	114.1

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº: CC

TABLE WS 4-10-38

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	418.8	1.3	45.4	418.8	—	0.4	167.5	14.0
	other consumers	WSC supply	piped	—	—	85.7	1.3	9.3	85.7	—	0.4	34.3	2.8
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			7.6	13.0	98.8	1.0	8.1	98.8	—	0.0	—	—
	Total					603.3		62.8	603.3			201.8	16.8
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 ⊗ - 3,000	piped	17.6	34.0	598.4	1.5	74.8			0.4	239.4	20.0
	communities	< 3,000 ⊗	piped	19.7	32.5	640.2	1.6	85.4			0.4	256.1	21.3
	other consumers		piped	—	—	86.0	1.5	10.8			0.4	34.4	2.9
	industry		piped	—	—		1.0				0.5		
	un-piped supply			7.6	13.0	98.8	1.0	8.1			0.0	—	—
	Total			44.9		1,423.4		179.1				529.9	44.2
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 ⊗ - 3,000	piped	17.3	43.5	752.6	1.5	94.1			0.55	413.9	34.5
	communities	< 3,000 ⊗	piped	20.2	39.0	787.8	1.6	105.0			0.55	433.3	36.1
	other consumers		piped	—	—	86.0	1.5	10.8			0.6	51.6	4.3
	industry		piped	—	—		1.0				0.5		
	un-piped supply			4.7	13.0	61.1	1.0	5.0			0.0	—	—
	Total			42.2		1,687.5		214.9				898.8	74.9
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 ⊗ - 3,000	piped	18.3	50.7	927.8	1.5	116.0			0.6	556.7	46.4
	communities	< 3,000 ⊗	piped	19.0	44.2	839.8	1.6	112.0			0.6	503.9	42.0
	other consumers		piped	—	—	86.0	1.5	10.8			0.7	60.2	5.0
	industry		piped	—	—		1.0				0.5		
	un-piped supply			4.5	13.0	58.5	1.0	4.9			0.0	—	—
	Total			41.8		1,912.1		243.7				1,120.8	93.4

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: CD 4

TABLE WS 4-10-39

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	158.0	1.3	17.1	158.0	—	0.4	63.2	5.2
	other consumers	WSC supply	piped	—	—	50.2	1.3	5.4	50.2	—	0.4	20.1	1.7
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply				13.0		1.0			—	0.0	—	—
	Total					208.2		22.5	208.2			83.3	6.9
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped	19.9	32.5	646.8	1.6	86.2			0.4	258.8	21.6
	other consumers		piped	—	—	51.0	1.5	6.4			0.4	20.4	1.7
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			19.9		697.8		92.6				279.2	23.3
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped	23.1	39.0	900.9	1.6	120.1			0.55	495.5	41.3
	other consumers		piped	—	—	51.0	1.5	6.4			0.6	30.6	2.6
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			23.1		951.9		126.5				526.1	43.9
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	10.0	50.7	507.0	1.5	63.4			0.6	304.2	25.4
	communities	< 3,000 ⊗	piped	18.1	44.2	800.0	1.6	106.7			0.6	480.0	40.0
	other consumers		piped	—	—	51.0	1.5	6.4			0.7	35.7	3.0
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			28.1		1,358.0		176.5				819.9	68.4

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: CD 11

TABLE WS 4-10-40

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City/Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.9	13.0	11.7	1.0	0.9	11.7	—	0.0	—	—
	Total					11.7		0.9	11.7				
Demand 1975	City/Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.9	13.0	11.7	1.0	0.9			0.0	—	—
	Total			0.9		11.7		0.9					
Demand 1985	City/Town of						1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	0.5	39.0	19.5	1.6	2.6			0.55	10.7	0.9
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.4	13.0	5.2	1.0	0.4			0.0	—	—
	Total			0.9		24.7		3.0				10.7	0.9
Demand 2000	City/Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped		50.7		1.5				0.6		
	comm-unities	< 3,000 ⊗	piped	0.9	44.2	39.8	1.6	5.3			0.6	23.9	2.0
	other consumers		piped	—	—		1.5				0.7		
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			0.9		39.8		5.3				23.9	2.0

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: CD 31

TABLE WS 4-10-41

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers			—	—		1.3			—	0.4		
	industry			—	—		1.0			—	0.5		
	un-piped supply			6.0	13.0	78.0	1.0	6.5	78.0	—	0.0	—	—
	Total					78.0		6.5	78.0				
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
		< 3,000 ⊗			32.5		1.6				0.4		
	other consumers			—	—		1.5				0.4		
	industry			—	—		1.0				0.5		
	un-piped supply			6.0	13.0	78.0	1.0	6.5			0.0	—	—
	Total			6,0		78.0		6.5					
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
		< 3,000 ⊗		3.2	39.0	124.8	1.6	16.6			0.55	68.6	5.7
	other consumers			—	—		1.5				0.6		
	industry			—	—		1.0				0.5		
	un-piped supply			3.0	13.0	39.0	1.0	3.2			0.0	—	—
	Total			6.2		163.8		19.8				68.6	5.7
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	--
		< 3,000 ⊗		3.3	44.2	145.9	1.6	19.5			0.6	87.5	7.3
	other consumers			—	—	-	1.5	-			0.7	-	-
	industry			—	—	-	1.0	-			0.5	-	-
	un-piped supply			2.5	13.0	32.5	1.0	2.7			0.0	—	—
	Total			5.8		178.4		22.2				87.5	7.3

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: CD 32

TABLE WS 4-10-42

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	48.7	1.3	5.3	48.7	—	0.4	19.5	1.6
	other consumers	WSC supply	piped	—	—	15.4	1.3	1.7	15.4	—	0.4	6.2	0.5
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.1	13.0	1.3	1.0	0.1	1.3	—	0.0	—	—
	Total					65.4		7.1	65.4			25.7	2.1
Demand 1975	City Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊛	piped		34.0		1.5				0.4		
	comm-unities	< 3,000 ⊛	piped	6.2	32.5	201.5	1.6	26.9			0.4	80.6	6.7
	other consumers		piped	—	—	16.0	1.5	2.0			0.4	6.4	0.5
	industry		piped	—	—	—	1.0	—			0.5	—	—
	un-piped supply			0.1	13.0	1.3	1.0	0.1			0.0	—	—
	Total			6.3		218.8		29.0				87.0	7.2
Demand 1985	City Town of						1.4				0.65		
	comm-unities	50,000 - 3,000 ⊛	piped		43.5		1.5				0.55		
	comm-unities	< 3,000 ⊛	piped	8.5	39.0	331.5	1.6	44.2			0.55	182.3	15.2
	other consumers		piped	—	—	16.0	1.5	2.0			0.6	9.6	0.8
	industry		piped	—	—	3,000.0	1.0	250.0			0.5	1,500.0	125.0
	un-piped supply			0.4	13.0	5.2	1.0	0.4			0.0	—	—
	Total			8.9		3,352.7		296.6				1,691.9	141.0
Demand 2000	City Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊛	piped		50.7		1.5				0.6		
	comm-unities	< 3,000 ⊛	piped	12.4	44.2	548.1	1.6	73.1			0.6	328.9	27.4
	other consumers		piped	—	—	16.0	1.5	2.0			0.7	11.2	0.9
	industry		piped	—	—	—	1.0	—			0.5	—	—
	un-piped supply			1.0	13.0	13.0	1.0	1.1			0.0	—	—
	Total			13.4		577.1		76.2				340.1	28.3

⊛ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			
Phosph. Wadi Abyad	-	-	3,000.0	-
Total	-	-	3,000.0	-

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: CD 81/82

TABLE WS 4-10-43

year	CONSUMERS				Population	CONSUMPTION / DEMAND per capita and year	total per year	factor	max per month	ORIGIN OF WATER ground	surface	WASTE WATER factor	total per year	average per month
					No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2				3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City/Town of Karak				—	—	365.0	1.3	39.5	365.0	—	0.6	219.0	18.2
	communities	WSC supply	piped		—	—	92.5	1.3	10.0	92.5	—	0.4	37.0	3.1
	other consumers	WSC supply	piped		—	—	29.3	1.3	3.2	29.3	—	0.4	11.7	1.0
	industry		piped		—	—		1.0			—	0.5		
	un-piped supply					13.0		1.0			—	0.0	—	—
	Total						486.8		52.7	486.8			267.7	22.3
Demand 1975	City/Town of							1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		12.0	34.0	408.0	1.5	51.0			0.4	163.2	13.6
		< 3,000 ⊗	piped		11.3	32.5	367.2	1.6	48.9			0.4	146.9	12.2
	other consumers		piped		—	—	30.0	1.5	3.8			0.4	12.0	1.0
	industry		piped		—	—		1.0				0.5		
	un-piped supply					13.0		1.0				0.0	—	—
	Total				23.3		805.2		103.7				322.1	26.8
Demand 1985	City/Town of							1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		15.7	43.5	683.0	1.5	85.4			0.55	375.6	31.3
		< 3,000 ⊗	piped		14.7	39.0	573.3	1.6	76.4			0.55	315.3	26.3
	other consumers		piped		—	—	30.0	1.5	3.8			0.6	18.0	1.5
	industry		piped		—	—		1.0				0.5		
	un-piped supply					13.0		1.0				0.0	—	—
	Total				30.4		1,286.3		165.6				708.9	59.1
Demand 2000	City/Town of							1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped		25.5	50.7	1,292.9	1.5	161.6			0.6	775.7	64.6
		< 3,000 ⊗	piped		15.7	44.2	693.9	1.6	92.5			0.6	416.3	34.7
	other consumers		piped		—	—	30.0	1.5	3.8			0.7	21.0	1.8
	industry		piped		—	—	-	1.0	-			0.5	-	-
	un-piped supply				-	13.0	-	1.0	-			0.0	—	—
	Total				41.2		2,016.8		257.9				1,213.0	101.1

inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: CE

TABLE WS 4-10-44

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 8+9=5	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City/Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	6.4	1.3	0.7	6.4	—	0.4	2.6	0.2
	other consumers	WSC supply	piped	—	—	0.2	1.3	-	0.2	—	0.4	0.1	-
	industry		piped	—	—	2,200.0	1.0	183.3	2,200.0	—	0.5	1,100.0	91.7
	un-piped supply			7.2	13.0	93.6	1.0	7.8	93.6	—	0.0	—	—
	Total					2,300.2		194.0	2,300.2			1,102.7	91.9
Demand 1975	City/Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped	0.4	32.5	13.0	1.6	1.8			0.4	5.2	0.4
	other consumers		piped	—	—	1.0	1.5	0.1			0.4	0.4	
	industry		piped	—	—	2,200.0	1.0	183.3			0.5	1,100.0	91.7
	un-piped supply			7.2	13.0	93.6	1.0	7.8			0.0	—	—
	Total			7.6		2,307.6		193.0				1,105.6	92.1
Demand 1985	City/Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	3.0	43.5	130.5	1.5	16.3			0.55	71.8	6.0
	communities	< 3,000 ⊗	piped	0.5	39.0	19.5	1.6	2.6			0.55	10.7	0.9
	other consumers		piped	—	—	1.0	1.5	0.1			0.6	0.6	-
	industry		piped	—	—	6,500.0	1.0	541.6			0.5	3,250.0	270.8
	un-piped supply			8.1	13.0	105.3	1.0	8.8			0.0	—	—
	Total			11.6		6,756.3		569.4				3,333.1	277.7
Demand 2000	City/Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	9.5	50.7	481.7	1.5	60.2			0.6	289.0	24.1
	communities	< 3,000 ⊗	piped	3.7	44.2	163.5	1.6	21.8			0.6	98.1	8.2
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			7.5	13.0	97.5	1.0	8.1			0.0	—	—
	Total			20.7		742.7		90.1				387.1	32.3

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			
Al Hassa Phosphate	2,200.0	2,200.0	6,500.0	
Total	2,200.0	2,200.0	6,500.0	

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº: CF 11/12

TABLE WS 4-10-45

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9 (8+9=5)	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	44.7 3.9	1.3	5.3	48.6	—	0.4	19.4	1.6
	other consumers	WSC supply	piped	—	—	1.0 1.2	1.3	0.2	2.2	—	0.4	0.9	0.1
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.1	13.0	1.3	1.0	0.1	1.3	—	0.0	—	—
	Total					52.1		5.6	52.1			20.3	1.7
Demand 1975	City Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		340		1.5				0.4		
	communities	< 3,000 ⊗	piped	3.3	32.5	107.2	1.6	14.3			0.4	42.9	3.6
	other consumers		piped	—	—	3.0	1.5	0.4			0.4	1.2	0.1
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.1	13.0	1.3	1.0	0.1			0.0	—	—
	Total			3.4		111.5		14.8				44.1	3.7
Demand 1985	City Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped		435		1.5				0.55		
	communities	< 3,000 ⊗	piped	4.7	39.0	183.3	1.6	24.4			0.55	100.8	8.4
	other consumers		piped	—	—	3.0	1.5	0.4			0.6	1.8	0.2
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			4.7		186.3		24.8				102.6	8.6
Demand 2000	City Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	communities	< 3,000 ⊗	piped	7.8	44.2	344.8	1.6	46.0			0.6	206.9	17.2
	other consumers		piped	—	—	3.0	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			-	13.0	-	1.0	-			0.0	—	—
	Total			7.8		344.8		46.0				206.9	17.2

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº: CP 2

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9	10	11= 5x10	12= $\frac{11}{(12)}$
									8 + 9 = 5				
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			6.6	13.0	85.8	1.0	7.2	85.8	—	0.0	—	—
	Total					85.8		7.2	85.8				
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 ⊗ - 3,000	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			6.6	13.0	85.8	1.0	7.2			0.0	—	—
	Total			6.6		85.8		7.2					
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 ⊗ - 3,000	piped	4.3	43.5	187.0	1.5	23.4			0.55	102.9	8.6
	communities	< 3,000 ⊗	piped	0.3	39.0	11.7	1.6	0.7			0.55	6.4	0.5
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.0	13.0	26.0	1.0	2.2			0.0	—	—
	Total			6.6		224.7		26.3				109.3	9.1
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 ⊗ - 3,000	piped	3.5	50.7	117.5	1.5	22.2			0.6	106.5	8.9
	communities	< 3,000 ⊗	piped	1.0	44.2	44.2	1.6	5.9			0.6	26.5	2.2
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			1.5	13.0	19.5	1.0	1.6			0.0	—	—
	Total			6.0		241.2		29.7				133.0	11.1

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975 - 2000

Origin of Water / Waste Water

Area Nº.: DA 11

TABLE WS 4-10-47

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	214.9	1.3	23.3	214.9	—	0.4	86.0	7.2
	other consumers	WSC supply	piped	—	—	4.6	1.3	0.5	4.6	—	0.4	1.8	0.1
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply				13.0		1.0			—	0.0	—	—
	Total					219.5		23.8	219.5			87.8	7.3
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped	12.8	34.0	435.2	1.5	54.4			0.4	174.1	14.5
	communities	< 3,000 ⊗	piped	0.5	32.5	16.2	1.6	2.2			0.4	6.5	0.5
	other consumers		piped	—	—	5.0	1.5	0.6			0.4	2.0	0.2
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			13.3		456.4		57.2				182.6	15.2
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	20.5	43.5	891.8	1.5	111.5			0.55	490.5	40.9
	communities	< 3,000 ⊗	piped	0.9	39.0	35.1	1.6	4.7			0.55	19.3	1.6
	other consumers		piped	—	—	5.0	1.5	0.6			0.6	3.0	0.2
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			21.4		931.9		116.8				512.8	42.7
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	36.6	50.7	1,855.6	1.5	231.9			0.6	1,113.4	92.8
	communities	< 3,000 ⊗	piped	3.0	44.2	132.6	1.6	17.7			0.6	79.6	6.6
	other consumers		piped	—	—	5.0	1.5	0.6			0.7	3.5	0.3
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			-	13.0	-	1.0	-			0.0	—	—
	Total			39.6		1,993.2		250.2				1,196.5	99.7

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: DB

TABLE WS 4-10-48

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City/Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	56.0	1.3	6.1	56.0	—	0.4	22.4	1.9
	other consumers	WSC supply	piped	—	—	1.2	1.3	0.1	1.2	—	0.4	0.5	
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.6	13.0	7.8	1.0	0.7	7.8	—	0.0	—	—
	Total					65.0		6.9	65.0			22.9	1.9
Demand 1975	City/Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped	3.5	32.5	113.8	1.6	15.2			0.4	45.5	3.8
	other consumers		piped	—	—	2.0	1.5	0.2			0.4	0.8	0.1
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.6	13.0	7.8	1.0	0.7			0.0	—	—
	Total			4.1		123.6		16.1				46.3	3.9
Demand 1985	City/Town of						1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	3.6	39.0	140.4	1.6	18.7			0.55	77.2	6.4
	other consumers		piped	—	—	2.0	1.5	0.2			0.6	1.2	0.1
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.4	13.0	5.2	1.0	0.4			0.0	—	—
	Total			4.0		147.6		19.3				78.4	6.5
Demand 2000	City/Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6		
	comm-unities	< 3,000 ⊗	piped	4.4	44.2	194.5	1.6	25.9			0.6	116.7	9.7
	other consumers		piped	—	—	2.0	1.5	0.2			0.7	1.4	0.1
	industry		piped	—	—	-	1.0	-			0.5		
	un-piped supply			0.5	13.0	6.5	1.0	0.5			0.0	—	—
	Total			4.9		203.0		26.6				118.1	9.8

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: DC 1/2

TABLE WS 4-10-49

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	30.6	1.3	3.3	30.6	—	0.4	12.2	1.0
	other consumers	WSC supply	piped	—	—	3.0	1.3	0.3	3.0	—	0.4	1.2	0.1
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply				13.0		1.0			—	0.0	—	—
	Total					33.6		3.6	33.6			13.4	1.1
Demand 1975	City Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped	4.3	32.5	139.8	1.6	18.6			0.4	55.9	4.7
	other consumers		piped	—	—	3.0	1.5	0.4			0.4	1.2	0.1
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			4.3		142.8		19.0				57.1	4.8
Demand 1985	City Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped	3.5	39.0	136.5	1.6	18.2			0.55	75.0	6.3
	other consumers		piped	—	—	3.0	1.5	0.4			0.6	1.8	0.1
	industry		piped	—	—	9,000.0	1.0	750.0			0.5	4,500.0	375.0
	un-piped supply				13.0		1.0				0.0	—	—
	Total			3.5		9,139.5		786.6				4,576.8	381.4
Demand 2000	City Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	communities	< 3,000 ⊗	piped	2.3	44.2	101.7	1.6	13.6			0.6	61.0	5.1
	other consumers		piped	—	—	3.0	1.5	0.4			0.7	2.1	0.2
	industry		piped	—	—	9,000.0	1.0	750.0			0.5	4,500.0	375.0
	un-piped supply			-	13.0	-	1.0	-			0.0	—	—
	Total			2.3		9,104.7		764.0				4,563.1	380.3

⊗ inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			
Copper Project-Feinan			9,000.0	9,000.0

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: DE

TABLE WS 4-10-50

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	total per year	factor	max per month	ORIGIN OF WATER ground	surface	WASTE WATER factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—	3.2	1.3	0.3	3.2	—	0.4	1.3	0.1
	other consumers	WSC supply	piped	—	—	0.3	1.3		0.3	—	0.4	0.1	
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply				13.0		1.0			—	0.0	—	—
	Total					3.5		0.3	3.5			1.4	0.1
Demand 1975	City / Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped	0.4	32.5	13.0	1.6	1.7			0.4	5.2	0.4
	other consumers		piped	—	—	1.0	1.5	0.1			0.4	0.4	
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			0.4		14.0		1.8				5.6	0.4
Demand 1985	City / Town of						1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	0.4	39.0	15.6	1.6	2.0			0.55	8.5	0.7
	other consumers		piped	—	—	1.0	1.5	0.1			0.6	0.6	-
	industry		piped	—	—		1.0				0.5		
	un-piped supply				13.0		1.0				0.0	—	—
	Total			0.4		16.6		2.1				9.1	0.7
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	comm-unities	< 3,000 ⊗	piped	0.3	44.2	13.3	1.6	1.8			0.6	8.0	0.7
	other consumers		piped	—	—	1.0	1.5	0.1			0.7	0.7	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply				13.0	-	1.0	-			0.0	—	—
	Total			0.3		14.3		1.9				8.7	0.7

inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº: DF 1

TABLE WS 4-10-51

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City/Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			4.0	13.0	52.0	1.0	4.3	52.0	—	0.0	—	—
	Total					52.0		4.3	52.0				
Demand 1975	City/Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			4.0	13.0	52.0	1.0	4.0			0.0	—	—
	Total			4.0		52.0		4.0					
Demand 1985	City/Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped	1.5	43.5	65.2	1.5	8.1			0.55	35.9	3.0
	communities	< 3,000 ⊗	piped	0.1	39.0	3.9	1.6	0.5			0.55	2.1	0.2
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			3.7	13.0	48.1	1.0	4.0			0.0	—	—
	Total			5.3		117.2		12.6				38.0	3.2
Demand 2000	City/Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	2.8	50.7	142.0	1.5	17.8			0.6	85.2	7.1
	communities	< 3,000 ⊗	piped	1.3	44.2	57.5	1.6	7.7			0.6	34.5	2.9
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			3.0	13.0	39.0	1.0	3.2			0.0	—	—
	Total			7.1		238.5		28.7				119.7	10.0

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº: DG 11

TABLE WS 4-10-52

year	CONSUMERS				Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
					No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2				3	4	5 = 3 x 4	6	7 = 5/(12) x 6	8	9	10	11 = 5 x 10	12 = 11/(12)
Consumption 1975	City / Town of				—	—		1.3			—	0.6		
	communities	WSC supply	piped		—	—		1.3			—	0.4		
	other consumers	WSC supply	piped		—	—		1.3			—	0.4		
	industry		piped		—	—		1.0			—	0.5		
	un-piped supply				0.6	13.0	7.8	1.0	0.6	7.8	—	0.0	—	—
	Total						7.8		0.6	7.8				
Demand 1975	City / Town of							1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped			34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped			32.5		1.6				0.4		
	other consumers		piped		—	—		1.5				0.4		
	industry		piped		—	—		1.0				0.5		
	un-piped supply				0.6	13.0	7.8	1.0	0.6			0.0	—	—
	Total				0.6		7.8		0.6					
Demand 1985	City / Town of							1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped			43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped		0.2	39.0	7.8	1.6	1.0			0.55	4.2	0.3
	other consumers		piped		—	—		1.5				0.6		
	industry		piped		—	—		1.0				0.5		
	un-piped supply				0.5	13.0	6.5	1.0	0.5			0.0	—	—
	Total				0.7		14.3		1.5				4.2	0.3
Demand 2000	City / Town of							1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped		-	50.7	-	1.5	-			0.6	-	-
	communities	< 3,000 ⊗	piped		0.5	44.2	22.1	1.6	2.9			0.6	13.3	1.1
	other consumers		piped		—	—	-	1.5	-			0.7	-	-
	industry		piped		—	—	-	1.0	-			0.5	-	-
	un-piped supply				0.5	13.0	6.5	1.0	0.5			0.0	—	—
	Total				1.0		28.6		3.4				13.3	1.1

inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº: DG 21

TABLE WS 4-10-53

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9 (8+9=5)	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			2.2	13.0	28.6	1.0	2.4	28.6	—	0.0	—	—
	Total					28.6		2.4	28.6				
Demand 1975	City / Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.2	13.0	28.6	1.0	2.4			0.0	—	—
	Total			2.2		28.6		2.4					
Demand 1985	City / Town of						1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	0.8	39.0	31.2	1.6	4.1			0.55	17.1	1.4
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.0	13.0	26.0	1.0	2.1			0.0	—	—
	Total			2.8		57.2		6.2				17.1	1.4
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	comm-unities	< 3,000 ⊗	piped	1.7	44.2	75.1	1.6	10.0			0.6	45.1	3.8
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			2.0	13.0	26.0	1.0	2.2			0.0	—	—
	Total			3.7		101.1		12.2				45.1	3.8

inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: DH 1/2

TABLE WS 4-10-54

year	CONSUMERS			Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
					per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of Aqaba			—	—	725.0	1.3	78.5	725.0	—	0.6	435.0	36.2
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—	275.0	1.0	22.9	275.0	—	0.5	137.5	11.5
	un-piped supply			1.1	13.0	14.3	1.0	1.2	14.3	—	0.0	—	—
	Total					1,014.3		102.6	1,014.3			572.5	47.7
Demand 1975	City / Town of Aqaba			16.1	64.9	1,044.9	1.4	121.9			0.6	627.0	52.2
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—	275.0	1.0	22.9			0.5	137.5	11.5
	un-piped supply			1.1	13.0	14.3	1.0	1.2			0.0	—	—
	Total			17.2		1,334.2		146.0				764.5	63.7
Demand 1985	City / Town of Aqaba			20.2	74.8	1,511.0	1.4	176.2			0.65	982.1	81.9
	communities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped		39.0		1.6				0.55		
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—	7,800.0	1.0	650.0			0.5	3.900.0	325.0
	un-piped supply			1.4	13.0	18.2	1.0	1.5			0.0	—	—
	Total			21.6		9,329.2		827.7				4,882.1	406.9
Demand 2000	City / Town of Aqaba			26.0	81.4	2,116.4	1.4	246.9			0.7	1,481.5	123.5
	communities	50,000 - 3,000 ⊗	piped		50.7		1.5				0.6		
	communities	< 3,000 ⊗	piped		44.2		1.6				0.6		
	other consumers		piped	—	—		1.5				0.7		
	industry		piped	—	—	12,320.0	1.0	1,026.7			0.5	6,160.0	513.3
	un-piped supply			1.8	13.0	23.4	1.0	2.0			0.0	—	—
	Total			27.8		14,459.8		1,275.6				7,641.5	636.8

inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			
Aqaba	275.0	275.0	7,800.0	12,320.0
Total	275.0	275.0	7,800.0	12,320.0

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: EA 1

TABLE WS 4-10-55

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5 = 3 x 4	6	$7 = \frac{5}{(12)} \times 6$	8	9	10	11 = 5 x 10	$12 = \frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			3.9	13.0	50.7	1.0	4.2	50.7	—	0.0	—	—
	Total					50.7		4.2	50.7				
Demand 1975	City / Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			3.9	13.0	50.7	1.0	4.2			0.0	—	—
	Total			3.9		50.7		4.2					
Demand 1985	City / Town of						1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	2.2	39.0	85.8	1.6	11.4			0.55	47.2	3.9
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			2.2	13.0	28.6	1.0	2.4			0.0	—	—
	Total			4.4		114.4		13.8				47.2	3.9
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	comm-unities	< 3,000 ⊗	piped	3.0	44.2	132.6	1.6	17.7			0.6	79.6	6.6
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			2.2	13.0	28.6	1.0	2.4			0.0	—	—
	Total			5.2		161.2		20.1				79.6	6.6

inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: ED 11

TABLE WS 4-10-56

year	CONSUMERS				Population	CONSUMPTION / DEMAND				ORIGIN OF WATER		WASTE WATER		
						per capita and year	total per year	factor	max per month	ground	surface	factor	total per year	average per month
					No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2				3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	8+9=5 9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City Town of				—	—		1.3			—	0.6		
	communities	WSC supply	piped		—	—		1.3			—	0.4		
	other consumers	WSC supply	piped		—	—		1.3			—	0.4		
	industry		piped		—	—		1.0			—	0.5		
	un-piped supply				0.6	13.0	7.8	1.0	0.6	7.8	—	0.0	—	—
	Total						7.8		0.6	7.8				
Demand 1975	City Town of							1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped			34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped			32.5		1.6				0.4		
	other consumers		piped		—	—		1.5				0.4		
	industry		piped		—	—		1.0				0.5		
	un-piped supply				0.6	13.0	7.8	1.0	0.6			0.0	—	—
	Total				0.6		7.8		0.6					
Demand 1985	City Town of							1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped			43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped		0.5	39.0	19.5	1.6	2.6			0.55	10.7	0.9
	other consumers		piped		—	—		1.5				0.6		
	industry		piped		—	—		1.0				0.5		
	un-piped supply				0.2	13.0	2.6	1.0	0.2			0.0	—	—
	Total				0.7		22.1		2.8				10.7	0.9
Demand 2000	City Town of							1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped		-	50.7	-	1.5	-			0.6	-	-
	comm-unities	< 3,000 ⊗	piped		0.5	44.2	22.1	1.6	2.9			0.6	13.3	1.1
	other consumers		piped		—	—	-	1.5	-			0.7	-	-
	industry		piped		—	—	-	1.0	-			0.5	-	-
	un-piped supply				0.3	13.0	3.9	1.0	0.3			0.0	—	—
	Total				0.8		26.0		3.2				13.3	1.1

inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: ED 12

TABLE WS 4-10-57

year	CONSUMERS				Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
					No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2				3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of				—	—		1.3			—	0.6		
	communities	WSC supply	piped		—	—	39.8	1.3	4.3	39.8	—	0.4	15.9	1.3
	other consumers	WSC supply	piped		—	—	13.2	1.3	1.4	13.2	—	0.4	5.3	0.5
	industry		piped		—	—		1.0			—	0.5		
	un-piped supply				7.2	13.0	93.6	1.0	7.8	93.6	—	0.0	—	—
	Total						146.6		13.5	146.6			21.2	1.8
Demand 1975	City / Town of							1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped			34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped		4.2	32.5	136.5	1.6	18.2			0.4	54.6	4.6
	other consumers		piped		—	—		1.5				0.4		
	industry		piped		—	—		1.0				0.5		
	un-piped supply				7.2	13.0	93.6	1.0	7.8			0.0	—	—
	Total				11.4		230.1		26.0				54.6	4.6
Demand 1985	City / Town of							1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped			43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped		9.9	39.0	386.1	1.6	51.5			0.55	212.4	17.7
	other consumers		piped		—	—		1.5				0.6		
	industry		piped		—	—		1.0				0.5		
	un-piped supply				4.2	13.0	54.6	1.0	4.6			0.0	—	—
	Total				14.1		440.7		56.1				212.4	17.7
Demand 2000	City / Town of							1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped		-	50.7	-	1.5	-			0.6	-	-
	comm-unities	< 3,000 ⊗	piped		12.0	44.2	530.4	1.6	70.7			0.6	318.2	26.5
	other consumers		piped		—	—	-	1.5	-			0.7	-	-
	industry		piped		—	—	-	1.0	-			0.5	-	-
	un-piped supply				6.3	13.0	81.9	1.0	6.8			0.0	—	—
	Total				18.3		612.3		77.5				318.2	26.5

inhabitant

Industry	Cons. 1975	Demand		
		1975	1985	2000
		Thousand m^3		

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: F/H

TABLE WS 4-10-58

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.6	13.0	7.8	1.0	0.7	7.8	—	0.0	—	—
	Total					7.8		0.7	7.8				
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—	14.0	1.5	1.8			0.4	5.6	0.5
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.6	13.0	7.8	1.0	0.7			0.0	—	—
	Total			0.6		21.8		2.5				5.6	0.5
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped	0.6	39.0	23.4	1.6	3.1			0.55	12.9	1.1
	other consumers		piped	—	—	14.0	1.5	1.8			0.6	8.4	0.7
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.2	13.0	2.6	1.0	0.2			0.0	—	—
	Total			0.8		40.0		5.1				21.3	1.8
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	communities	< 3,000 ⊗	piped	0.6	44.2	26.5	1.6	3.5			0.6	15.9	1.3
	other consumers		piped	—	—	14.0	1.5	1.8			0.7	9.8	0.8
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			0.5	13.0	6.5	1.0	0.5			0.0	—	—
	Total			1.1		47.0		5.8				25.7	2.1

inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: G1

TABLE WS 4-10-59

year	CONSUMERS				Population	CONSUMPTION / DEMAND: per capita and year	CONSUMPTION / DEMAND: total per year	CONSUMPTION / DEMAND: factor	CONSUMPTION / DEMAND: max per month	ORIGIN OF WATER: ground	ORIGIN OF WATER: surface	WASTE WATER: factor	WASTE WATER: total per year	WASTE WATER: average per month
					No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2				3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of Ma'an				—	—	304.0	1.3	32.9	304.0	—	0.6	182.4	15.3
	communities	WSC supply	piped		—	—	37.2	1.3	4.0	37.2	—	0.4	14.9	1.2
	other consumers	WSC supply	piped		—	—	3.7	1.3	0.4	3.7	—	0.4	1.5	0.1
	industry		piped		—	—		1.0			—	0.5		
	un-piped supply				0.9	13.0	11.7	1.0	1.0	11.7	—	0.0	—	—
	Total				0.9		356.6		38.3	356.6			198.8	16.6
Demand 1975	City / Town of							1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		12.0	34.0	408.0	1.5	51.0			0.4	163.2	13.6
	comm-unities	< 3,000 ⊗	piped		5.2	32.5	169.0	1.6	22.5			0.4	67.6	5.6
	other consumers		piped		—	—		1.5				0.4		
	industry		piped		—	—		1.0				0.5		
	un-piped supply				0.9	13.0	11.7	1.0	1.0			0.0	—	—
	Total				18.1		588.7		74.5				230.8	19.2
Demand 1985	City / Town of							1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		13.9	43.5	604.7	1.5	75.6			0.55	332.6	27.7
	comm-unities	< 3,000 ⊗	piped		6.0	39.0	234.0	1.6	31.2			0.55	128.7	10.7
	other consumers		piped		—	—		1.5				0.6		
	industry		piped		—	—	4,200.0	1.0	350.0			0.5	2,100.0	175.0
	un-piped supply				1.0	13.0	13.0	1.0	1.0			0.0	—	—
	Total				20.9		5,051.7		457.8				2,561.3	213.4
Demand 2000	City / Town of							1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped		17.0	50.7	861.9	1.5	107.7			0.6	517.1	43.1
	comm-unities	< 3,000 ⊗	piped		6.3	44.2	278.5	1.6	37.1			0.6	167.1	13.9
	other consumers		piped		—	—	-	1.5	-			0.7	-	-
	industry		piped		—	—	4,200.0	1.0	350.0			0.5	2,100.0	175.0
	un-piped supply				1.0	13.0	13.0	1.0	1.1			0.0	—	—
	Total				24.3		5,353.4		495.9				2,784.2	232.0

⊗ inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			
Phosph. El Shiddiya	-	-	4,200.0	4,200.0
Total	-	-	4,200.0	4,200.0

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000
Origin of Water / Waste Water

Area Nº.: G2

TABLE WS 4-10-60

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
	2			3	4	5=3x4	6	7=$\frac{5}{(12)}$ x 6	8	9 (8+9=5)	10	11= 5x10	12= $\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.2	13.0	2.6	1.0	0.2	2.6	—	0.0	—	—
	Total					2.6		0.2	2.6				
Demand 1975	City / Town of						1.4				0.6		
	comm-unities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	comm-unities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.2	13.0	2.6	1.0	0.2			0.0	—	—
	Total			0.2		2.6		0.2					
Demand 1985	City / Town of						1.4				0.65		
	comm-unities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	comm-unities	< 3,000 ⊗	piped	0.1	39.0	3.9	1.6	0.5			0.55	2.1	0.2
	other consumers		piped	—	—	4.0	1.5	0.5			0.6	2.4	0.2
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.1	13.0	1.3	1.0	0.1			0.0	—	—
	Total			0.2		9.2		1.1				4.5	0.4
Demand 2000	City / Town of						1.4				0.7		
	comm-unities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	comm-unities	< 3,000 ⊗	piped	0.1	44.2	4.4	1.6	0.6			0.6	2.6	0.2
	other consumers		piped	—	—	4.0	1.5	0.5			0.7	2.8	0.2
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			0.1	13.0	1.3	1.0	0.1			0.0	—	—
	Total			0.2		9.7		1.2				5.4	0.4

inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº.: I

TABLE WS 4-10-61

year	CONSUMERS			Population	CONSUMPTION / DEMAND per capita and year	CONSUMPTION / DEMAND total per year	CONSUMPTION / DEMAND factor	CONSUMPTION / DEMAND max per month	ORIGIN OF WATER ground	ORIGIN OF WATER surface	WASTE WATER factor	WASTE WATER total per year	WASTE WATER average per month
				No x 10^3	m^3	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$	$m^3 \times 10^3$	/	$m^3 \times 10^3$	$m^3 \times 10^3$
1	2			3	4	5=3x4	6	$7=\frac{5}{(12)} \times 6$	8	9	10	11= 5x10	$12=\frac{11}{(12)}$
Consumption 1975	City / Town of			—	—		1.3			—	0.6		
	communities	WSC supply	piped	—	—		1.3			—	0.4		
	other consumers	WSC supply	piped	—	—		1.3			—	0.4		
	industry		piped	—	—		1.0			—	0.5		
	un-piped supply			0.3	13.0	3.9	1.0	0.3	3.9	—	0.0	—	—
	Total					3.9		0.3	3.9				
Demand 1975	City / Town of						1.4				0.6		
	communities	50,000 - 3,000 ⊗	piped		34.0		1.5				0.4		
	communities	< 3,000 ⊗	piped		32.5		1.6				0.4		
	other consumers		piped	—	—		1.5				0.4		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.3	13.0	3.9	1.0	0.3			0.0	—	—
	Total			0.3		3.9		0.3					
Demand 1985	City / Town of						1.4				0.65		
	communities	50,000 - 3,000 ⊗	piped		43.5		1.5				0.55		
	communities	< 3,000 ⊗	piped	0.2	39.0	7.8	1.6	1.0			0.55	4.3	0.4
	other consumers		piped	—	—		1.5				0.6		
	industry		piped	—	—		1.0				0.5		
	un-piped supply			0.2	13.0	2.6	1.0	0.2			0.0	—	—
	Total			0.4		10.4		1.2				4.3	0.4
Demand 2000	City / Town of						1.4				0.7		
	communities	50,000 - 3,000 ⊗	piped	-	50.7	-	1.5	-			0.6	-	-
	communities	< 3,000 ⊗	piped	0.3	44.2	13.3	1.6	1.8			0.6	8.0	0.7
	other consumers		piped	—	—	-	1.5	-			0.7	-	-
	industry		piped	—	—	-	1.0	-			0.5	-	-
	un-piped supply			0.2	13.0	2.6	1.0	0.2			0.0	—	—
	Total			0.5		15.9		2.0				8.0	0.7

inhabitant

Industry	Cons. 1975	Demand 1975	Demand 1985	Demand 2000
	Thousand m^3			

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

Consumption / Demand 1975-2000

Origin of Water / Waste Water

Area Nº: K

SCALE 1 : 1000 000

0 10 20 30 40 50 km

WATER SUPPLY SYSTEMS IN JORDAN 1975/1980

MAP WS-1

SYRIA

SAUDI ARABIA

MEDITERRANEAN

LAKE TIBERIAS

DEAD SEA

JORDAN RIVER

PALESTINE OCCUPIED

TRUCE LINE

GULF OF AQABA

HANSHIYA JVC SYSTEM

WAQA JVC SYSTEM

TANNOUR WSC SYSTEM

SUBERRA JVC SYSTEM

WADI RAJIB WSC SYSTEM

YARQA WSC SYSTEM

WADI SHUEIB JVC SYSTEM

IRBID

RAMTHA

EL HUSN

AJLUN

SUF

JARASH

MAFRAQ

SUMMAYYA WELL

NORTHERN DISTRICT WSC SYSTEM

AIN DEEK WSC SYSTEM

SARRUT WSC SYSTEM

YAZIDIYA WSC SYSTEM

HASHIMIYA WSC SYSTEM

ZAATARY BOOSTER STATION

DHULEIL WELLS

H5

DES. STATION HALLABAT

CEMENT FACTORY

SALT

SUWEILEH

YAJUZ WSC SYSTEM

ZARQA

RUSEIFA

PHOSPHATE MINE

AMMAN

WADI ES SIR

AZRAQ SOURCES

JERUSALEM

MADABA

SOUTH OF AMMAN WSC SYSTEM

DES. STATION KHARANA

SIWAQA WELL

GHUWEIR WSC SYSTEM

DES. STATION SWAQA

KARAK

TAFILE

TAFILE WSC SYSTEM

EL HASSA PHOSPHATE MINE

SHAUBACK WSC SYSTEM

DES. STATION HUSSEINIYEH

DES. STATION FUJEIJ

DES. STATION JERBA

DES. STATION UDHRUH

EL QA' WSC SYSTEM

MA'AN

DES. STATION QA MA'AN

QA' DISI WELLS

AQABA

35°00' 30' 36°00' 30' 37°00' 30' 38°00'

30°00' 30' 31°00' 30' 32°00' 30'

100 200 300 400 900 000

LEGEND:

- TOWNS SUPPLIED BY THEIR OWN WATER SUPPLY SYSTEMS
- TOWN SUPPLIED BY WSC WATER SUPPLY SYSTEMS
- AREAS SUPPLIED IN 1975 BY WSC
- AREAS WHICH WILL BE SUPPLIED BY THE NEW WSC SYSTEMS IN THE PERIOD 1975 - 1980
- DESERT STATIONS OF WSC
- WELLS IN OPERATION FOR WATER SUPPLY SYSTEMS IN 1975
- WELLS TO BE OPERATED IN THE FUTURE FOR WATER SUPPLY SYSTEMS
- SPRINGS
- INDUSTRIES IN OPERATION IN 1975 WITH THEIR OWN WELLS
- EXISTING MAIN PIPELINES
- PROJECTED MAIN PIPELINES

PREPARED BY

AGRAR – UND HYDROTECHNIK GMBH, ESSEN

BUNDESANSTALT FÜR GEOWISSENSCHAFTEN UND ROHSTOFFE, HANNOVER

JULY 1977

THE HASHEMITE KINGDOM OF JORDAN

NATURAL RESOURCES AUTHORITY, AMMAN

NATIONAL WATER MASTER PLAN OF JORDAN

FEDERAL REPUBLIC OF GERMANY

GERMAN AGENCY FOR TECHNICAL COOPERATION LTD., FRANKFURT

gtz

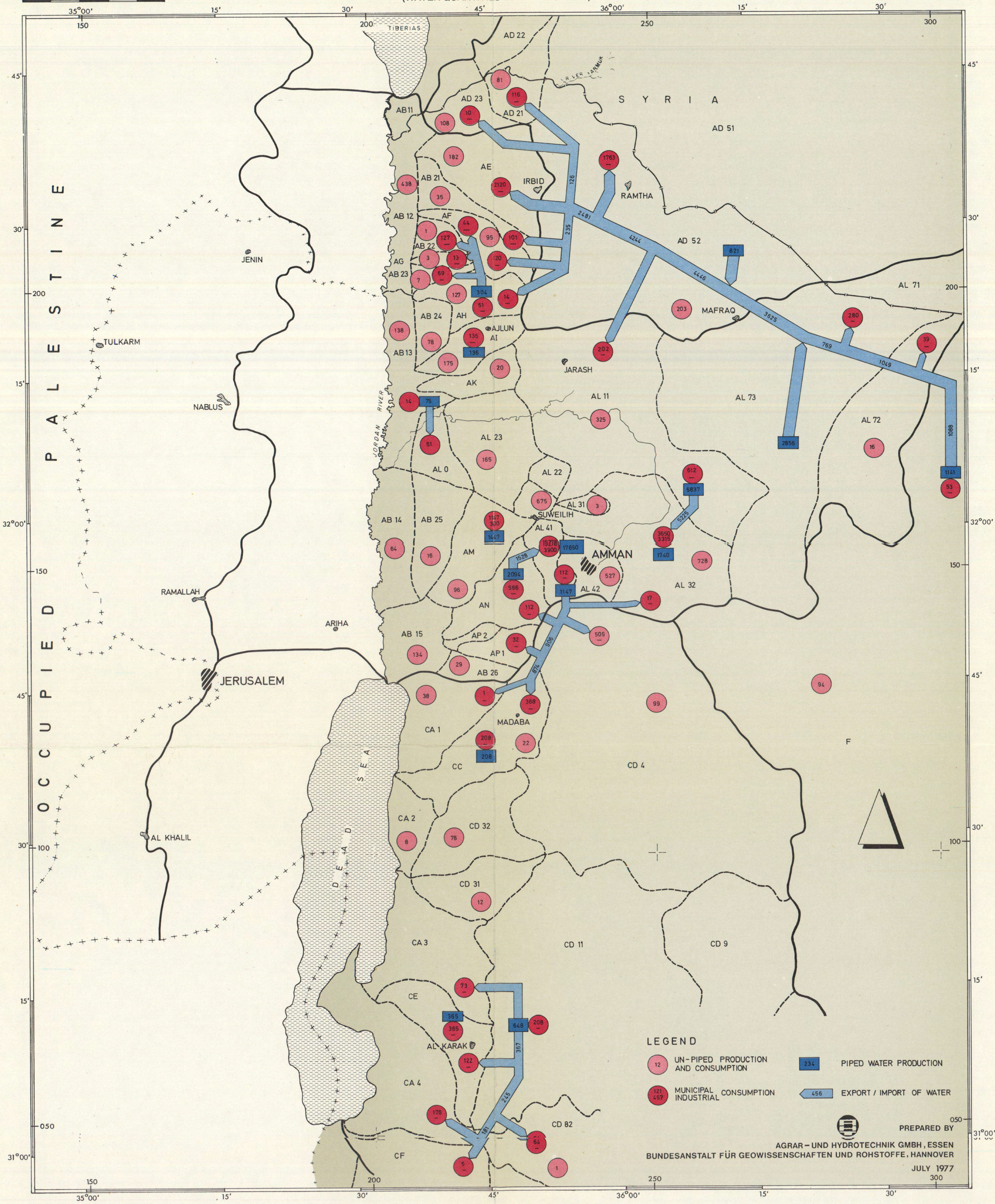
WATER PRODUCTION/CONSUMPTION 1975

(WATER QUANTITIES IN $m^3 \times 10^3$/YEAR)

MAP WS-2 N

SCALE 1 : 500000

0 5 10 15 20 25 km



THE HASHEMITE KINGDOM OF JORDAN
NATURAL RESOURCES AUTHORITY, AMMAN

NATIONAL WATER MASTER PLAN OF JORDAN

FEDERAL REPUBLIC OF GERMANY
GERMAN AGENCY FOR TECHNICAL COOPERATION LTD., FRANKFURT
gtz

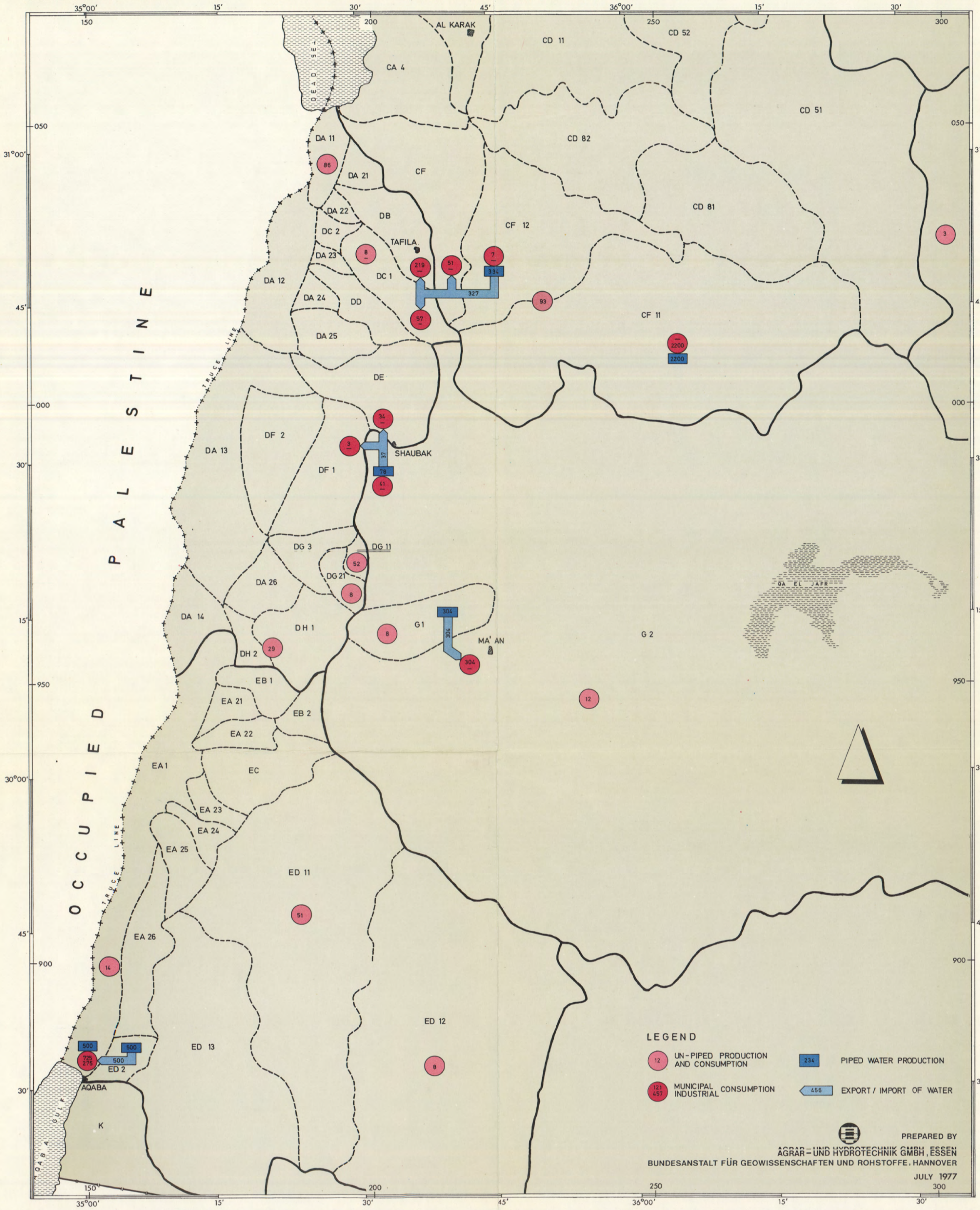
WATER PRODUCTION/CONSUMPTION 1975

(WATER QUANTITIES IN $m^3 \times 10^3$/YEAR)

MAP WS-2 S

SCALE 1 : 500 000

0 5 10 15 20 25 km



LEGEND

- UN-PIPED PRODUCTION AND CONSUMPTION
- MUNICIPAL / INDUSTRIAL CONSUMPTION
- PIPED WATER PRODUCTION
- EXPORT / IMPORT OF WATER

PREPARED BY

AGRAR-UND HYDROTECHNIK GMBH, ESSEN

BUNDESANSTALT FÜR GEOWISSENSCHAFTEN UND ROHSTOFFE, HANNOVER

JULY 1977

THE HASHEMITE KINGDOM OF JORDAN

NATURAL RESOURCES AUTHORITY, AMMAN

NATIONAL WATER MASTER PLAN OF JORDAN

FEDERAL REPUBLIC OF GERMANY

GERMAN AGENCY FOR TECHNICAL COOPERATION LTD., FRANKFURT

gtz

SCALE 1 : 500000

0 5 10 15 20 25 km

DOMESTIC CONSUMPTION/DEMAND 1975

MAP WS-3 N

TIBERIAS
RIVER YARMUK
JORDAN RIVER
DEAD SEA
S Y R I A
P A L E S T I N E
O C C U P I E D
JENIN
TULKRAM
NABLUS
AL KHALIL
RAMALLAH
ARIHA
JERUSALEM
IRBID
RAMTHA
MAFRAQ
AJLUN
JARASH
SUWEILIH
AMMAN
MADABA
AL KARAK
AD 21
AD 22
AD 23
AD 51
AD 52
AB 11
AB 12
AB 13
AB 14
AB 15
AB 21
AB 22
AB 23
AB 24
AB 25
AB 26
AE
AF
AG
AH
AJ
AK
AL 0
AL 11
AL 21
AL 22
AL 23
AL 31
AL 32
AL 41
AL 42
AL 71
AL 72
AL 73
AM
AN
AP 1
AP 2
CA 1
CA 2
CA 3
CA 4
CC
CD 4
CD 9
CD 11
CD 31
CD 32
CE
CF
F
AE 8 92 2302 — 2 98 7625
AB 11 100 438
AF AB 21 33 67 396 — 14 86 898
AB 12
AB 22 AB 23 AG 5 95 219 — 2 98 655
AB 23
AH AB 24 24 76 271 — 45 55 371
AJ AK 43 57 331 — 43 57 331
AB 13 9 91 152 — 23 77 180
AL 0 35 65 173 — 63 37 300
AL 23 100 165
AL 22
AL 21 100 675
AB 14
AB 25
AM 8 92 1243 — 6 94 1592
AN 100 678 — 100 841
AB 15 100 213
AP 2
AP 1
AP AB 26 50 50 65 — 74 26 126
AB 26
CA 1 CC 9 91 636 — 5 95 1169
CA 3 CA 4 100 249 — 100 853
CA 2 100 35
CD 32
CD 31
CE
CA 4
CF
AD 2 40 60 314 — 55 45 533
AL 4 3 97 17617 — 2 98 31564
AL 11 29 71 1140 — 16 84 1986
AL 73 5 95 850
AL 72 12 88 360
AL 31 15 85 4748
AL 32 6 94 11341
AL 41
AL 42
CD 4 16 84 603 — 6 94 1586
F 36 64 147 — 59 41 230
AE 10 90 1966 — 4 96 5104
AL 71

LEGEND:

DEMAND / CONSUMPTION RATIO: 1.0 | 1.0 - 1.5 | 1.5 - 2.0 | 2.0 - 2.5 | 2.5 - 3.0 | 3.0 - 3.5 | OVER 3.5 (RATIO OF SUPPLY INADEQUACY)

CONSUMPTION: UN-PIPED SUPPLY, PIPED SUPPLY — Q [m³ x 10³/YEAR]

DEMAND: UN-PIPED SUPPLY, PIPED SUPPLY — Q [m³ x 10³/YEAR]

CONSUMPTION EQUAL DEMAND — Q [m³ 10³/YEAR]

PREPARED BY
AGRAR – UND HYDROTECHNIK GMBH, ESSEN
BUNDESANSTALT FÜR GEOWISSENSCHAFTEN UND ROHSTOFFE, HANNOVER

JULY 1977

THE HASHEMITE KINGDOM OF JORDAN
NATURAL RESOURCES AUTHORITY, AMMAN

NATIONAL WATER MASTER PLAN OF JORDAN

FEDERAL REPUBLIC OF GERMANY
GERMAN AGENCY FOR TECHNICAL COOPERATION LTD., FRANKFURT
gtz

SCALE 1 : 500 000

0 5 10 15 20 25 km

DOMESTIC CONSUMPTION/DEMAND 1975

MAP WS-3 S

DEAD SEA

AL KARAK

CA 4

CD 11

CD 52

CD 82

CD 51

CD 81

CF 2

CF 12

CF 11

DA 11

DA 21

DA 22

DB

TAFILA

DC 2

DA 23

DC 1

DA 12

DA 24

DD

DA 25

DE

DF 2

DF 1

SHAUBAK

DA 13

G 2

DG 3

DG 11

DG 21

DA 26

DA 14

DH 1

DH 2

MA'AN

EB 1

EA 21

EB 2

EA 22

EA 1

EC

EA 23

EA 24

EA 25

EA 26

ED 11

ED 12

ED 13

ED 2

AQABA

K

G2

QA EL JAFR

P A L E S T I N E

O C C U P I E D

T R U C E L I N E

A Q A B A G U L F

100 86

100 220 DB 100 456

12 88 5 94 DC1 DC2 65 124

38 62 152 57 43 219

100 274 100 917

100 37 DE DF1 100 157

100 88

5 95 364 3 97 610

100 58

2 98 739 1 99 1059

LEGEND :

DEMAND / CONSUMPTION RATIO 1.0 | 1.0 - 1.5 | 1.5 - 2.0 | 2.0 - 2.5 | 2.5 - 3.0 | 3.0 - 3.5 | OVER 3.5 (RATIO OF SUPPLY INADEQUACY)

CONSUMPTION — UN-PIPED SUPPLY / PIPED SUPPLY — Q [m³ x 10³/YEAR]

DEMAND — UN-PIPED SUPPLY / PIPED SUPPLY — Q [m³ x 10³/YEAR]

CONSUMPTION EQUAL DEMAND — Q [m³ 10³/YEAR]

PREPARED BY

AGRAR – UND HYDROTECHNIK GMBH, ESSEN

BUNDESANSTALT FÜR GEOWISSENSCHAFTEN UND ROHSTOFFE, HANNOVER

JULY 1977

THE HASHEMITE KINGDOM OF JORDAN

NATURAL RESOURCES AUTHORITY, AMMAN

NATIONAL WATER MASTER PLAN OF JORDAN

FEDERAL REPUBLIC OF GERMANY

GERMAN AGENCY FOR TECHNICAL COOPERATION LTD., FRANKFURT

gtz

SCALE 1 : 1000 000

0 10 20 30 40 50 km

INDUSTRIAL WATER SUPPLY 1975–1985

MAP WS-4

SYRIA

SA'UDI ARABIA

MEDITERRANEAN SEA

DEAD SEA

GULF OF AQABA

LAKE TIBERIAS

YARMUK RIVER

JORDAN RIVER

TRUCE LINE

APPROXIMATE BOUNDARY

IRBID

RAMTHA

SAMA

AJLUN

JARASH

MAFRAQ

AZRAQ

1975 2935 1985 8900

REFINERY
PHOSPHATE PLANT
VARIOUS INDUSTRIES

1975 300 1985 600

CEMENT FACTORY
SUWEILEH

SALT

ZARQA

RUSEIFAH

AMMAN

1975 2200 1985 6000

VARIOUS INDUSTRIES

MADABA

JERUSALEM

KARAK

1980-1981 9000

POTASH EXTRACTION PLANT

SAFI

WADI EL ABYAD 1980 3000

PHOSPHATE MINES
(PROJECTED LIFESPAN 1978 - 1992)

TAFILA

HASA

EL HASSA 1975 2200 1985 6500

PHOSPHATE MINES
(EXPECTED TO CEASE OPERATION IN 1990)

1982 - 1985 9000

COPPER PROJECT

FEINAN

SHAUBAK

MA'AN

1980 - 1982 4200

EL SHADYAH

PHOSPHATE MINES

RAS EN NAQB

1975 275 1985 7800

PORT
FTZ
SMALL INDUSTRIES

PORT + FTZ
FERTILISER PLANT
REFINERY
TOURISM

ORAM

AQABA

DURRAH

LEGEND:

CONSUMPTION 1975

FUTURE DEMAND

[$m^3 \times 10^3$/YEAR]

PREPARED BY

AGRAR – UND HYDROTECHNIK GMBH, ESSEN

BUNDESANSTALT FÜR GEOWISSENSCHAFTEN UND ROHSTOFFE, HANNOVER

JULY 1977

THE HASHEMITE KINGDOM OF JORDAN

NATURAL RESOURCES AUTHORITY, AMMAN

NATIONAL WATER MASTER PLAN OF JORDAN

FEDERAL REPUBLIC OF GERMANY

GERMAN AGENCY FOR TECHNICAL COOPERATION LTD., FRANKFURT

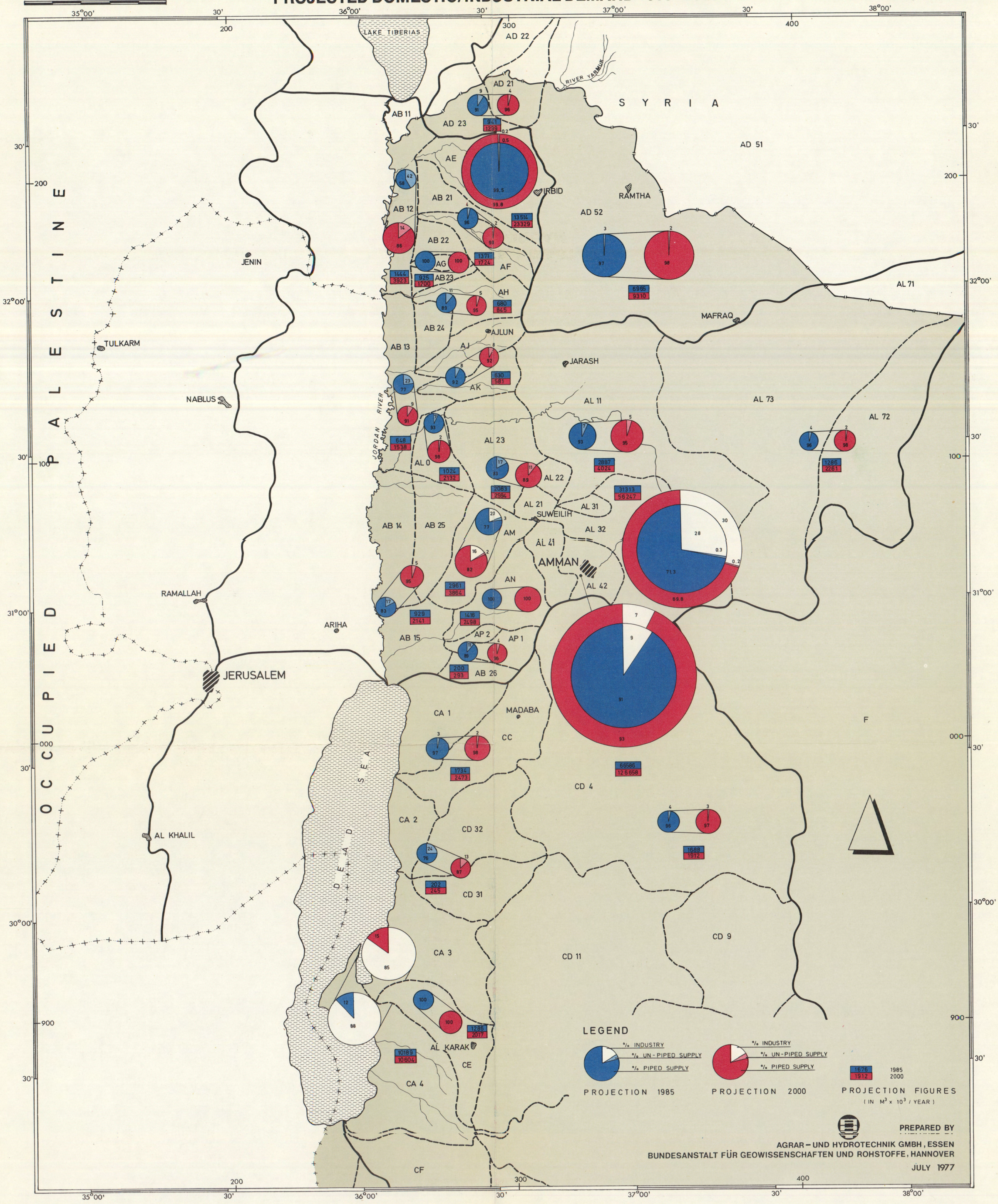
gtz

SCALE 1 : 1000 000

0 10 20 30 40 50 km

PROJECTED DOMESTIC/INDUSTRIAL DEMAND 1985–2000

MAP WS-5 N



THE HASHEMITE KINGDOM OF JORDAN
NATURAL RESOURCES AUTHORITY, AMMAN

NATIONAL WATER MASTER PLAN OF JORDAN

FEDERAL REPUBLIC OF GERMANY
GERMAN AGENCY FOR TECHNICAL COOPERATION LTD., FRANKFURT
gtz

SCALE 1 : 500 000

0 5 10 15 20 25 km

PROJECTED DOMESTIC/INDUSTRIAL DEMAND 1985–2000

MAP WS-5 S

AL KARAK
TAFILA
SHAUBAK
MA' AN
AQABA
DEAD SEA
TRUCE LINE
OCCUPIED PALESTINE
GULF OF AQABA
SAUDI ARABIA
IRAQ
OA EL JAFR

CA 4
CD 11
CD 52
CD 51
CD 82
CD 81
CF 2
CF 12
CF 11
DA 11
DA 21
DA 22
DB
DC 2
DA 23
DC 1
DA 12
DA 24
DD
DA 25
DE
DF 2
DA 13
DF 1
DG 3
DG 11
DG 21
DA 26
DA 14
DH 2
DH 1
EB 1
EA 21
EB 2
EA 22
EA 1
EC
EA 23
EA 24
EA 25
EA 26
ED 11
ED 13
ED 12
ED 2
G1
G 2
K

30 70 4305 1935
100
2 98 1 99 1304 2437
4 94 9 91 6943 1088
2 98 9156 9119
2 98
19 81 43 57 189 368
18 82 22 78 5092 5400
23 77 17 83 137 187
15 85 17 83 9329 14460

LEGEND

% INDUSTRY
% UN-PIPED SUPPLY
% PIPED SUPPLY

PROJECTION 1985

% INDUSTRY
% UN-PIPED SUPPLY
% PIPED SUPPLY

PROJECTION 2000

1676 1985
1912 2000

PROJECTION FIGURES
(IN $M^3 \times 10^3$ / YEAR)

PREPARED BY
AGRAR – UND HYDROTECHNIK GMBH, ESSEN
BUNDESANSTALT FÜR GEOWISSENSCHAFTEN UND ROHSTOFFE, HANNOVER
JULY 1977

THE HASHEMITE KINGDOM OF JORDAN
NATURAL RESOURCES AUTHORITY, AMMAN

NATIONAL WATER MASTER PLAN OF JORDAN

FEDERAL REPUBLIC OF GERMANY
GERMAN AGENCY FOR TECHNICAL COOPERATION LTD., FRANKFURT
gtz