Report No. 1224-GR

Appraisal of the Salonica and Volos Sewerage Project Greece

November 12, 1976

Water Supply and Sewerage Division
Europe, Middle East and North Africa Regional Office

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CURRENCY AND EQUIVALENTS

Currency Unit	=	Drachma (Dr.)
Dr. 1	=	US$ 0.029
US$ 1	=	Dr. 35.0
Dr. 1 Million	=	US$ 28,571
US$ 1 Million	=	Dr. 35,000,000

WEIGHTS AND MEASURES

mm	=	millimeter (1 millimeter = 0.039 inches)
cm	=	centimeter (1 centimeter = 0.39 inches)
m	=	meter (1 meter = 3.28 feet)
km	=	kilometer (1 kilometer = 0.62 miles)
km^2	=	square kilometer (1 km^2 = 247.1 acres)
m^3	=	cubic meter (1 m^3 = 264.2 US gallons)
m^3/sec	=	cubic meter per second (1 m^3/second = 22.8 million US gallons per day)
l/sec	=	liter per second (1 l/sec = 0.26 US gallons/sec)
ha	=	hectare (1 hectare = 2.471 acres)

GLOSSARY OF ABBREVIATIONS

ETVA	=	Hellenic Industrial Development Bank
IOKAE	=	Institute of Oceanography and Fishing Research
MI	=	Ministry of Interior
MPW	=	Ministry of Public Works
SSA	=	Salonica Sewerage Authority
SWA	=	Salonica Water Authority
UNDP	=	United Nations Development Program
VMWSA	=	Volos Municipal Water and Sewerage Authority
VWSO	=	Water and Sewerage Municipal Organization for the Greater Volos Area (Volos Water and Sewerage Organization)
WHO	=	World Health Organization

FISCAL YEAR

January 1 - December 31 for both project beneficiaries

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

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This report was prepared by Messrs. David C. Jones (Financial Analyst) and Marcial Cuellar (Sanitary Engineer).

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SUMMARY AND CONCLUSIONS

i. Rapid urbanization and industrialization, deficient sewer systems and uncontrolled discharges of industrial wastewaters have resulted in severe pollution of Greece's coastal waters and shown the need for upgrading the country's sewerage sector policies. The Government has selected the cities of Salonica and Volos for implementing new sectoral policies because their sewer systems are especially deficient and their different degrees of industrialization provide a good range for the study of industrial wastewater management.

ii. Water and sewerage services have hitherto been mainly the responsibility of municipal authorities. The trend has been towards the establishment of semi-autonomous authorities to run these services, under the general supervision of the Ministry of Public Works or the Ministry of Interior. Where such organizations have already been established, considerable streamlining of their administrative arrangements is desirable.

iii. Apart from the physical construction of sewerage systems in Salonica and Volos, the major goal of the project is to improve the planning and design of sewerage projects and to develop local expertise in water pollution control procedures and industrial wastewater management. The project is also intended to initiate and develop sectoral reforms in accounting and financial administration.

iv. The project will comprise the construction of interceptors, treatment and disposal facilities for Salonica; construction of sewer networks, interceptors, pre-treatment and an ocean outfall in Volos; industrial wastewater surveys; oceanographic studies; design of additional treatment facilities in Salonica; accounting, financial control and tariff studies; and training.

v. Project costs are estimated to total US$113 million with the estimated foreign exchange component of US$36 million to be covered by the proposed Bank loan. The major part of the loan would be on-lent to separate project entities, on Bank terms, towards physical construction costs. The Government would retain a small portion towards the cost of studies and training. Pending the establishment of adequate technical and administrative capability in the project authorities, the supervision of construction would be undertaken, on their behalf, by the Ministry of Public Works.

vi. All procurement would be in accordance with Bank guidelines. Advance contracting might be necessary for oceanographic studies and final project design. This may result in the Bank being asked to finance retroactively up to US$100,000 of approved contract expenditures. It may be appropriate for certain works, up to a maximum of US$1.0 million, to be carried out by the staff of the two project entities.

vii. The project is technically and economically sound. The construction components are the least-cost solution for meeting the sewerage needs of each city and will make significant contributions to the public health and environment in and around these towns. The studies will contribute towards the establishment of more rational management of the sector.

viii. Sewerage charges will have to be significantly increased in each city to permit full long-term cost recovery of the provision and operation of the system, and to provide a reasonable proportion of funds for expansion.

ix. Agreement having been reached on the various matters referred to in the report, the project is suitable for a Bank loan of US$36 million to the Government of Greece for a period of 15 years, including a 3-year grace period, with on-lending of portions of the loan to the Salonica Sewerage Authority and the Volos Water and Sewerage Organization, as outlined in the report.

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

I. INTRODUCTION

1.01 The Government of Greece has requested a Bank loan to help finance the first construction stages of the Salonica and Volos sewerage programs. The Government intends these projects to serve as pilots for institutional development of regional water and sewer authorities as well as vehicles for improving national expertise in industrial wastewater management, operation of wastewater treatment facilities and water pollution control. The proposed construction, which, with related studies, is estimated to cost US$113 million, constitutes the first stage of works to be constructed in accordance with the sewer master plans for both cities.

1.02 Engineering feasibility studies for Salonica were prepared by OTME Hydraulic Projects Ltd. (Greece) and D. Balfour and Sons (England) and, for Volos, by Alex G. Macheras S.A. (Greece) and Balasha-Jalon (Israel). Financial and institutional studies were conducted by the Hellenic Industrial Development Bank (ETVA) with the assistance of Arthur Andersen and Company. Oceanographic studies were conducted by the Institute of Oceanographic and Fishing Research (IOKAE) and industrial wastewater surveys by ETVA.

1.03 During 1975, various project preparation missions composed of Messrs. Thys, Jones, Cuellar and Gunnerson (consultant) reviewed the work being conducted by IOKAE, ETVA and the consultants and agreed on the project scope and its basic design criteria.

1.04 A mission composed of Messrs. Jones and Cuellar appraised the project in February-March 1976. This report is based on the consultants' reports and the mission's findings.

II. THE SEWERAGE SECTOR

A. Existing Sewer Systems

2.01 The main Greek cities are located on the coast and have traditionally discharged their wastewaters into the sea. Their sewer systems usually consist of laterals and multiple trunk mains discharging at the shore into surface waters. Only parts of Athens and Salonica have integrated sewer networks discharging through submarine outfalls. Inland communities have depended mainly on septic tanks and percolation pits and only recently have started construction of sewer systems. These systems lack treatment facilities and usually discharge into the nearest water body. Even though the Ministry of Public Works (MPW) now requires separate sanitary sewers in all new projects, most of the existing systems are still of the combined (waste and storm waters) type.

B. Urbanization and Industrialization

2.02 During the last census decade (1961-1971), Greece registered a high tempo of urbanization, of 4% per year, which was due mainly to the accelerated industrialization of the country. Projections based on this demographic trend indicate that urban population, which in 1971 constituted 53% of the total population, would reach 76% by 1996.

2.03 To date, the internal migration has been absorbed almost exclusively by Athens and Salonica, which together now contain about 38% of the country's population. To improve the spatial distribution of migration, the Government is advancing regional development programs and encouraging growth of smaller cities such as Volos by improving their public services and promoting their industrialization.

C. Pollution

2.04 The intensive urban growth and uncontrolled discharge of industrial wastewaters have caused severe pollution of rivers and coastal waters. Construction of poorly planned submarine outfalls in Athens and Salonica and the establishment of arbitrary industrial effluent standards have failed to abate the growing pollution and have shown the need for development of local expertise in environmental engineering.

2.05 Greece expects to shortly join the European Common Market and will therefore have to impose upon its industries environmental protection standards, comparable to those of other member countries. The Government will also have to step up its efforts on water pollution control in accordance with the spirit of the recently signed Barcelona Agreement for pollution abatement in the Mediterranean and also to prevent further damage to its important tourism and fishing industries.

D. Sector Organization

2.06 Traditionally the water supply and sewer systems have been operated by the municipalities. However, urban development across municipal boundaries has already led, in Athens and Salonica, to the creation of regional water and sewerage authorities responsible to the central government and is bringing regionalization in other urban areas. In Athens and Salonica, the Government opted for separate water supply and sewerage authorities but its present thinking favors the eventual merging of regional water supply and sewerage under single authorities for each urban area.

2.07 Design and construction of new water supply and sewer systems and important expansions or upgrading of existing systems have been usually financed by central government grants and loans and constructed by private contractors under the direction of the Ministry of Public Works (MPW). Smaller constructions have been usually financed through low interest loans provided by the provincial governments and conducted by the municipalities through private contractors or force account.

2.08 Design and construction of sewerage projects are conducted by private consultants and contractors under the supervision of the MPW and are governed by generally out-dated design standards and construction specifications. Staged sewer construction is rarely practised so that overdesign is common. Construction is usually good and local contracting capacity is adequate but present specifications need considerable updating to incorporate new materials, equipment and construction processes. The MPW intends to use the experience gained from the Salonica and Volos sewerage projects to update the existing standards and specifications.

E. Reorganization of the Sector

2.09 The Government is aware of the shortcomings of its institutions in the sewerage field and it has requested assistance not only from the Bank but also from the UNDP and WHO. WHO has already conducted a preliminary study of the institutional aspects of the establishment of a national environmental protection agency. UNDP offered financial assistance for the feasibility studies of the Athens sewerage system and WHO has been assisting the MPW in selecting consultants for this work.

2.10 From the preparation of the Salonica and Volos sewerage projects and from the studies conducted by UNDP/WHO, the following proposals have emerged for improving the organization of the sewerage sector:

(a) creation of a Wastewater Department within the MPW to serve as an advisory and regulatory agency for the sector;

(b) creation of a Project Appraisal Department within the MPW to review the technical, economic and financial feasibility of water supply and sewerage projects;

(c) creation of semi-autonomous water supply and sewerage authorities with responsibility for design, construction and operation of their systems;

(d) financing of new water supply and sewerage projects by the central or provincial governments through commercial type loans together with the introduction of cost-related tariff policies; and

(e) strengthening of the capabilities of the Institute of Oceanographic and Fishing Research (IOKAE) for surveying and monitoring fresh and ocean waters.

III. THE PROJECT AREAS

A. General

3.01 Detailed descriptions of the project areas and of the existing water supply and sewerage systems of Salonica and Volos are given in Annexes 1 and 2.

B. Greater Salonica

3.02 Greater Salonica is located in northern Greece at the head of the Thermaikos Gulf and is the second largest population and industrial center of the country. The metropolitan area extends for about 60 km along the shores of Salonica Bay, covering an area of about 24,800 ha and including six municipalities and 22 townships. Its present population is estimated at 690,000.

3.03 Three industrial zones are located north of the City and a fourth one is under development on the eastern bank of the Axios River. Today these industrial zones cover an area of about 1,800 ha, provide employment for about 70,000 people and house 240 industries.

3.04 During the last census decade (1961-1971) Salonica became the fastest growing of the Greek cities with an average growth of 3.8% per year. This accelerated growth is largely due to its privileged geographical position as the gateway of the Balkans and Central Europe to the Mediterranean. A proposed expansion of Salonica's port facilities and ongoing improvements of the road network connecting northern Greece with Central Europe should maintain its importance as an international port.

C. Greater Salonica Water Supply System

3.05 The Salonica Water Authority (SWA) supplies water to almost the entire urban area. It operates a 750 km distribution system and six well-fields located within the metropolitan area. Well construction has never kept up with the urban growth and Salonica has suffered chronic water shortages. As a result, the City has also a large number of privately owned wells.

3.06 Including consumption from privately owned wells, domestic water consumption during 1974 was estimated at 23.7 million m3 and industrial consumption at 18.6 million m3. The SWA estimated its total water sales in 1974 at 34.5 million m3 and the population connected to its system at 612,000. Water production by the SWA was estimated at 47.5 million m3.

3.07 Two new well fields, with an expected combined yield of 265,000 m3/day, are being completed and should provide sufficient water to serve the expected population and industrial growth up to 1995.

D. Greater Salonica Sewer System

3.08 Since January 1, 1976 the sewer system has been operated by the recently created Salonica Sewer Authority (SSA). The system has a length of about 250 km, partially covers six municipalities and 13 townships and serves a population estimated at 463,000. The remaining population is served by an estimated 40,000 septic tanks.

3.09 The downtown area of the City was sewered during the 1930's with a combined network discharging into the inner Salonica Bay through a submarine outfall. This system has been gradually extended to the north and northeastern sector of the City causing heavy overloading of the outfall. The south-eastern part of the City which constitutes its higher-cost residential zone extends along the coast and its numerous apartment buildings discharge directly into the sea. The lower cost residential areas occupy the north-western part of the City, are far away from the ocean and lack a defined sewer system.

3.10 Two of the industrial zones discharge part of their liquid wastes into the municipal sewers and the remainder into the Dendropotamos River. The third zone (Esso) has some pre-treatment facilities and a separate sewer to the sea.

3.11 The pollution of Salonica Bay has been minimized by the excellent dispersion resulting from the existing disposal pattern of multiple discharges into surface waters. However, this type of disposal favors the blooming of algae which have washed upon the shore where they decompose, producing foul smells which envelop the City during part of the summer.

3.12 Because of frequent fish killings and high bacterial contamination of the coastal waters, the City has closed the beaches and forbidden fishing in the inner Salonica Bay.

E. Greater Volos

3.13 Greater Volos is located in Central Greece on the northern shore of Pagasitikos Gulf and ranks fourth in population among Greek cities. The metropolitan area covers two principal municipalities, several smaller townships and an Industrial Estate with a presently combined built-up area of about 1,600 ha. Present populations are estimated at 82,600 for the City and at 97,300 for the entire metropolitan area, excluding the considerable numbers of tourists which visit Volos during the summer.

3.14 An Industrial Estate developed by ETVA as part of the regional development effort, houses today 19 industries. Within the City, there are also 57 smaller industries.

F. Greater Volos Water Supply System

3.15 An important aquifer underlies the City; lesser aquifers underlie adjacent areas and numerous springs flow on the slopes of Mount Pilion so that the metropolitan population has always had an abundant water supply.

3.16 The metropolitan area is served by two main systems operated by the municipalities of Volos and Nea Ionea plus a new system built by the Industrial Estate and some minor systems operated by the townships. The main sources of water are the underground aquifer.

3.17 During 1974, these systems pumped a combined total of 4.3 million m3 and sold a metered total of 3.2 million m3. It is estimated that an additional 0.6 million m3 were pumped from privately-owned wells.

3.18 There is concern in Volos that the City aquifer is being contaminated by sea water intrusion and by seepage from the numerous septic tanks. Because of this fear, the City is completing construction of Kaliakouda Spring aqueduct and is advancing plans to use other springs further away from the City. With the addition of the Kaliakouda aqueduct, the City will have an abundant water supply, so agreement has been reached to delay construction of major additional new water sources until the extent of the aquifer's contamination can be established by adequate monitoring.

G. Greater Volos Sewer System

3.19 Within the City only about 110 ha of the coastal area, housing a population of about 8,400 are presently sewered, through a system composed of about 15 km of sewers. The rest of the City and all the adjacent villages and townships are served by septic tanks.

3.20 The area already developed of the Industrial Estate (160 ha) is served by a recently constructed sewer network discharging into the Xerias Creek, which flows into the Volos Bay.

3.21 There is little deterioration in the water quality of the inner Volos Bay, which is reasonable since most of the City is served by septic tanks and the multiple outfalls provide good sewage dispersion. In the NW corner of the Bay, near the mouth of the Xerias Creek there is, however, a strong dissolved oxygen depression and high nutrient concentration. For the two bathing beaches within the metropolitan area, bacterial contamination appears permanent but moderate at Goritsa beach (eastern end of the City) and only sporadic at Alykes beach (western shore of Volos Bay).

IV. THE PROJECT

A. Objectives

4.01 The primary objective of the proposed project is to assist Greece in implementing the reorganization of the sewerage sector, as outlined in paragraph 2.10. Two priority pilot sewerage projects, for Salonica and Volos, which have also major direct benefits, have been chosen for this purpose. In pursuit of these sectoral objectives the project includes oceanographic, wastewater reclamation, industrial wastewater and financial studies which have been specifically designed to strengthen national capability for planning and carrying out properly designed and financially sound priority investments in the sewerage sector.

B. General

4.02 The Salonica and Volos sewerage projects proposed for Bank financing constitute only the first construction stage of the sewerage program for each city. IBRD Maps Nos. 12212 and 12213 and Annexes 3 and 4 describe the entire sewerage programs for both cities as well as the proposed schedules for subsequent construction stages. Population and water consumption projections used in the preparation of these programs are tabulated in Annexes 5 and 6.

C. Greater Salonica Sewerage

4.03 The proposed project, to be constructed during the period 1977-1981, includes partial rehabilitation of the existing sewer network and extensions of the network to the low-cost residential areas, plus the structures needed to intercept, treat and discharge into the Axios River the wastewaters presently flowing into Salonica Bay. This project contemplates only physico-chemical treatment of the wastewaters. Biological treatment (including stabilization ponds) is not considered viable until the Government establishes a program for controlling industrial liquid wastes and capable of effectively preventing discharge of the toxic substances likely to inhibit biological processes. Specifically, the project includes:

(a) installation of about 65 km of secondary sewers, 17 km of trunk and force mains, and three pumping stations to serve the coastal area and the Lagadas and Esso industrial zones;

(b) installation of about 8 km of gravity interceptors, 1 km of force mains, and three pumping stations to intercept the trunk mains discharging into Salonica Bay;

(c) construction of about 25 km of the main interceptor between White Tower and the Axios River;

(d) construction of a physico-chemical primary treatment plant with an initial capacity of about 3.9 m3/second; and

(e) purchase of equipment for sewer inspection and maintenance.

D. Greater Volos Sewerage

4.04 The proposed project, to be constructed during the period 1977-1981, includes the infrastructure to serve the population projected up to 1995, pretreatment of the wastewater and all the secondary sewer networks which can logistically be installed during that five-year span. Specifically, the project includes:

(a) installation of about 113 km of secondary sewers, 18 km of trunk and force mains and five pumping stations;

(b) construction of a pre-treatment plant with an initial capacity of about 0.44 m3/second;

(c) installation of a collector of about 4 km, to carry wastewater from the industrial estate to the pre-treatment plant; and

(d) construction of a temporary effluent pumping station, an 8.1 km final interceptor and a 0.7 km ocean outfall to discharge the pre-treated wastewater into the Pagasitikos Gulf.

E. Studies and Training

4.05 The project also includes the studies and surveys listed below. At the request of Government these studies and surveys have been designed to provide not only the data required for the Salonica and Volos sewerage projects but mainly to develop guidelines and techniques which can be employed in other cities. Detailed terms of reference are given in Annexes 7 to 10 and cost estimates in Annex 11, pages 4 and 5. The studies and surveys are:

(a) feasibility studies for the Mega Emvolon sewerage system which would serve the southeastern part of Salonica metropolitan area and which would be constructed by SSA as part of its future investment program. These studies aim to establish the first pilot project in Greece on the use of wastewater effluents for irrigation and it is expected that their results can be applied in other areas of the country;

(b) industrial wastewater surveys in Salonica and Volos aimed at establishing country-wide procedures on industrial wastewater management;

(c) oceanographic studies of the Thermaikos and Pagasitikos Gulfs designed to establish country-wide procedures for monitoring and evaluation of ocean water quality. They include:

(i) monitoring of the receiving waters once the proposed sewerage projects enter operation; and

(ii) establishment of a mathematical model to forecast the cost of treatment for different types of industrial developments and various criteria of water quality;

(d) a review of accounting, financial control and tariff systems of the Salonica Water Authority, Salonica Sewerage Authority and Volos Water and Sewerage Authority, with a view to the eventual implementation of systems more appropriate to the operations of semi-autonomous water and sewerage authorities throughout the country.

4.06 The project also includes provisions for training of senior staff of the proposed Wastewater and Project Appraisal Departments of the MPW and selected senior staff of the Ministry of Interior (MI) through short visits to sewerage organizations and systems abroad.

F. Cost Estimates

4.07 Project cost estimates are detailed in Annex 11 and summarized below:

Estimated Project Cost

Item	Local	Foreign	Total	Local	Foreign	Total	% of Total
	----- million of drachmas -----			------ million of US $ ------			
Salonica Sewerage							
Secondary networks	106.2	11.8	118.0	3.03	0.34	3.37	2.97
Trunk mains	63.1	7.0	70.1	1.80	0.20	2.00	1.76
Pumping stations	10.7	16.3	27.0	0.31	0.47	0.78	0.69
Force mains	7.2	0.8	8.0	0.21	0.02	0.23	0.20
Coastal interceptors	28.4	7.1	35.5	0.81	0.20	1.01	0.89
Main interceptor	357.0	119.0	476.0	10.20	3.40	13.60	11.99
Treatment plant	392.0	370.0	762.0	11.20	10.57	21.77	19.19
Maintenance equipment	-	5.0	5.0	-	0.14	0.14	0.12
Sub-total	964.6	537.0	1,501.6	27.56	15.34	42.90	37.81
Land	60.0	-	60.0	1.72	-	1.72	1.51
Engineering and administration	108.	72.2	180.2	3.09	2.06	5.15	4.54
Physical contingencies	116.7	73.2	189.9	3.33	2.09	5.42	4.78
Sub-total	1,249.3	682.4	1,931.7	35.70	19.49	55.19	48.64
Price contingencies	787.6	348.5	1,136.1	22.50	9.96	32.46	28.61
TOTAL	2.036.9	1,030.9	3,067.8	58.20	29.45	87.65	77.25
Volos Sewerage							
Secondary networks	180.0	20.0	200.0	5.14	0.57	5.71	5.03
Trunk mains	33.2	3.7	36.9	0.95	0.10	1.05	0.93
Pumping stations	17.0	13.0	30.0	0.48	0.38	0.86	0.76
Force mains	15.0	1.7	16.7	0.43	0.05	0.48	0.42
Industrial area collector	17.7	2.0	19.7	0.51	0.06	0.57	0.50
Treatment plant	(22.6)	37.2	59.8	0.65	1.06	1.71	1.51
Main Interceptors	44.8	11.2	56.0	1.28	0.32	1.60	1.41
Ocean outfall	9.7	14.5	24.2	0.28	0.41	0.69	0.61
Sub-total	340.0	103.3	443.3	9.72	2.95	12.67	11.17
Land	9.5	-	9.5	0.27	-	0.27	0.24
Engineering and administration	31.9	21.3	53.2	0.91	0.61	1.52	1.34
Physical contingencies	37.6	15.0	52.6	1.07	0.43	1.50	1.32
Sub-total	419.0	139.6	558.6	11.97	3.99	15.96	14.07
Price contingencies	239.3	71.9	311.2	6.84	2.05	8.89	7.83
TOTAL	658.3	211.5	869.8	18.81	6.04	24.85	21.90
Studies and Training							
Industrial surveys	3.2	2.8	6.0	0.09	0.08	0.17	0.15
Oceanographic studies	3.5	0.9	4.4	0.10	0.02	0.12	0.11
Mega Emvolon design	2.8	4.1	6.9	0.08	0.12	0.20	0.18
Accounting and financial	3.5	1.8	5.3	0.10	0.05	0.15	0.13
Training	1.3	1.4	2.7	0.04	0.04	0.08	0.07
Sub-total	14.3	11.0	25.3	0.41	0.31	0.72	0.64
Price contingencies	4.4	3.9	8.3	0.13	0.11	0.24	0.21
TOTAL	18.7	14.9	33.6	0.54	0.42	0.96	0.85
GRAND TOTAL	2,713.9	1,257.3	3,971.2	77.55	35.91	113.46	100.00

4.08 The cost estimates were prepared by the mission, in consultation with MPW and its consultants. Foreign exchange costs are based on the mission's estimate of the identifiable foreign exchange components of all expenditures based on the assumptions about contracting explained in paragraph 4.12. Physical contingencies have been provided for as follows: 10% for the collection system and 15% for treatment works and pumping stations. For the Volos submarine outfall, which represents less than 1% of the total estimated project cost, a physical contingency of 25% has been used since data on underwater subsoil conditions is not yet available. The project costs are expressed in prices prevailing in January 1976 with provision for price increases as follows:

	Civil Works	Equipment
	%	%
1976	14	10
1977 - 1979	12	8
1980 - 1982	10	7

G. Implementation of Project

4.09 The selection of engineering consultants for final project design is a critical step for timely project execution. Agreement has been reached that suitable consultants will be appointed for project final design and supervision of construction before December 31, 1976 in accordance with terms of reference acceptable to the Bank. Agreement has further been reached that the Government will also appoint, before June 30, 1977 suitable consultants for conducting various studies included in the project.

4.10 A tentative construction schedule for the entire project is given in Annex 12. Agreement has been reached that the Government will prepare, in consultation with the Bank, detailed construction schedules, which the Government will review and update from time to time, as necessary, throughout the construction period.

4.11 Project construction in each city will require the acquisition of land and rights of way and the relocation of a small number of households. Agreement has been reached that the land and rights of way will be acquired in a timely manner, so as to prevent delays in the construction of the project. Greek law provides for relocation of displaced residents.

H. Procurement

4.12 Materials and equipment contracts estimated to cost more than US$200,000 will be procured after international competitive bidding in accordance with the Bank Group's guidelines. For awarding materials and equipment contracts, it is proposed that qualified domestic manufacturers will be given a margin of preference of 15% or customs duties, whichever is lower. Civil works contracts expected to cost more than US$500,000 and which are estimated to total about US$45 million, will be awarded after international competitive

bidding in accordance with the Bank Group's guidelines. Other equipment and civil works contracts would be awarded on the basis of competitive bidding advertised locally and in accordance with the procedures of the Ministry of Public Works, which are acceptable. Pre-qualification of contractors will be required for the Salonica treatment works and the Volos ocean outfall. In other contracts the procurement procedures of MPW may also require pre-qualification. Agreement has been reached that contracts will be grouped in a manner acceptable to the Bank so as to facilitate the most efficient use of international competitive bidding procedures. Minor works, such as service connections and rehabilitation or replacement of secondary sewers, may be carried out by SSA and/or VWSO, under arrangements acceptable to the Bank, up to a total value of US$1.0 million.

4.13 Contracts for the supply of equipment for the sewage treatment plants and pumping stations are expected to be awarded to foreign contractors. All civil works contracts are expected to be won by Greek firms. In order to continue the necessary oceanographic studies and to enable final design to be started, advance contracting is contemplated for work in 1976 by IOKAE and by engineering consultants. Retroactive finance of up to US$100,000 is recommended for expenditures on these studies and surveys incurred after June 30, 1976. About 220 man-months of consultants' services (including about 20 for foreign consultants) are provided for, under the project, to carry out the various studies. An additional 1200 man-months (250 foreign) are provided for final design and project supervision of the two construction components but this may be reduced by the additional involvement of MPW staff.

I. Disbursements

4.14 The proposed loan would be disbursed over a 5-year period as follows:

(a) 24% of total expenditure on civil works carried out by contractors and by SSA and/or VWSO, representing the estimated foreign exchange component;

(b) 100% of foreign expenditures on contracts for equipment awarded under international competitive bidding, or 100% of local expenditures, ex-factory, in the unlikely event that such contracts are won by local firms;

(c) 100% of foreign expenditures for consulting services; and

(d) 100% of foreign expenditures for training of staff.

The disbursement percentage under (a) related to civil works would be adjusted, if necessary, in order that withdrawals from the loan account would continue throughout the implementation period of the project. Disbursements for expenditures related to the work referred to in sub-paragraph (a) above, by SSA and/or VWSO would be made against a statement of expenditures, with the supporting documentation retained by the MPW and held available for inspection during the course of a supervision mission. Normal documentation would be required for all other items. Savings, if any, on completion of the project, would be cancelled. An estimated disbursement schedule is given in Annex 14.

J. Monitoring Criteria

4.15 Annex 13 shows the indicators which should be monitored by the respective authorities and by the MPW during and after execution of the project to measure the achievement of the technical, financial and administrative goals set for the project. These criteria were discussed during negotiations and agreement reached that they will be implemented and reported upon to the satisfaction of the Government and the Bank.

K. Environmental and Health Impacts

4.16 The proposed Salonica sewerage project will prevent further deterioration of the water quality of Salonica Bay, will eliminate the stench which affects the City during part of the summer and eventually will allow the re-establishment of fishing and the re-opening of bathing beaches. Within the City, the project will eliminate the unsanitary conditions created by the overloaded septic tanks serving the poorest areas and by the present discharge of raw sewage into almost dry inland water courses. Adverse effects will result from the discharge of primary effluent into the Axios River. Even though these effects will be minimised by the use of chemical coagulation at the treatment plant, they are expected to become serious enough to require, by about 1995, either the upgrading of treatment or the construction of an effluent sewer to the sea. Since the affected part of the Axios River is not presently populated, these adverse effects will be far outweighed by the resulting benefits of improved sanitation in and around the city.

4.17 In Volos, the proposed sewerage project will allow closing down a large number of the septic tanks which constitute a serious threat to the City's underlying aquifer and will stop the incipient deterioration of the Bay's water quality. The preliminary oceanographic studies indicated that at the proposed outfall location the sea can provide adequate dilution of the pollutants expected up to 1995. Accordingly, no significant detrimental effects are expected from the proposed outfall operation.

4.18 The oceanographic studies and industrial wastewater surveys included in the project should have a country-wide impact on environmental matters since they should lead to the establishment of adequate industrial wastewater management and to effective measures for water pollution abatement.

V. THE BORROWER AND PROJECT ENTITIES

A. General

5.01 The main objective of the present project is to initiate implementation of the Government's new policy for the sewerage sector outlined in paragraph 2.10. The Salonica and Volos sewerage systems are considered pilot projects to obtain this objective but it is understood that during their construction, there will be a transition from the old to the new sewerage sector policies. As indicated below, this transitional period has been an important factor in the procedures agreed upon with Government for the execution of the project.

5.02 The new sewerage sector policy calls for the construction of new sewerage systems by the local sewerage authorities. However, it has been agreed that major responsibility for the management of the project should be asssigned to the MPW because of the following:

(a) The Salonica Sewerage Authority (SSA) started operation only in January 1976 and the Volos Water Supply and Sewerage Organization (VWSO) is only now being created by Government and, therefore, they have not yet developed the expertise to undertake this large project.

(b) The industrial wastewater surveys and the oceanographic and other technical studies included in the project were designed to develop country-wide policies in water pollution control and industrial wastewater management so that it is logical that their supervision be assigned to the MPW.

5.03 The MPW is expected to award all contracts required for the execution of the project. It is intended, however, that the MPW will use the project for training the local sewerage authorities so that they can undertake, on their own, full operation and future expansions of their collection systems (networks, trunk and force mains, interceptors and pumping stations). It is expected therefore, that an increasing number of staff of the sewerage authorities will be attached to the MPW units in charge of managing the project. It is intended that by midway through the execution of the project, the routine supervision of design and construction of collection system components will be carried out, as part of their training, by staff of the sewerage authorities working under the direction of the MPW. Supervision of the design and construction of treatment and disposal facilities and of the industrial and oceanographic surveys, will continue to be carried out by the MPW staff but personnel of the sewerage authorities will participate in this work to the extent required to enable them to operate and maintain their entire sewerage systems. Agreement has been reached on specific proposals for the management of the project in accordance with the above objectives and a timetable established for attaching personnel of the local sewerage authorities to the MPW units managing the project. MPW will keep financial records of the project adequate to ensure that the books of the respective project entities can record all necessary information to manage their financial operations to the satisfaction of the Government and the Bank.

B. Ministry of Public Works

5.04 A description of the organization and administration of the Hydraulics Division of MPW is given in Annex 15. MPW conducts, through private consultants and contractors, the design and construction of all important sewerage works in the country. The design and construction are governed by generally over-detailed and out-dated specifications and guidelines covering only the collection components of sewerage systems as there is no experience in Greece in wastewater treatment.

5.05 The preliminary oceanographic surveys conducted by IOKAE for the MPW in Salonica and Volos were the first attempt made in Greece to evaluate the environmental impact of sewerage projects. These surveys, made in accordance with the terms of reference prepared by the Bank proved so successful that MPW has requested IOKAE to conduct similar surveys for other sewerage projects presently under study. To accomplish this work, IOKAE is expanding its laboratory and recruiting additional staff. Since adequate monitoring of the receiving waters is a basic requirement for any water pollution control program, the Government intends that the proposed project be used to develop IOKAE's expertise on monitoring of fresh and ocean waters.

5.06 MPW is fully aware of its shortcomings in the sewerage field and to correct this situation is now in the process of establishing a Wastewater Department within its Hydraulics Division. MPW intends to develop within this department expertise in water pollution control, industrial wastewater management and wastewater treatment and disposal processes. In accordance with the Government's new sewerage sector policy, MPW expects to gradually shift its responsibility for design and construction to the local water supply and sewerage authorities so that the new Wastewater Department becomes eventually a purely regulatory and advisory body at national level.

5.07 MPW will also establish within the Hydraulics Division a Project Appraisal Department comprising engineers, economists and financial analysts for appraising future water and sewerage projects. In addition, arrangements will be made, through MI and MPW, as appropriate, for advising the local water and sewerage authorities on financial management.

5.08 It is expected that specific training in sewage treatment, industrial wastewater management and financial administration will be needed for the staff of the newly established departments, and perhaps, also, by existing staff of MI. Such training is likely to mainly comprise short visits, by selected staff, to study relevant operations outside of Greece. The project includes provision for the costs of such training.

5.09 Agreement has been reached that by June 30, 1977, staffing and training proposals will have been prepared, in consultation with the Bank, for the Wastewater and Appraisal Departments of MPW, and training proposals prepared for the staff of MI. Such proposals are thereafter to be implemented to the satisfaction of the Government and the Bank.

C. Salonica

5.10 Public water supplies in Salonica are provided almost exclusively by the Salonica Water Authority (SWA). Although SWA will not be directly concerned with the construction aspects of the project, its levels of production and distribution of water are crucial to the design and operation of the sewerage systems. SWA will also act as agent in the collection of sewer charges based on water consumption. Details of the present organization of SWA are given in Annex 15.

5.11 Since January 1, 1976, sewerage services in Salonica have been operated by the SSA. Details of the organization and administration of SSA are given in Annex 15. At present, SSA is responsible for only part of the Greater Salonica area and it is, therefore, necessary that its jurisdiction be extended to cover the entire metropolitan area. A draft decree to accomplish this jurisdictional change has been submitted to the Bank. Passage into law of relevant legislation satisfactory to the Bank is to be a condition of loan disbursement on the Salonica project component. In addition, approval of either this decree or of the legislation for Volos (para 5.19) is to be a condition of loan effectiveness.

5.12 SSA is not expected to be fully staffed until the end of 1976. The present organization appears to have taken over its responsibilities in a satisfactory manner and the staff already appointed are carrying out their initial responsibilities competently. However, the authority is subject to the civil service procedures and regulations described in Annex 15 which will become an increasing constraint upon efficient operations. Furthermore, its present accounting system is inadequate for providing meaningful information for management, planning and financial control. These problems are addressed in paragraphs 5.22 and 5.23 below.

5.13 Until now, the financial direction of SSA has been in the hands of temporary staff. Agreement has been reached that SSA will appoint a qualified and experienced finance director and will otherwise be staffed with adequate numbers of qualified personnel.

5.14 There is consensus for the merging of SSA with SWA into a joint water supply and sewerage authority. It is recognized, however, that present administrative and financial procedures in SSA and SWA are unsatisfactory and must be modified in accordance with the results of the financial studies included in this project (Annex 7), before the merger can take place. Furthermore, during the immediate future, SSA will need to devote its resources to developing its responsibilities for the existing sewerage system and to the gradual taking over of responsibility for supervision of project construction.

5.15 The terms of reference for the financial studies (Annex 7) provide that they should be conducted considering the eventual merging of SSA and SWA, but agreement has been reached that no merger will take place until the studies have been completed.

5.16 Prior to any intended merging of SSA and SWA, the Government should present to the Bank a draft of their proposals, including financial forecasts and details of the accounting and financial control procedures which will govern the joint authority. Agreement has been reached that no merger will take place until the Bank is satisfied that the joint authority will be able to operate in a financially viable manner, and that the merger will not be detrimental to its technical operations.

5.17 Unless and until SSA and SWA are merged, it is expected that SWA will continue to collect sewerage charges on behalf of SSA by appropriate additions to the billings of water consumers connected to the sewerage system. The present computerized billing system appears satisfactory, and it has been agreed that joint billing for water and sewerage charges will continue, unless adequate alternative arrangements are developed to the satisfaction of the Bank.

D. Volos

5.18 As indicated in Annex 15, there are several water supply systems operating in the greater Volos area. The principal water authority is the Volos Municipal Water and Sewerage Authority (VMWSA), which also operates a limited sewerage system and (on an agency basis) the water supply system of the Industrial Estate. The Municipality of Nea Ionea and the various townships within the metropolitan area operate small water supply systems and some consumers are supplied by privately owned wells.

5.19 The Government has agreed upon the need for regionalization of water and sewer services and has prepared draft legislation to create a Volos Water and Sewerage Organization (VWSO) for the entire Greater Volos area. 1/ This draft has been discussed with Bank staff and a revised draft is now under preparation. The new law proposes to establish an authority independent of the various municipalities, but with municipal representation on its managing board. Government administrative supervision will be by the Ministry of Interior (MI). The law is to contain a clause to enable its provisions to be extended to other areas in Greece, as appropriate, by Presidential Decree. The passage into law of relevant legislation satisfactory to the Bank is to be a condition of loan disbursement on the Volos project component. In addition, approval of either this legislation or of similar legislation for Salonica (para 5.11) is to be a condition of loan effectiveness.

5.20 VMWSA, which is expected to form the nucleus for VWSO, is reasonably well operated but is subject to similar financial and administrative controls to SSA and SWA and its accounting and budgetary systems are inappropriate. There is no general manager, and heads of departments report directly to the Mayor of Volos, as Chairman of the authority. The financial regulations require the involvement of board members in certain of the day-to-day operations, such as certifying the proper receipt of purchased goods.

5.21 VMWSA has a competent chief accountant, its financial controls and procedures work as intended and the computerized billing system is reasonably effective. In the reorganization, VWSO will need to recruit a general manager and increase its engineering capability. Agreement has been reached, therefore, that VWSO will appoint a competent general manager within six months of the passage into law of legislation establishing VWSO and otherwise will be adequately staffed. VWSO will maintain separate accounts for its water supply and sewerage services.

1/ Formally titled the "Water and Sewerage Municipal Organization for the Greater Volos Area".

E. Accounting and Financial Control

5.22 As indicated in Annex 15 all three authorities to be concerned with the project (SSA, SWA and VWSO) must comply with detailed government regulations and financial controls based on civil service procedures. These are largely inappropriate. Concurrently, budgetary and accounting arrangements are kept on a simple cash basis which do not facilitate the type of financial planning and decision-making necessary for an authority of this type.

5.23 Consequently, the project includes a study of accounting and financial controls at the three authorities, to be carried out by a competent firm of accounting consultants. Suggested terms of reference for this study are given in Annex 7. Agreement has been reached that before June 30, 1977, suitable consultants will be recruited to perform this study in accordance with terms of reference satisfactory to the Bank. Following the receipt of the consultants proposals, suitable accounting systems and financial controls, satisfactory to the Government and the Bank, will be implemented by each of the three authorities, with the assistance of the reporting consultants or other suitable consultants.

F. Audit

5.24 At present, the three authorities do not prepare appropriate annual financial statements nor are they subject to adequate audits. Each authority prepares an analytical statement of cash receipts and disbursements which is forwarded with supporting documents and vouchers to an audit office of the Ministry of Finance. Here the documents are checked, but it is often several years before they are returned to the originating authority. This is unsatisfactory.

5.25 It is the law and practice in Greece for certain independent authorities financed and controlled by Government (e.g. the Greek Telephone Company) to have their accounts audited by "sworn accountants" who are members of a special institute set up for this purpose. Such audits do not, at present apply to water and sewerage authorities. The members of the institute have received an accounting education and are required to follow accounting rules prescribed by Government. The audit practices of the institute are not necessarily consistent with those adopted by international accounting firms.

5.26 Agreement has been reached that SSA and VWSO will prepare suitable annual financial statements, which will be audited in a manner acceptable to the Bank, by qualified and independent accountants satisfactory to the Bank and be submitted to the Bank within four months of the close of each fiscal year.

VI. FINANCE

A. General

6.01 The borrower would be the Government of Greece, with proportions on-lent to SSA and VWSO towards their respective project construction costs. The Government will enter into subsidiary agreements, satisfactory to the Bank, with each of the two beneficiaries. The execution of either of these agreements is to be a condition of loan effectiveness and the execution of the other a condition of disbursement on the project component to which it relates. Each agreement will cover on-lending conditions, other financing, project implementation and obligations undertaken on behalf of each beneficiary under the loan agreement. The proceeds of the Bank loan would be allocated as follows:

	US$ Million
Salonica Construction	29.5
Volos Construction	6.1
Studies and Training	0.4
	36.0

The Government will provide counterpart funds for the various studies and make available capital finance, in the form of loans or equity contributions, to cover the balance of project costs in Salonica and Volos, to the extent not covered from other sources. Agreement has been reached that the Government will provide all necessary funds (including funds to cover costs in excess of present estimates) to ensure timely completion of the project, to the extent that such funds are not available from other sources. Such funds are to be provided on terms and conditions acceptable to the Bank.

B. Salonica

Present Financial Position

6.02 The responsible project authority, SSA, began full operations only on January 1, 1976. Pro-forma financial statements are given in Annex 17 and explained in Annex 18. The income statement for 1976 indicates that if SSA kept its accounts in accordance with generally accepted accounting principles, it would incur a loss of about Dr 30 million, mainly because the restructured accounts recognize depreciation as an operating expense, whereas SSA's present budgetary procedures ignore this. However, the funds flow statement shows that, without borrowing, SSA is expected to have a cash surplus amounting to about Dr 5 million at the end of 1976. The pro-forma balance sheet of SSA as of January 1, 1976 prepared from such data as available and using rough engineering estimates for the value of the present sewer system, is as follows:

	Dr (million)
Fixed Assets (at valuation)	1,200.0
Current Assets	
Investments	175.5
Cash	9.7
Equity Capital	1,385.2

6.03 No loans were apparently taken over by SSA from its predecessors, so it began its operations with a debt-free system. Investments represent mainly the balance of property tax collections from 1972, the proceeds of which are retained in a separate bank account, and not available for general use without ministerial authority.

Financing Plan

6.04 The following table shows SSA's total funds requirements for the period of project construction and the sources from which they would be met.

	1977-1981		
	Amount Dr (million)	Amount US$ (million)	%
Requirements			
Project Expenditures	3,067.8	87.7	85.9
Other Capital Expenditures	395.0	11.3	11.0
Increase in Net Working Capital	110.0	3.1	3.1
Total Requirements	3,572.8	102.1	100.0
Sources			
Internal Cash Generation from Operations	584.8	16.7	16.4
Less: Debt Service	479.9	13.7	13.4
	104.9	3.0	3.0
Contributions:			
Industrial	63.6	1.8	1.8
Other	152.5	4.4	4.3
Net Internal Cash Generation	321.0	9.2	9.1
Other Local Sources:			
Property Tax	693.0	19.8	19.4
Redemption of Investments	175.5	5.0	4.8
Total Local Sources:	1,189.5	34.0	33.3
Proposed Borrowings:			
IBRD Loan	866.6 /1	24.8 /1	24.3
Government Loan	1,516.7	43.3	42.4
Total Sources	3,572.8	102.1	100.0

/1 Excluding Dr 165.9 million (US$4.7 million) estimated to be disbursed in 1982.

6.05 An explanation of the various components of the financing plan is given in Annex 16. Since the financing plan does not allow for the necessary funds to provide customers with credit facilities to cover connection fees and consumer contributions, agreement has been reached that the Government will provide SSA, or cause SSA to be provided with, the necessary funds on suitable terms for this purpose.

6.06 Annex 17 gives details of SSA's estimated financial operations from 1976-1985. These forecasts take account of the project, additional extensions during the project period, and a further program of expansion from 1982 to 1985

as shown in Annex 11 (page 2). It is assumed that all capital finance not provided from other sources will be in the form of government loans, though the Government may choose to arrange some of the financing from other sources (e.g. banks).

6.07 The repayment terms of the Bank loan have been set in accordance with recent changes in Bank policies and are therefore influenced by country considerations. However they can still be regarded as appropriate for the project, because of the commitment of the Government to provide additional funds on acceptable terms, and for the reasons explained below. In accordance with Bank practice, it has been agreed that the appropriate proportion of the Bank loan would be on-lent to SSA on the same terms as agreed between the Bank and the Government, thus providing for amortization over 12 years following the 3-year grace period. The repayment period is somewhat shorter than that normally associated with sewerage projects of this type and will impose an additional burden on SSA's funds flow during the years immediately following project completion. Consequently, SSA's financial requirements will be dominated by cash needs during these years. However, this will be mitigated by the fact that the SSA has taken over a debt-free system and also that a substantial proportion of its capital expenditures will be financed by non-returnable allocations of property tax.

Tariffs

6.08 A schedule of tariffs, together with an explanation of various aspects of tariff policies, are given in Annex 21. Tariffs at the present time are far too low, largely because they have been arbitrarily fixed by law at 40% of water tariffs, which in no way reflects the present costs, and will reflect future costs of providing the service still less. The present water supply system has in the past been based on relatively inexpensive tubewells. By contrast, the proposed new sewer system, with its long interceptor to the Axios River and large treatment facilities is relatively expensive. These facts tend to support the evidence of the financial forecasts, that sewerage tariffs are likely to be at least equal to, and probably in excess of, water tariffs. Any substantial amendment to sewerage tariffs will, therefore, require an amendment to the law. Agreement has been reached that passage into law of a suitable amendment, removing the fixed ratio between water and sewerage tariffs, is to be a condition of loan effectiveness, or disbursement.

6.09 Another difficulty is that certain premises, particularly industrial premises, are served by privately owned wells for water and yet will be connected to the sewer system. Although SWA expects to be able to serve most of these premises with water in due course, it cannot collect water charges and related sewer charges until this is done. Agreement has been reached that a satisfactory system of sewer charges will be implemented for all users, including those supplied with water from private wells, no later than December 31, 1977.

6.10 Even when the law is amended, certain inequities will still continue. As indicated in Annex 21, the Salonica Water Authority (SWA) has a tariff schedule which gives discounts to various classes of consumer and which are not entirely appropriate. The Government has requested that guidance and

assistance in the review of SWA's tariff structures be provided as part of the study of accounting and financial controls to be carried out under the project (para 4.05 (d)). Agreement has been reached that SWA, on completion of this review, will provide the Bank, for its comments, with detailed proposals for improvement of its tariff structures, taking into consideration all categories of water users. SWA will, promptly thereafter, establish tariffs based on those proposals and on the Bank's comments. SWA will also extend water metering to all categories of water users. The principal objectives are to develop a tariff under which the users pay all costs, which does not unduly burden low-income consumers and which encourages a rational use of water resources. Consideration will also be given to the provision of a minimum supply at low prices to assist those consumers unable to afford supplies at the standard price. Present free supplies (e.g. to the municipality) will be fully metered and arrangements considered whereby payment for such supplies be made from other public revenues.

6.11 If SSA is to become reasonably financially viable by the end of the project period, and to cover its funds requirements thereafter, tariffs will have to be substantially raised over the next few years. In 1977, even if present tariffs are doubled, SSA will still incur a loss after depreciation of about Dr 12.0 million. Because of the necessity to change the law (para 6.08) such an increase will not be possible until some time after January 1, 1977. Agreement has been reached that SSA will double its average sewerage tariffs presently in force when this is legally permitted. This increase is to take place no later than three months following the execution of a subsidiary agreement, which is to be a condition of loan effectiveness or disbursement (para 6.01).

6.12 Agreement has been further reached that SSA will, thereafter, set its sewerage tariffs so that in each fiscal year revenues from operations (excluding property taxes) will provide for:

(1) expenses of operation and maintenance (excluding depreciation), debt service, adequate increases in working capital, taxes, dividends and other distribution of earnings; and

(2) a minimum contribution from internal funds 1/ towards capital investment amounting to a percentage of the net value of fixed assets in operation and under construction of 4% until 1981 and 2% thereafter.

The average annual tariffs estimated to be necessary to achieve these objectives until 1982 (Annex 17, Table 4) are as follows:

Fiscal Year	Dr per m3
1977	4.0
1978	5.5
1979	7.0
1980	9.0
1981	12.0
1982	13.0

1/ Including non-industrial consumer contributions (Annex 18, para 10).

6.13 Following substantial completion of the proposed industrial wastewater survey, SSA will, in consultation with the Bank, develop an appropriate schedule of industrial wastewater surcharges, to be formally approved and implemented by December 31, 1979.

Future Performance

6.14 If the tariffs are implemented as above, and if the terms of loans are assumed, SSA could be expected to earn a rate of return of between 5% and 6% in every year from 1981 onwards. Present average tariffs of Dr 1.95 (US$0.06) per m3 would increase to about Dr 13.00 (US$0.37) per m3. The debt:equity ratio of SSA would peak at 50:50 in 1981, falling thereafter to about 37:63 by 1985. After the project period, between 20% and 30% would be contributed from internal funds towards construction, which, in the light of the accelerated debt amortization, is reasonable. Property taxes would finance additional construction. Debt service coverage would be 1.4-1.5 times in each year following project construction. Agreement has been reached that SSA will not raise further loans beyond the project period, without the concurrence of the Bank, unless its net cash earnings before depreciation and interest exceed 1.3 times its debt service in any future year, including debt service on the amount to be borrowed. In the event of the merging of SSA and SWA, the above requirements may need to be modified, as explained in para 5.16.

C. Volos

Present Financial Position

6.15 Pro-forma financial statements are given in Annex 19 and explained in Annex 20. Because the accounts of the Volos area authorities are kept on a simple cash basis, only approximate information can be given as to past performance. However, income statements for 1974 and 1975 have been constructed, using available information and combining the activities for the entire Volos area. These income statements are shown in Annex 19.

6.16 The statements indicate that, for the time being, because of the small size and inadequate nature of the present sewerage system, the 40% sewerage charge, together with the 10% stormwater surcharge, brings about a more than adequate financial performance for the sewerage system, relative to water. This is confirmed by the financial projections in Annex 19, Table 3, which shows very high rates of return for sewerage before the new system comes into operation. In 1976, if a combined authority were in existence, the water service would earn a net income before interest of Dr 1.9 million, with a rate of return of about 1%. The sewerage service would earn a net income before interest of Dr 3.3 million with a very high (but rather meaningless) rate of return of about 25%.

6.17 The pro-forma balance sheet for the combined area, as at December 31, 1975 prepared from such data as available, and using rough engineering estimates for the value of the present water and sewer systems, is also given in Annex 19. The loan debt of Dr 37.5 million is represented by 9 loans, of which 7 are for VMWSA and one each for the Municipality of Nea Ionea and the

Commune of Dimini. All have been raised from various branches of Government, or (in one case) from the Municipality of Volos. Interest rates vary from interest-free to 6% (average about 2.5%) with repayment typically over about 20 years.

Financing Plan

6.18 The following table shows VWSO total funds requirements and the sources from which they would be met:

	1977-1981		
	Amount Dr (millions)	Amount US$ (millions)	%
Requirements			
Project Expenditures	869.8	24.9	90.4
Other Capital Expenditures-Water	68.0	1.9	7.1
Increase in Net Working Capital	24.6	0.7	2.5
Total Requirements	962.4	27.5	100.0
Sources			
Internal Cash Generation from Operations	206.9	5.9	21.5
Less: Debt Service	127.9	3.6	13.3
	79.0	2.3	8.2
Contributions:			
Industrial	43.7	1.2	4.5
Other	93.5	2.7	9.7
Net Internal Cash Generation	216.2	6.2	22.4
Proposed Borrowings:			
IBRD Loan	192.6 /1	5.5 /1	20.0
Government Loan	276.8	7.9	28.8
Government Equity	276.8	7.9	28.8
Total Sources	962.4	27.5	100.0

1/ Excluding Dr 20.9 million (US$0.6 million) estimated to be disbursed in 1982.

6.19 An explanation of the various components of the financing plan is given in Annex 16. Since the financing plan does not allow for the necessary funds to provide customers with credit facilities to cover connection fees and consumer contributions, agreement has been reached that the Government will provide VWSO, or cause VWSO to be provided with, the necessary funds on suitable terms for this purpose.

6.20 Annex 19 gives details of VWSO's estimated financial operations from 1976-1985. These forecasts take account of the project, and of additional extensions to the sewer network following project completion. Provision is also included for additional extensions to the water distribution system during the whole period and for the possible development of an additional source of water supply in the years 1984 and 1985.

6.21 It is assumed that all capital finance beyond the project period, not provided from other soures, will be in the form of government loans, though the Government may choose to arrange some of the financing from other sources (e.g. banks).

6.22 As in the case of Salonica, it has been agreed that the appropriate proportion of Bank loan would be on-lent to VWSO on the same terms as agreed between the Bank and the Government, thus providing for amortization over 12 years, following the 3-year grace period. Since the repayment period is somewhat shorter than that normally associated with sewerage projects of this type it will impose an additional burden on VWSO's funds flow during the years immediately following project completion. Consequently, VWSO's financial requirements will be dominated by cash needs during these years.

6.23 Unlike the case of SSA, which already has a large equity base in the form of its existing sewerage system, VWSO must establish a new system, which cannot be placed in operation until substantially completed and where construction logistics will prevent full utilization during the first few years following completion. When these facts are combined with the funds flow problems outlined above, it is clear that it would not be reasonable to base tariffs merely upon funds requirements of a largely debt-financed system during the years immediately following construction, particularly since the repayment periods are relatively short. 1/ Consequently, tariffs must reflect cost recovery over a longer time period (Annex 22), and the Government intends that the immediate burden upon funds flow be mitigated by the provision of a proportion of the Government counterpart funds in the form of equity (grant) during the period of project construction.

Tariffs

6.24 A schedule of tariffs and information regarding tariff policies is given in Annex 21. Present water tariffs appear to be too low, earning a rate of return of only about 1%. To increase this rate of return, and to provide for an increasing contribution towards capital investment in water and sewerage projects, tariffs should be raised. If VWSO were already operating, it would be appropriate to increase water tariffs by 20% on January 1, 1977 and by a

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1/ Preliminary calculations indicate that such a tariff would average about Dr 18 per m3 (US$0.51 per m3). The present charge in Fairfax County, Virginia averages about US$0.30 per m3. In Tunisia, the present charge is equivalent to about US$0.10 per m3.

further 20% on January 1, 1978. These increases, followed by relatively minor changes thereafter would increase the rate of return on the water service to within the range of 7%-8%, which is acceptable. However, because of time needed for the legislative process, VWSO will not be in operation until some time after January 1, 1977. Since it is not now appropriate to introduce new tariffs until the new authority is in operation, a new tariff introduced later in 1977 might be followed too closely by the second increase to be acceptable. Consequently, the two increases should be combined. Agreement has been reached that, following the establishment of VWSO, present water tariffs, together with related sewer tariffs, will be increased by an average of 45%. This increase is to take place no later than three months following the execution of the subsidiary agreement which is to be a condition of loan effectiveness or disbursement (para 6.01).

6.25 Apart from bearing a more realistic relationship to cost recovery, increased tariffs will help to improve VWSO's cash flow during the project period. Because there are very few sewer customers, served in any event by a totally inadequate system, VWSO cannot look to its sewer operations for any significant generation of funds during project construction. Fortunately, the Volos area is adequately provided with water for a number of years and funds generated from the water system can be used for sewerage construction.

6.26 As in Salonica, the tariff schedule of VMWSA gives arbitrary discounts to various classes of consumers and the Government has made a similar request for assistance in the review of tariff structures as part of the project financial studies (para 4.05 (d)). Agreement has been reached that VWSO, on completion of this review, will provide the Bank, for its comments, with detailed proposals for improvement of its tariff structures taking into account all categories of water users. VWSO will promptly thereafter establish tariffs based on these proposals and on the Bank's comments. VWSO will also extend water metering to all categories of water users by December, 1977. As in Salonica, the principal objectives are to develop a tariff under which the users pay all costs, which does not unduly burden low-income consumers and which encourages a rational use of water resources. Consideration will be given to the provision of a minimum supply at low prices to assist those consumers unable to afford supplies at the standard price. Consideration will also be given to the establishment of differential tariff arrangements for consumers in the different areas to comprise the new VWSO authority area, along the lines explained in Annex 21. Present free supplies (e.g. to the municipality) will be fully metered and arrangements considered whereby payment for such supplies be made from other public revenues.

6.27 The changes in water tariffs discussed above will contribute towards the establishment of VWSO as a financially viable enterprise. However, when the new sewerage system begins to operate, substantially higher sewerage tariffs will be necessary and they will no longer be able to be based on the present fixed 40% of water charges. It is intended that the new law establishing VWSO will contain no provision to link future sewerage tariffs to a fixed proportion of related water tariffs. Instead sewerage tariffs will be based on cost recovery. As in Salonica, a number of sewer users will continue

to be supplied with water from privately owned wells, thus precluding a sewerage surcharge based on water supplied by VWSO. Agreement has been reached that a satisfactory system of sewer charges will be implemented for all users, including those supplied with water from private wells, no later than December 31, 1977. Industrial enterprises in the Industrial Estate do not, at present, pay a sewerage surcharge, even though connected to a sewerage system (albeit with crude discharge to a streambed). VWSO will therefore extend the system of sewerage surcharges to the Industrial Estate, no later than December 31, 1977.

6.28 The various changes in tariffs discussed above should ensure reasonable financial viability for VWSO until December 31, 1978. Agreement has been reached that, in addition to the initial increase, VWSO will set and maintain its tariffs so that in each fiscal year, total revenues from water and sewerage operations will provide for:

(1) expenses of operation and maintenance (excluding depreciation), debt service, adequate increases in working capital, taxes, dividends and other distributions of earnings; and

(2) a minimum contribution from internal funds 1/ towards capital investment amounting to a percentage of the net value of fixed assets in operation and under construction of 4% until 1981 and 1.5% thereafter.

The average annual tariffs estimated to be necessary to achieve these objectives until 1981 (Annex 19, Table 7) are as follows:

Fiscal Year	Dr. per m3	
	Water	Sewerage
1977	9.6	3.8
1978	9.6	3.8
1979	10.1	4.0
1980	10.1	11.5
1981	10.4	14.0

6.29 Following the substantial completion of the proposed industrial wastewater survey, VWSO will, in consultation with the Bank, develop an appropriate schedule of industrial wastewater surcharges, to be formally approved and implemented by December 31, 1979.

Future Performance

6.30 If the above tariff principles are adopted, VWSO could be expected to achieve reasonable financial viability with an average sewer charge which would increase from its present level of Dr. 2.50 (US$0.07) per m3 to about Dr 14 (US$ 0.40) per m3 from January 1981. This charge would be about 35% in excess of the water tariff. However, with an increasing number of sewer users being connected to the system in the years following the project the sewer charge should not require any substantial further increase for several years and by 1985 might be only a little above the water charge.

1/ Including non-industrial consumer contributions (Annex 20, para 11)

6.31 VWSO could be expected to earn an overall rate of return on its joint water and sewerage operations of about 3.5-4% from 1981 onwards. The debt: equity ratio would rise from about 20:80 in 1976 to about 45:55 by 1981 thereafter remaining fairly constant. After the project period, between 25% and 50% would be contributed from internal funds towards construction, which, in the light of the accelerated debt amortization, is reasonable. Debt service coverage would be 1.4-1.5 times in each year following project construction. Agreement has been reached that VWSO will not raise further loans beyond the project period, without the concurrence of the Bank, unless its net cash earnings before depreciation and interest exceed 1.3 times its debt service in any future year, including debt service on the amount to be borrowed.

D. Fixed Asset Valuation

6.32 Because of the present accounting system, fixed asset valuations cannot be regarded as very accurate. Agreement has been reached that SSA and VWSO will establish reasonable valuations of fixed assets by December 31, 1977. Because such valuations have not yet been established and because asset values will be dominated by costs of the new project, annual revaluations have not been used in the financial projections.

VII. JUSTIFICATION

A. General

7.01 The main benefits of the proposed construction of sewage collection, treatment and disposal facilities in Salonica and Volos are listed in Annex 23. These benefits, which are not necessarily mutually exclusive, include health benefits, property value increases and recreational benefits, which would result from the removal of wastewaters from inland areas and the improvement of coastal waters and beaches for fishing and swimming. However, the overriding justification is that the systems are necessary for the orderly development of these cities and that the proposed methods of collection, treatment and disposal of sewage are adequate and represent the least cost solutions for each locality.

B. Institutional

7.02 Greece needs to improve the design, construction and operation of its urban sewerage systems and to develop adequate procedures for water pollution control and industrial wastewater management, but its technical and administrative capabilities in these fields are not yet adequate. The development and construction of the Salonica and Volos projects will enable the concerned Greek authorities to develop the required expertise in these fields. This will then enable the authorities to more confidently proceed with the development of sewerage systems in other urban areas. Significantly, many of the lessons expected to be learned in the development of sewerage systems in Salonica and Volos will be of value to the Government in developing and implementing its proposals for Athens (para 2.09).

C. Economic and Financial

7.03 A minimum estimate of the benefits of sewage collection and disposal cannot be derived through customers' observed willingness to pay since (a) for reasons of public health, financial viability and orderly development, consumers will be required to connect to the sewerage systems, thus distorting the free expression of value which they place upon the system, and (b) the surcharge on water which consumers currently pay for sewerage services may reflect the additional amount (i.e. consumers' surplus) which they are willing to pay for water. For this reason, tariffs cannot be subjected to meaningful economic analysis, but Annex 22 shows that the proposed tariffs broadly relate to requirements for long-term cost recovery.

VIII. AGREEMENTS REACHED AND RECOMMENDATION

8.01 Agreement has been reached on the various issues referred to in Chapters III to VI of this report, including the following matters of particular significance:

(a) MPW will prepare and implement staffing and training proposals for newly-created Wastewater and Appraisal Departments of its Hydraulics Division (para 5.09);

(b) a review of accounting financial controls and tariff systems will be carried out and satisfactory accounting systems, financial controls and tariff systems implemented by SWA, SSA and VWSO, with the assistance of suitable consultants (para 5.23);

(c) SSA will set its sewerage tariffs to meet appropriate cash generation criteria and also develop an appropriate schedule of industrial wastewater surcharges (paras 6.12 and 6.13); and

(d) VWSO will set water and sewerage tariffs to meet appropriate cash generation criteria and also develop an appropriate schedule of industrial wastewater surcharges (paras 6.24, 6.28 and 6.29).

8.02 Either of the following, whichever occurs first, is to be a condition of loan effectiveness:

(a) approval of legislation to extend the jurisdictional boundaries of SSA (para 5.11) and the execution of a satisfactory agreement between the Government and SSA (to include provisions for initial tariff increases) (para 6.01); or

(b) approval of legislation to create a regional water and sewerage authority for the Greater Volos area (para 5.19) and the execution of a satisfactory agreement between the Government and VWSO (to include provisions for initial tariff increases (para 6.01).

Whichever of these alternatives does not occur first will be a condition of loan disbursement for that project component to which it relates.

8.03 An additional condition of effectiveness or disbursement for Salonica is to be a change in the law to permit sewerage tariffs to be related to cost instead of representing a fixed percentage of water tariffs (para 6.08).

8.04 Agreement having been reached upon the various matters outlined above, the project is suitable for a Bank loan of US$36 million to the Government of Greece, repayable over 15 years, including a 3-year grace period.

November 12, 1976

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Existing Water Supply and Sewer Systems of Greater Salonica

A. Metropolitan Area

1. Greater Salonica is located in the region of Macedonia (north eastern shores of the Aegean Sea) at the head of the Thermaikos Gulf. It is the second largest population and industrial center of Greece, covering an area of about 24,800 ha. and including six municipalities and 22 townships.

2. The metropolitan area extends for about 70 km along the shores of the Salonica Bay (cul-de-sac at the northern end of the Thermaikos Gulf) from the Axios River on the west to the Cape of Mega Emvolon on the south east. Three rivers (Axios, Gallikos and Dendropotamos) cross the metropolitan area. The Gallikos and Dendropotamos carry waters only during the rainy season and flow into the Salonica Bay. The Axios, originating in Yugoslavia is the only river of permanent flow and discharges outside of Salonica Bay into the Thermaikos Gulf.

3. The City of Salonica itself occupies a long and narrow strip of land between the northern shore of Salonica Bay and the Asvestohorion hills and the Hortiatis Mount. The Dendropotamos river used to be the western boundary of the urban area but presently the City is rapidly expanding westward to the Gallikos river. The City is also spreading to the east and south east toward the Micra airport located on the northeastern shore of Salonica Bay.

4. West of the City, between the Gallikos and Axios rivers, lies an extensive valley presently dedicated to agriculture but which constitutes the largest area for future urban development. The shores of the western sector are made up of low marshy grounds of little urban potential but where construction of large port facilities is presently under consideration.

5. The eastern sector of the metropolitan area is a triangular shaped piece of land extending along the eastern shore of the Salonica Bay from Micra airport at the north narrowing down to the Cape of Mega Emvolon in the south. This sector contains the bathing beaches of Perea and Aghia Trias, which attract a large number of tourists during the summer. Its potential for urban development is limited because of its topography.

6. Three industrial zones (Lagadas, Esso and Gallikos) are located north of the City but within present urban boundaries. A fourth industrial zone (Axios) is under development on the eastern bank of the Axios river. Today the industrial zones cover an area of about 1,840 ha, provide employment for about 70,000 people and house 240 industries: oil refinery, petrochemicals, paper, metallurgy, textiles, plastics, leather, food and beverages, drugs, etc. The Hellenic Industrial Development Bank estimates that the four industrial zones will occupy an area of 3,000 ha by 1990 and 4,300 ha by the year 2015.

B. Demographic Growth

7. During the last census decade (1961-1971) Salonica became the fastest growing of the Greek cities with an average annual growth rate of 3.8%. Industrial development in nearby smaller cities during the early years of the present decade have already reduced the annual growth rate of Salonica to an estimated 3.5% for the period 1971-1975. A rapid decrease in the number of house construction permits issued during the last two years tends to indicate further reduction of the past growth rate.

8. Because of its geographical location, Salonica has, however, a potential for further accelerated growth. Salonica is the natural gateway of the Balkans and Central Europe to the Mediterranean and through the recently re-opened Suez Canal to East Africa and the Far East. Yugoslavia, Bulgaria and Romania are presently improving their in-land connections to Salonica and linking them to the existing northern road network, so it is expected that the growing trade between Central Europe and the oil-producing countries of the Middle East will be carried out through the Salonica port and would result in accelerated urban growth.

C. Existing Water Supply System

9. An important aquifer underlying the western sector of the metropolitan area and some minor springs on the slopes of Mount Hortiatis have been to date the only sources of drinking and industrial waters for Salonica. However, well construction has not kept up with the urban growth and Greater Salonica has suffered chronic water shortages. During the summer months the yield of the well-fields diminish considerably and severe constraints are imposed on the use of water.

10. The present municipal water sources are:

(a) The Sindos well field located between the Gallikos and Axios rivers with a yield of 35-55,000 m3/day.

(b) The Kalshorion well field on the eastern bank of the Gallikos river with a yield of 30-40,000 m3/day.

(c) The Navres well field on the upper reaches of the Gallikos river with a yield of 20-50,000 m3/day.

(d) The small well fields of Lebet, Kalamaria and Stavroupolis with a combined average yield of about 8,200 m3/day.

(e) The Hortiatis and Retziki Springs with a combined average yield of about 750 m3/day.

In addition, there are a large number of privately-owned wells which are operated mainly by some of the industrial concerns and townships.

11. The Salonica Water Authority (SWA) serves most of the metropolitan area and presently provides about 70% of the industrial water. Some of the townships are served by local supplies which are, in some cases, supplemented with water purchased from the SWA. The total length of the distribution system is about 750 km and has been increasing during recent years at a rate of 25-30 km/year.

12. Estimated water consumption during 1974 is tabulated below:

Estimated 1974 Water Consumptions - Millions m3/year

Premises	SWA	Private Wells	Total
Domestic	21.1	2.6	23.7
Industrial Zones	13.0	4.5	17.5
Industries within urban area	0.4	0.7	1.1
Total	34.5	7.8	42.3

Total population served during 1974 was estimated at 612,000 and the total area of the industrial zones at 1,840 ha. Unitary water consumptions were then 106 lpcd for domestic use and 9,500 m3/ha/year (0.30 lps/ha) for the industrial zones.

13. Total water produced by the SWA during 1974 was estimated at 47.5 million m3 (130,000 m3/day) showing a volume of unaccounted for water of 13.0 million m3 (27%). Since unmetered water is supplied to schools, public buildings and for some municipal uses, it is impossible to estimate actual water losses in the system.

14. A new well field with an estimated average yield of 50,000 m3/day is being completed on the banks of the Axios river. A sum of 125 million drachmas has been included in this year's budget to complete the Axios well field by late 1976. An additional well field (Aravissos) with an average yield of 215,000 m3/day is also under construction about 65 km northwest of the City. This field is expected to enter operation in late 1977, and to complete its construction, sums of 250 and 270 million drachmas have been budgeted in 1976 and 1977 respectively. These two new well fields should triple present water production capacity and should be sufficient to serve the expected population and industrial growth up to 1995.

15. Future sources of water supply presently under study are:

(a) The Aliakmon river, located about 70 km west of the City. Its average yield is estimated at 450,000 m3/day and its construction cost at 695 million drachmas (1975 prices).

(b) The Migdonia aqueduct, with intake at Volvi Lake about 40 km east of the City. Its average yield is estimated at 275,000 m3/day.

D. Existing Sewer System

16. Since January 1 of this year, the existing sewer system is operated by the recently created Salonica Sewer Authority. It has a length of about 250 km and partially serves 6 municipalities and 13 townships with an estimated 1975 population of 651,600. The remaining 9 townships, with an estimated 1975 population of 19,500 are served only by septic tanks. In early 1975, there were 51,600 known connections to the sewer system plus a large number of illegal sewer connections to the stormwater network.

17. The downtown area of the City (160 ha) was sewered during the 1930's with a combined network discharging into the inner Salonica Bay through the White Tower submarine outfall. This combined system was gradually extended to the north sector of the City and recently to the university campus and areas northeast of the university. To relieve the resulting overloading of the outfall, several overflows have been added to this system during recent years.

18. During the last two decades, the area south of White Tower has become very densely populated as a result of the construction of numerous apartment buildings. This area, with an extension of about 850 ha is served by combined sewers running perpendicular to the coast and discharging at the shore into surface ocean waters. A similar system has been constructed by the Municipality of Kalamaria at the southern end of the City. Both of these systems have been constructed haphazardly to meet the needs of the growing population and are, in many instances, of insufficient capacity.

19. The northwestern sector of the City, further away from the coast, lacks a defined sewer system. Some of the existing storm sewers have been connected to the downtown system and pressed into service as combined sewers. The main part of the storm sewer network discharges, however, into the Dendropotamos river and through its entire length a large number of apartment buildings and private dwellings have illegally connected their sewage discharges and septic tank overflows.

20. The Lagadas and Gallikos industrial zones discharge part of their liquid waste into the municipal sewers and the rest into the Dendropotamos and Gallikos rivers, respectively. The Esso industrial zone has some primary treatment facilities and discharges directly into the inner Salonica Bay. The new Axios industrial zone is discharging its raw wastes into the Axios river.

21. Sewer construction has been generally deficient. In many instances, inadequate slopes produce heavy grit sedimentation which requires continuous sewer cleaning. Most of the smaller sewers were constructed of concrete and vitrified clay pipes with cement mortar joints. Important seawater infiltration is, therefore, common in the sewers laid below sea level which serve the coastal areas of the City. Finally, the insufficient capacity of the system causes severe flooding of the lower areas during heavy rains.

22. In spite of these unsatisfactory conditions, about 950 sewer connections have been added annually during recent years and it is estimated that a population of about 463,000 is presently sewered. The rest of the population is served by septic tanks, which are periodically emptied by privately owned tank trucks. The number of septic tanks within the metropolitan area is estimated at 40,000.

E. Wastewater Characterization

23. The results of tests of 24-hour composite samples taken in October 1975 at various points of the sewer system are summarized below:

Parameter	Unit	Average	Range
BOD_5	mg/l	413	112 - 534
Suspended solids	mg/l	276	52 - 510
COD	mg/l	778	300 - 1,110
Temperature	°C	21.8	19.0 - 25.9
pH	-	8.1	7.5 - 8.4
Total nitrogen	mg/l	102	13 - 270
Total phosphorus	mg/l	20	5 - 35
Chlorides	mg/l	171	78 - 305

The above tests indicate a strong sewage with extremely high nutrients concentrations and sporadic seawater infiltration.

Industrial Effluents Standards

24. The Ministry of Social Services has adopted the following standards for industrial effluents discharged into Salonica Bay:

Parameter	Maximum permissible concentration
BOD_5	30 mg/l
Suspended solids	50 mg/l
Phenols	0.5 mg/l
Iron	30 mg/l
Mercury	0.05 mg/l
Chromiun	3 mg/l
Lead	5 mg/l
pH	6.5 - 8.5

25. There are not tests available of the effluents of the two largest industrial polluters (Macedonia Paper Company and Esso Pappas Petrochemical Complex) but some industries were tested with the following results:

Industry	Water Consumption m^3/day	pH	BOD_5 mg/l	S.S. mg/l
Sing - Chemicals	3,888	2.6	-	546
Ethyl Hellas - Chemicals	1,380	6.8	170	13
Coca Cola	-	9.7	460	169
Amstel - Brewery	-	7.5	720	230
Good Year - Tires	-	9.0	165	75
Amstel - Distillery	-	5.7	780	318

Comparison of the figures above show that there is no compliance whatsoever with the standards.

November 1976

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Existing Water Supply and Sewer Systems of Greater Volos

A. Metropolitan Area

1. Greater Volos is located in the region of Thessaly (eastern coast of Central Greece) along the northern shore of the Pagasitikos Gulf and ranks fourth in population among Greek cities. The metropolitan area covers three municipalities, nine townships and an Industrial Estate as follows:

(a) The City itself on the northern shore of Volos Bay includes the towns of Volos, Nea Ionia, Agia Paraskevi and Agios Georgios.

(b) The village of Alykes on a narrow strip of land about 3.5 km long and 200 to 500 m wide along the western shore of Volos Bay.

(c) The township of Dimini and the village of Dimitrias located in the hills above Alykes.

(d) The village of Melissatika and eight townships, known as the "mountain villages", located on the slopes of Mt. Pilion.

(e) The Industrial Estate located about 5 km west of the City.

2. The total built-up area of Greater Volos covers about 1,600 ha. and is expected to increase to about 2,300 ha. by the year 2015. Present populations are estimated at 82,600 for the City and at 97,300 for the entire metropolitan area and by the year 2015 are expected to increase to 134,000 and 163,000, respectively.

3. The Industrial Estate started operations in 1970 and houses today 19 industries: paper mill, foods, drugs, textiles, metal and glass products, electrical appliances, etc. Within the City there are 57 smaller industries including a distillery, a tannery, textiles, foods and beverages, dairies, drugs, metallic and electrical appliances and building materials.

4. During the summer, Volos attracts a considerable number of tourists, and the metropolitan area has now about 2,000 hotel beds. In 1975, a peak of 6,000 summer daily visitors were recorded at the beaches of Alykes and Goritsa (at the eastern shore of the City).

B. Water Supply System

5. An important aquifer underlies the City; lesser aquifers underlie Alykes and the valley east of the Industrial Estate and numerous springs flow on the slopes of Mount Pilion so that the metropolitan population has always had an abundant water supply.

6. The Volos Municipal Water and Sewerage Authority (VMWSA) supplies the Municipality of Volos which includes the towns of Volos, Agia Paraskevi, Agios Georgios, Alykes and Dimitrias. This water supply system is composed of:

Fourteen 90 - 130 m deep wells located in the NE part of the City

Four reservoirs with a total storage capacity of 3,400 m3

150 km of water distribution pipes

21,726 house connections (at the end of 1974).

7. During 1974, the VMWSA pumped a total of 3,193,000 m3 and sold 2,320,000 m3. An additional volume of 300,000 m3 was pumped from private wells. Of the large unaccounted-for municipal water (27.3%), it is estimated that 458,000 m3 (14.3%) correspond to losses in the system and the rest to unmetered municipal uses such as standpipes, public laborartories, street washing and sprinkling of parks.

8. The Municipality of Nea Ionia serves only the town of Nea Ionia and its water supply system consists of:

Six 85 - 100 m deep wells located in the NW part of the City

Two reservoirs with a combined storage capacity of 900 m3

30 km of water distribution pipes

7,890 house connections (at the end of 1974).

9. During 1974, the Municipality of Nea Ionia pumped a total of 981,000 m3 and sold 746,000 m3 of water so that the proportion of unaccounted-for water (24%) is similar to the one recorded by the VMWSA.

10. The village of Melissatika is supplied by a deep well and the "mountain villages" by local springs but neither production nor sales of water are metered.

11. The Industrial Estate has a separate water supply composed of:

Six 60 - 160 m deep wells located about 10 km west of the Industrial Estate

Three reservoirs with a combined storage capacity of 3,100 m3

8 km steel transmission pipe line of 250 - 350 mm diameter

15 km of water distribution pipes.

During 1974, total water consumption was estimated at 400,000 m3 of which 280,000 m3 were provided by the above described system and the remaining 120,000 m3 from private wells.

12. Undocumented deterioration in the quality of the water drawn from the City wells during recent years has created the fear that the aquifer is suffering contamination by sea water intrusion and by seepage from the numerous septic tanks and percolation pits. To reduce pumping from the City wells, the VMWSA is completing installation of an 11-km transmission pipeline to the Kaliakouda Spring located NE of the City at El. + 860 m. Average and minimum yields of the Kaliakouda Spring are estimated at 23,000 and 8,000 m3/day respectively. The transmission line has been designed, however, for a capacity fo 31,500 m3/day so that it can be extended in the future to take also the waters from the Lagonika Spring, located 2 km further uphill at El. + 1,100 m. The VMWSA is also contemplating another water supply from the Koukourava Spring, located about 5 km NE of the City at El. + 320 m. Further investments in new water sources should, however, be delayed until monitoring of chloride concentrations in the aquifer indicates the amounts of water which can be drawn from the existing wells without causing sea water intrusion.

13. During 1974, domestic and commercial water consumption (including that from private wells) within the service area amounted to 3,066,000 m3 and the population served to 75,200, that is, a unitary consumption of 112 lpcd. For the Industrial Estate the unitary water consumption in 1974 averaged 5,000 m3/yr/ha.

C. Existing Sewer System

14. Within the City only about 110 ha. of the coastal area, housing a population of about 8,400 are presently sewered. The sewer system is composed of:

8 km of old rectangular section combined sewers discharging at the shore on surface waters

7 km of recently laid sanitary sewers discharging mostly into the combined sewers

About 820 house connections.

Most of the new sewers were poorly laid and only a few can be incorporated into the proposed new sewer network.

15. The rest of the City and all the adjacent villages and townships are served by septic tanks and/or percolation pits. The septic tanks are emptied periodically by privately-owned tank trucks which discharge the septage into a sanitary landfill located about 3 km north of the City. Average unitary cost for emptying the septic tanks is estimated today at 300 drachmas/capita/year.

16. The area already developed of the Industrial Estate (160 ha) is served by a recently constructed sewer network. This network, composed of vitrified clay pipe of 200 - 300 mm diameter, has a total extension of about 8 km and discharges raw sewage into the Xerias Creek, which flows into the Volos Bay.

D. Wastewater Characterization

17. The results of tests of 24-hour composite samples taken during September-October, 1975 at the outlets of the existing sewer system are summarized below:

Parameter	Unit	Average	Range
BOD_5	mg/l	347	236 - 490
pH	-	7.9	5.8 - 8.4
Temperature	^oC	22	20 - 28
Total Solids	mg/l	1,351	1,018 - 1,898
Suspended Solids	mg/l	242	136 - 360
Settleable Solids	mg/l	12.8	6.0 - 19.0
Total Hardness	French ^{o}	40.0	31.8 - 67.0
Alkalinity as $CaCO_3$	mg/l	10.4	4.9 - 32.0
Chlorides	mg/l	276	145 - 702
Total Nitrogen	mg/l	72	12 - 135
Total Phosphorus	mg/l	18	2 - 46
COD	mg/l	701	500 - 1,200
Fats	mg/l	79	35 - 144

18. The above tests show a strong sewage with unusually high concentration of nutrients and fats. Most of the existing domestic sewer connections receive only septic tank overflows which explain the low suspended solid concentration. The large fluctuations in chloride concentration are very likely due to sea water infiltration.

19. The results of tests of composite samples taken at the outlets of the main factories are summarized in Attachment 1. The tests did not include determination of heavy metals which are likely to be present in rather high concentrations in the effluents of the Leventeris and Kappas factories.

GREECE - SALONICA AND VOLOS SEWERAGE PROJECT

Volos - Wastewaters from Main Industries

Name of Industry		Volos Cotton	Thessalian Distillery	Evol	Slaughter-house	Vis[1/]	Leventeris	Kappas
Products		Ginned Cotton	Alçohol CO_2	Dairy		Wrapping Paper	Wire	Tannery Sole-Leather
BOD_5	mg/l	290	490	535	1,000	482	30	900
pH	-	5.8	8.7	6.4	6.6	5.2	6.5	8
Temperature	°C	21	31	22	24	22	21	20
Total solids	mg/l	681	5,106	1,529	4,524	2,428	5,442	4,411
Suspended solids	mg/l	223	149	286	2,740	73	100	883
Settleable solids	mg/l	20.8	7.5	32.5	132	3.5	8	62
Total hardness	French°	31	253	45.4	32	68	308	25.2
Alcalinity as $CaCO_3$	mg/l	6.4	28	9.4	14.2	4.3	20.4	2.8
Total nitrogen	mg/l	30	120	55	178	23	26	72
Total phosphorus	mg/l	5.4	70.1	8.8	27.2	2.1	1	5.7
COD	mg/l	710	1,982	2,138	3,150	1,612	75	2,758
Annual water consumption m^3/year		44,000	80,000	70,000		285,000	45,000	1,500

1/ Vis has sedimentation facilities.

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Description of the Greater Salonica Sewerage Program

A. General

1. Because of its topography the Greater Salonica metropolitan area will be sewered by two separate systems, as follows:

(i) The Axios system, which will serve the City of Salonica itself and all the existing industrial zones and will discharge into the Axios River.

(ii) The Mega Emvolon system which will serve the southeastern sector of the metropolitan area and will discharge into the Thermaikos Gulf through a submarine outfall.

The long-range sewer program contemplates the entire construction of both systems.

2. The proposed Bank-financed project, to be developed during the period 1977-1981, includes the first construction stage of the Axios system, partial rehabilitation of the existing sewer network and a complete feasibility study for the Mega Emvolon system. The first stage of the Axios system includes the sewers needed to intercept the wastewaters presently being discharged into Salonica Bay and the inland water courses; the main interceptor to carry the wastewaters to the Axios River, a primary treatment plant on the eastern bank of the Axios and some extensions and replacements of the sewer network. Upon completion of the 1977-1981 project, the sewer program calls for the construction of the Mega Emvolon system, and the continuous expansion of both systems to cover the entire metropolitan area.

B. The Project (1977-1981)

3. The first construction stage of the Axios system, under consideration for Bank financing, includes the following structure:

(i) Existing Sewer Network: Rehabilitation, extension and reinforcement of the sewer networks presently serving the coastal downtown area of the City, as follows:

54.8 km of secondary sewers
9.2 km of trunk mains
1.6 km of force mains
3 pumping stations with initial capacities of 44, 74 and 109 lps respectively.

(ii) Sewer network expansions: Construction of sewer networks in the Lagadas and Esso industrial zones, as follows:

10.2 km of secondary sewers
6.2 km of trunk mains.

(iii) Coastal interceptors: To intercept the trunk mains presently discharging into the inner Salonica Bay and to pump their flows into the main interceptor, as follows:

8 km of gravity interceptors of 400 to 1,200 mm diameter
1.1 km of force mains
3 pumping stations with initial capacities of 240, 735 and 1,190 lps respectively.

(iv) Main interceptors: Construction of the lower part of the main interceptor, between the White Tower area and the Axios River, as follows:

25.4 km of gravity pipeline of 2.10 to 2.90 m diameter

(v) Primary treatment plant: Constructed on the eastern bank of the Axios River for a first stage design capacity of:

Average flow	=	3.9 m3/sec
Peak flow	=	4.6 m3/sec
Suspended solids loading	=	81.6 ton/day

Only physico-chemical treatment is considered viable at this stage, since existing industries are presently discharging toxic substances in concentrations likely to inhibit biological processes. The liquid phase of the plant would incorporate:

Low lift pumping station equipped with screw pumps
Parshall flume equipped with flow recorder
Mechanically cleaned bar screens
Aerated grit chambers equipped with grit washer
Primary clarifiers equipped with mechanical sludge and scum removal facilities
Feeders for the addition of coagulants - chemical coagulation would be used only when the flow of the Axios River becomes insufficient to provide adequate dilution of the plant effluent.

For the solid phase, two alternatives are to be considered as follows:

Alternative I

Gravity sludge thickeners
Water heated anaerobic digesters
Sludge ponds equipped with facilities for supernatant disposal by percolation.

Alternative II

Sludge dewatering by vacuum or pressure filtration
Sludge incineration by multiple hearth furnaces.

C. Mega Emvolon Sewer Project

4. The Bank-financed project will also include a full feasibility study for the Mega Emvolon sewer system. This study is expected to become a pilot for Greece on wastewater reclamation for irrigation purposes.

5. The Cape of Mega Emvolon contains a combination of conditions which are fairly common in Greece:

(i) Need to protect ocean beaches of considerable touristic potential; and

(ii) Need to provide seasonal irrigation of agricultural lands adjacent to the ocean.

Development of sewer projects which allow the use of wastewater effluent for seasonal irrigation is, therefore, of country-wide interest.

6. For the Mega Emvolon system, the consultants have indicated the possibility of using activated sludge treatment plant with an extended aeration configuration. For technical and economical reasons, the proposed review will also examine the possibility of using mechanically aerated ponds.

D. Rehabilitation of the Existing Sewer System

7. The Salonica Sewer Authority is acquiring equipment for sewer cleaning and has already initiated a program for mapping the existing sewer network. To supplement this program the Bank-financed project includes the acquisition of a television equipped van, smoke bombs and other related equipment for internal sewer inspection.

8. The purposes of the sewer rehabilitation program are threefold:

(i) To provide the data for designing the needed reinforcements of the existing sewer network;

(ii) To initiate the separation of the present combined system by locating and sealing the existing stormwater inlets;

(iii) To rehabilitate, whenever possible, existing sewers by installation of cement mortar or plastic pipe linings.

E. 1982-1985 Construction Program

9. It covers the construction of the first stage of the Mega Emvolon sewer system and extensions of the Axios system and includes the following structures:

Mega Emvolon System

(i) Secondary sewer network:

15.7 km of secondary sewers
3.8 km of trunk mains
1.0 km of force mains
3 pumping stations

(ii) Main interceptor:

9.3 km of gravity mains
1.0 km of force mains
2 pumping stations

(iii) Treatment plant:

Secondary treatment plant for a maximum day flow capacity of 12,000 m3/day.

(iv) Ocean outfall:

800 m of 600 mm pipe

Axios System

(v) Sewer network extensions and replacements:

167 km of secondary sewers
16.8 km of trunk mains

(vi) Dendropotamos interceptors:

15.9 km of gravity interceptors.

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Description of the Greater Volos Sewerage Program

A. General

1. The long-range sewer program covers the construction of the entire sewer system for metropolitan Volos and the adjacent Industrial Estate, including the collection system, joint treatment of the domestic and industrial wastewaters and final effluent disposal into the Pagasitikos Gulf through a submarine outfall.

2. The first stage of the sewer program, to be constructed during the period 1977-1980, includes the infrastructure to serve the projected population up to 1995, pretreatment of the wastewaters, and all the secondary sewer networks which can logistically be installed during that 4-year span. A continuous program of extensions of the sewer network is proposed for the period 1981-1990, and a second major construction stage is likely during the period 1991-1995. The second stage would increase the capacity of the infrastructure to serve the estimated population for the year 2015 and would also upgrade the treatment facilities, as required, to prevent deterioration in the water quality of the Pagasitikos Gulf. However, topography and low population densities preclude economical sewering of the mountain villages within the foreseeable future so it is intended that during this century these villages will continue to depend on septic tanks.

B. The Project

3. The first stage structures, to be constructed under the Bank-financed project, are detailed below:

(i) Sewer network - town area: It will serve an area of about 485 ha and will be integrated by:

104.0 km of secondary sewers
10.8 km of trunk mains
0.6 km of force mains
2 pumping stations designed for first stage peak flow capacities of 72 and 88 lps respectively.

(ii) Sewer network - Alykes Beach: It will serve an area of about 26 ha and will be integrated by:

5.0 km of secondary sewers
0.9 km of force mains
2 pumping stations designed for first stage peak flow capacities of 8 and 15 lps respectively.

(iii) Sewer network - Industrial Estate: It will serve an area of about 40 ha through the installation of about 4.0 km of secondary sewers.

(iv) Main pumping station and force main: It will pump all the sewage of the town area to the treatment plant.

Pumping station equipped with vertical, two-speed pumps designed for an initial flow of 470 lps

1.9 km of 700 mm diameter force main.

(v) Industrial Estate collector: It will carry all the wastewaters from the Industrial Estate to the treatment plant, and in the future will also serve the village of Dimini.

1.0 km of 500 mm diameter gravity sewer
2.9 km of 800 mm diameter gravity sewer

(vi) Treatment Plant: The pretreatment plant will be designed for a first stage peak flow of 1 m3/sec and will include the following structures:

1 Parshall flume equipped with in-stream flow recorder
2 mechanically cleaned bar screens
2 aerated grit chambers equipped with grit washer
2 air flotation tanks equipped with sludge holding tank.

The plant site allows future construction of primary clarifiers, sludge digesters and flow equalization ponds.

(vii) Effluent pumping station: It will be a temporary above-ground structure located at the outlet of the treatment plant. Construction of a permanent structure will be postponed until the second stage (1991-1995) so that it can conform with the upgrading of the treatment facilities to be conducted at that time. The station will be equipped with two-speed pumps and will have an initial capacity of about 740 lps.

(viii) Main Interceptor: It will carry the plant effluent to Cape Agistri

7.7 km of 800 mm diameter force main
0.4 km of 800 mm diameter gravity main

(ix) Ocean outfall: It will be located at Cape Agistri, will be designed to provide a minimum initial dilution of 1/100, and will reach depths of about 45 m below sea level.

450 m of 800 mm diameter submarine outfall
240 m of diffuser pipe provided with about 30 outlet ports.

C. Sewer Network Expansion (1981-1990)

4. The proposed extensions of the secondary sewer network to be carried out during the period 1981-1990 are tabulated below:

Extensions of the Secondary Sewer Network in kms

Period	City	Alykes	Dimini	Industrial Estate	Totals
1981-1985	33.6	1.6	2.4	3.3	40.9
1986-1990	29.0	2.2	3.6	3.3	38.1
Total	62.6	3.8	6.0	6.6	79.0

5. Installation of additional pumps in the Main and Effluent Pumping Stations are also proposed for 1986 to increase their capacities to 625 and 950 lps, respectively.

D. Second Stage (1991-1995)

6. The structure proposed for the second construction stage are enumerated below:

(i) Sewer networks

20.7 km of second sewers
3.5 km of trunk mains
1.6 km of force mains
Addition of pumps at the two Alykes pumping stations to increase their capacities to 33 and 56 lps, respectively.
One pumping station at Dimitrias with a 72 lps capacity.

(ii) Main pumping station and force main:

Double barrelling of the 1.9 km force main using 500 mm diameter pipe. By reducing friction losses the double barrelling would increase the pumping station capacity to 830 lps.

(iii) Treatment Plant

Increase of the pretreatment facilities capacity to 1.5 m3/sec through the addition of:

1 mechanically cleaned bar screen
2 air flotation tanks.

Upgrading of the treatment facilities as required by the results of the monitoring of the Pagasitikos Gulf.

(iv) Effluent pumping station

Flow equalization ponds equipped with floating aerators of sufficient capacity to maintain the solids in suspension and to prevent septicity.

Replacement of the temporary pumping station by a permanent structure.

(v) Main Interceptor and Ocean outfall

No changes are contemplated since the equalization ponds should allow the larger second-stage flows without double barrelling the main interceptor and ocean outfalls.

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APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Greater Salonica - Projections of Population, Levels of Service and Water Consumption

A. Past Demographic Growth

1. Some of the population figures recorded during the last three national census are tabulated below:

	Census Population (000)			Mean Annual Growth - %	
	1951	1961	1971	1951-1961	1961-1971
Greece	7,633	8,389	8,769	1.0	0.4
Urban Population 1/	2,880	3,628	4,668	2.3	2.6
Greater Salonica	323	404	585	2.3	3.8
Greater Patras	94	104	121	1.0	1.5
Greater Volos	76	83	91	0.9	0.9
Greater Heraklion	58	70	85	1.8	1.9

2. The reduction of the country's demographic growth during the period 1961-1971 was due mainly to a large emigration of mostly rural population to the labor markets of Western Europe and the Americas. The emigration reached its peak in 1969 and since then it has declined rapidly, being negligible during the last three years. However, the natural demographic growth (births minus deaths) also declined steadily during the 1960's, but it has stabilized at about 0.7% per year during the first part of the present decade.

B. Urbanization Trends

3. The urban-rural growth rate differential (URGD) computed from the above census figures using UN methodology are:

Period	URGD - %
1951-1961	2.3
1961-1971	4.0

4. Urbanization trends computed assuming a demographic growth of 0.7% per annum and a URGD of 4% per annum are tabulated below:

1/ Includes all urban centers with a population of at least 10,000.

Year	Population (000) Total	Urban	% of urban to total population
1976	9,076	5,264	58
1981	9,400	5,922	63
1986	9,734	6,522	67
1991	10,076	7,255	72
1996	10,435	7,931	76

C. Population Projections

5. The Government has commissioned several studies of the future growth of Greater Salonica. Even though these studies are based on different development policies, their predictions cover an unusually wide range showing the incertitudes in forecasting future population from existing historical data. For the Sewerage Master Plan, the consultants adopted the demographic growth curve proposed in 1968 by Professor J.D. Triandafillidis shown on Attachment 1. A comparison of population forecasts for various design horizons follows:

Year	Estimated Future Population (000) Triandafillidis Curve	Forecasting Range
1980	777	640 - 860
1990	957	750 - 1,250
2000	1,128	880 - 1,750

D. Projections of Service Levels and Water Consumptions

6. Projections of populations supplied with water and of sewered populations were made by the consultants on the basis of present programs of water supply and sewerage construction.

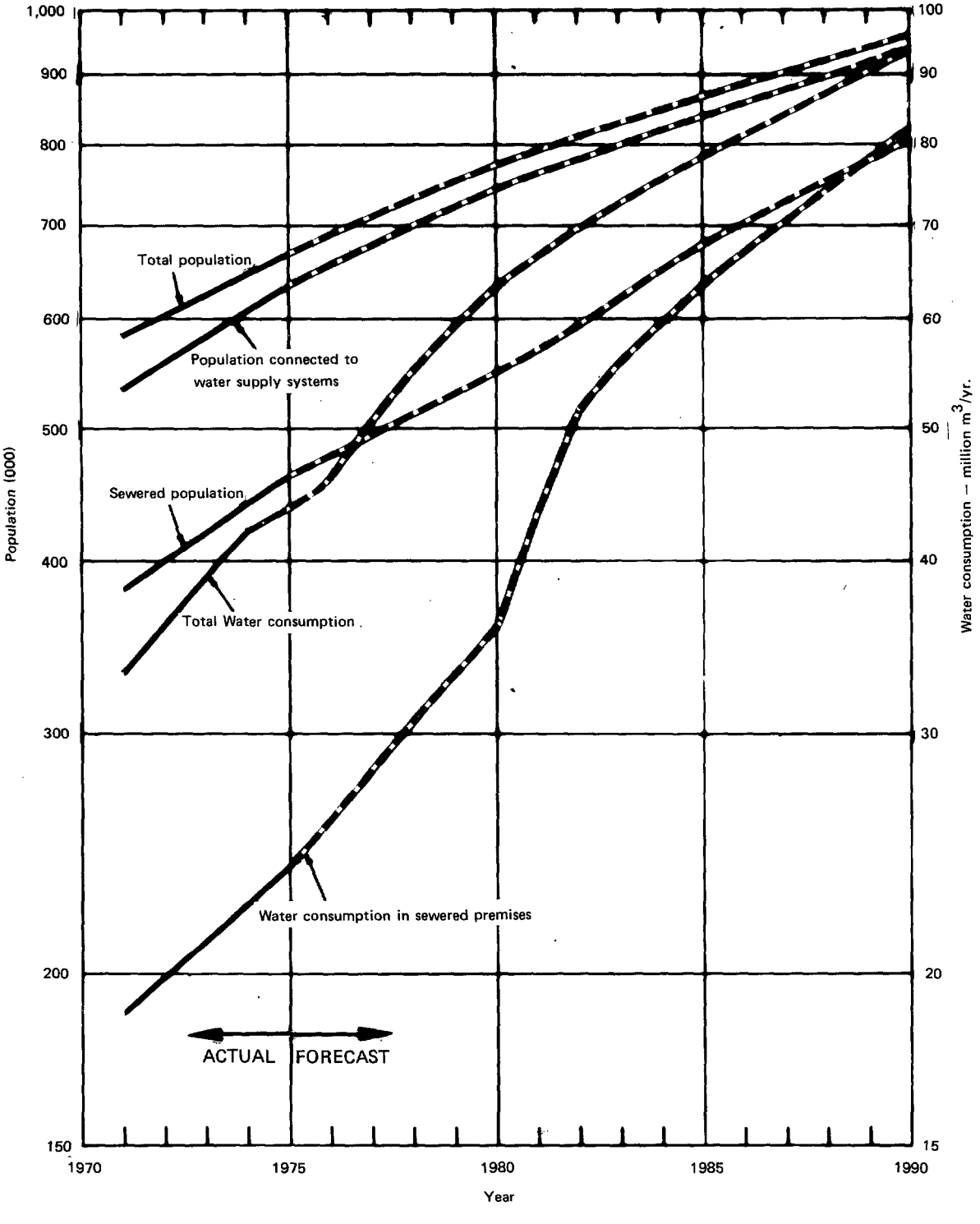
7. Water consumptions in premises connected to the sewer system and in the entire metropolitan area were projected by the mission using the following assumptions:

(a) Domestic water consumption - per capita consumptions from 106 lpcd in 1974 to 150 lpcd in 1990.

(b) Industrial water consumptions - unitary consumptions from 9,500 m3/ha/yr in 1974 to 13,500 m3/ha/yr in 1990.

The resulting curves are also included in Attachment 1.

GREECE–SALONICA AND VOLOS SEWERAGE PROJECT
DIAGRAM 3– 1– GREATER SALONICA PROJECTIONS OF POPULATION, LEVELS OF SERVICE AND WATER CONSUMPTION



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APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Greater Volos - Projections of Population, Levels of Service and Water Consumption

A. Past Demographic Growth

1. Census population for the city of Volos, itself, and for the entire Greater Volos metropolitan area are tabulated below:

	City of Volos		Greater Volos	
Year	Population	Mean Annual Growth - %	Population	Mean Annual Growth - %
1920	30,457		38,271	
		6.12		5.38
1928	49,002		58,101	
		1.20		0.85
1940	56,596		64,261	
		1.56		1.41
1951	67,157		75,817	
		0.71		0.81
1961	72,067		83,145	
		0.73		0.82
1971	77,485		90,851	

B. Projection of Population, Levels of Service and Water Sales

2. The populations predicted in the various studies of the future growth of Greater Volos are quite consistent so that the sewerage master plan consultants found the well accepted curve of future growth which is shown graphically in Attachment 1.

3. Projections of the population to be connected to the water supply system were made by the consultants in accordance with the proposed schedule for take-over of the existing water supply systems by the new Volos Water and Sewerage Organisation (VWSO). Projections of sewered population were made by the consultants on the basis of the proposed program of sewerage construction.

4. Water sales by the VWSO in the entire metropolitan area and in the premises connected to the sewerage system were made by the mission using the following coefficients:

(a) Domestic consumption - per capita consumptions from 116 lpcd in 1976 to 144 lpcd in 1990.

(b) Industrial consumption - unitary consumptions from 6,000 m3/ha/yr in 1976 to 10,000 m3/ha/yr in 1990.

Projected levels of service and water sales are also included in Attachment 1.

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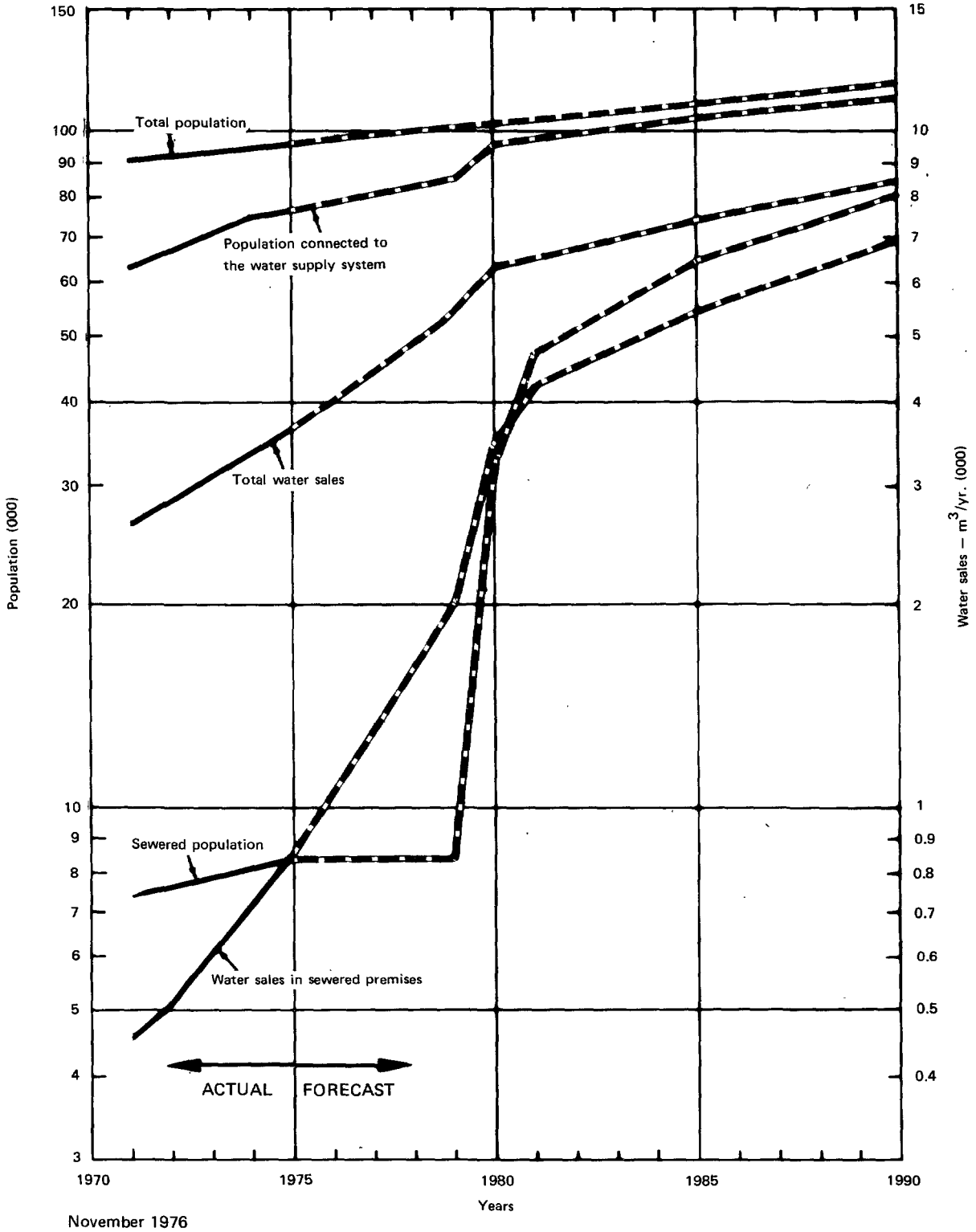
GREECE–SALONICA AND VOLOS SEWERAGE PROJECT
DIAGRAM 5– 1– GREATER VOLOS PROJECTIONS OF POPULATION, LEVELS OF SERVICE AND WATER SALES



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APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Accounting, Financial Control and Tariff Studies

Tentative Terms of Reference

A. Introduction

1. The Ministry of Public Works and local sewerage authorities are preparing long-range regional sewerage projects to serve the metropolitan areas of Salonica and Volos. The Salonica project is being planned on the basis of a joint primary treatment of industrial and municipal wastewaters followed by disposal into the Axios River and contemplates a possible second construction stage upgrading the primary plant to secondary biological treatment. The Volos project is based on the joint discharge of raw industrial and municipal wastewaters into the Pagasitikos Gulf through an ocean outfall off Agistri Cape and contemplates the future addition of treatment facilities.

2. The Government has established an autonomous sewerage authority for the metropolitan area of Salonica (SSA). It proposes to extend the jurisdiction of the authority to include new industrial estates and other areas intended to be served by the new sewer system. There is a separate water authority for the metropolitan area of Salonica (SWA) and it is the intention of the Government that the water and sewerage authorities combine, to operate under a common management, as soon as this seems appropriate. It is, however, expected, that for the time being, the two authorities will continue to operate separately. Water consumers connected to the wastewater system will be billed by the water authority for wastewater charges and the proceeds (less an allowance for collection costs) will be handed over the SSA.

3. The Government intends to establish, during 1977, an autonomous water and sewerage authority for the metropolitan area of Volos (VWSO). Such an authority already exists for the municipality of Volos, but does not cover other areas. However, the present authority provides certain water services to areas outside its jurisdictional boundaries (e.g. Industrial areas and Dimini) on an agency basis.

4. The present systems of accounting and financial control used by the water and sewer authorities are based on civil service procedures and, as such, are unsuitable for autonomous organizations. Accounts are kept on a cash receipts and payments basis following budget headings prescribed by the Government (either by administrative direction or by legislation or regulation).

The lack of an appropriate accounting and reporting system allows certain weaknesses in internal financial control which cannot be corrected by other systems of control imposed from outside.

5. In each city, at present, water tariffs are based on a single flat-rate unit charge, but with various discounts to different categories of consumer. In addition, certain public buildings and other premises are supplied free. Following its decision to establish water and sewerage authorities on a more autonomous and financially independent basis, and in view of growing water shortages in many areas, the Government is considering whether these present tariff structures are any longer appropriate.

6. The Government wishes to establish modern systems of accounting, reporting, financial control and tariff structures in the water and sewer authorities of Salonica and Volos, such systems to be appropriate to the work of these authorities as financially autonomous organizations. The Government therefore proposes to seek the assistance of suitably qualified financial and accounting consultants to review present arrangements, to make appropriate recommendations and to assist in the implementation of these recommendations, after approval by the Government.

7. The Government has requested a loan from the International Bank for Reconstruction and Development for partial financing of the construction of the sewerage system of Salonica and Volos and it is intended that part of the proceeds from this loan be applied towards foreign exchange payments (if any) for the consultants' services.

8. It is expected that the work of the consultants will be conducted in both cities simultaneously and that the initial work of review and implementation will be completed within a period of twelve months, beginning in the first half of 1977. It is expected that follow-up arrangements may be necessary for a further period of 12-18 months.

9. The Government has a program for the construction of water and sewerage works in other cities of Greece and contemplates the establishment of appropriate authorities for the management thereof, along similar principles to those to be developed in Salonica and Volos. It is therefore expected that the systems of accounting, financial control and tariffs established in Salonica and Volos will serve as models for these other cities in due course.

B. Qualifications of Consultants

10. It is expected that the consultants will be a reputable and experienced firm of professional accountants with international standing. It will be necessary for the majority of personnel employed on the assignment to have a thorough knowledge of conditions in Greece, and to speak, read and write fluently in Greek. It is anticipated that the assignment would most likely be carried out either:

(a) by an international firm of accountants with a permanent office established in Greece and employing Greek staff; or

(b) by a Greek firm of accountants working in association with a reputable international firm.

C. Objectives

11. In relation to accounting and financial control systems, the initial objectives of the assignment will be as follows:

(a) to review the present systems of accounting and financial control employed by the Salonica Water Authority, the Salonica Sewer Authority and the Volos Water and Sewer Authority;

(b) to assist the authorities in the development of the necessary changes for the establishment of accounting systems based on full commercial principles, including but not limited to:

(i) full accounting for fixed assets and for depreciation charges related thereto;

(ii) matching of periodical income and expenditures during the periods of their incurrence;

(iii) accrual of current assets and current liabilities, including accounts payable and receivable;

(iv) full accounting for inventories and for light tools and equipment on the basis of both quantity and value;

(v) accounting for loans and other long-term liabilities; and

(vi) preparation and presentation of periodical financial statements for management and for external publication as appropriate.

(c) to develop appropriate systems of billing, cash collection and disbursement, and analysis of income and expenditure;

(d) to develop systems of internal financial control consistent with accounting systems referred to in (b) and (c), and following principles outlined in Attachment 1;

(e) to examine systems of external financial control to determine the extent to which these could be modified or eliminated;

(f) to examine legislation and other regulations of Government regarding accounting procedures, budgetary requirements and financial control to determine the extent to which these should be modified to more effectively permit the overall objectives of the assignment; and

(g) to report recommendations to the appropriate department of Government on all matters covered by the review.

12. In relation to tariff systems, the initial objectives of the assignment will be as follows:

(a) to review the present water tariff structures, and related sewer tariff structures of the Salonica Water Authority, the Salonica Sewer Authority and the Volos Water and Sewer Authority; and

(b) to assist the authorities, and the government, in formulating proposals for changes in the various tariff structures, having regard to a reasonable balance among the following needs:

(i) payment by consumers of economic costs of providing supplies and services;

(ii) operation of each authority on a financially autonomous basis;

(iii) conservation of water and rational use thereof (with particular reference to industrial use);

(iv) deterence from uneconomic and irrational use of sewer facilities (with particular reference to industrial use);

(v) provision of a basic minimum supply at a price which does not unduly burden low-income consumers;

(vi) elimination of free supplies, other than in exceptional circumstances; and

(vii) efficiency and economy of billing and collection.

13. Following the approval of the recommendations by Government in consultation, as necessary, with the International Bank for Reconstruction and Development, the consultant would be expected to:

(a) assist in the design of the necessary accounting systems in detail;

(b) assist in the implementation of the systems of accounting and financial control in the various authorities concerned;

(c) give guidance to and, where necessary, train the staff of the authorities in the implementaion of the systems; and

(d) for a limited period, provide follow-up from time to time to ensure that the systems are operating in a satisfactory manner.

14. The recommendations on systems to be implemented in Salonica should have regard to the intended eventual merger of the water and sewer authorities under a single management. Present indications are that technical considerations related to construction and operation of the physical systems will preclude the full integration of the two authorities until after the wastewater project has been completed. However, recommendations can include proposals for joint co-operation between the two authorities on the establishment of a common accounting service, no earlier than January 1978, if this seems to be appropriate.

15. In the interests of economy and also to minimise disruptions resulting from proposed re-organizations, the recommendations of the consultant should consider the extent to which presently operating accounting arrangements could be integrated (with necessary modifications) into any new proposals. This might apply, for example, to the billing systems presently operational in both cities, and possibly to some of the procedures for the ordering and payment of goods and services.

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Proposed Water and Sewer Authorities

Main Principles of External Financial Control

1. Right of Government to approve:

   (a) annual budget;
   (b) fees and charges;
   (c) raising of loans; and
   (d) capital investment projects in excess of a stated sum (a fairly substantial limit should be set).

2. Right of Government to control the appointment of the managing board.

3. Right of Government to require an annual report, annual financial statements and an annual audit report by independent accountants.

4. Right of Government to prescribe by regulation:

   (a) outlines of internal financial control;
   (b) guidelines for keeping accounts; and
   (c) procedures for purchasing and contracting.

5. No day to day involvement by Government departments in the affairs of the water and sewer authority (e.g. approval of payments etc.).

6. No involvement of members of the managing board in the day to day administration of the authority. The board should determine policy (and approve of plans and budgets) but leave all administration to the general manager.

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Accounting and Financial Consultants

Suggested Outline of Evaluation of Proposals

and Arrangements for Contracting

1. Selection of consultants should follow the procedures outlined in the World Bank Group publication "Uses of Consultants by the World Bank and Its Borrowers."

2. Proposals should be invited by the Government from a selection of approprate firms, based on Section B of the draft terms of reference "QUALIFICATIONS OF CONSULTANTS."

3. The Government should evaluate the proposals without reference to fees to be charged and the consultants should be requested not to quote fees in their proposals.

4. After evaluation, but before opening negotiations with the firm selected, the proposals, and the Government's observations thereon, should be forwarded to the Bank for its review and concurrence.

> NOTE: The Bank does not seek to approve the Government's proposals but wishes to have the opportunity to raise objections where the acceptance of proposals might not be in the best interests of the project.

5. In the event that the Bank raises no objections to the proposed selection, negotiations should be opened with the intended consultant on fees and expenses for completion of the work outlined in paragraph 10 of the draft terms of reference (i.e. review and reporting). It is suggested that no commitment be entered into, at this stage, for the work outlined in paragraph 11 of the draft terms of reference (i.e. detailed design and implementation) for which expenses will be difficult to estimate until the review and reporting process has been completed. Furthermore, the Government should retain the option to employ, if necessary, a different firm for the implementation stage.

6. In the event that agreement cannot be reached on a contract with the first choice of consultant, the Government should negotiate with the consultant submitting the next most suitable proposal. This process should continue until agreement is reached between Government and a satisfactory consultant.

7. The consultant with whom the Government proposes to contract should provide the Government, before concluding such contract, with a schedule of personnel to be employed on the studies; details of each person's qualifications and experience; the periods of employment of such personnel; and the rates for their services specified in man-month and man-day rates. In addition, the consultant should specify the costs of additional services he proposes to utilize and give an estimate of likely foreign exchange costs. The consultant should be required to undertake not to withdraw personnel who have been approved by Government without the prior agreement of the Government.

8. When the report has been received on the first stage of work, it should be reviewed by the Government, in consultation with the World Bank. After such review, a decision should be taken by the Government as to the selection of consultants for the design and implementation stage.

9. The proposed studies are likely to recommend considerable changes in long-standing procedures, both in the Government and in the autonomous organizations concerned. The implementation, training, and follow-up procedures are therefore of considerable importance and the selection of the consultants should pay regard to their ability and experience in combining firmness and integrity of proposals with tact and understanding in their implementation.

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APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Review of the Feasiblity Studies for the Mega Emvolon Sewerage System

Tentative Terms of Reference

A. Introduction

1. In 1969 the consulting firm THESMEA prepared for the Ministry of Public Works a feasibility study of the sewer system of Greater Salonica. This study, which was updated in 1975 by the firm OTME Hydraulic Projects Ltd. proposed to sewer the Salonica metropolitan area by two separate sewer systems:

(a) the Axios system which would serve all the industrial zones and most of the present urban area and would discharge into the Axios River; and

(b) the Mega Emvolon system which would serve the southeastern part of the metropolitan area and would discharge into the sea through a submarine outfall.

2. The Ministry of Public Works has already approved the feasibility study for the Axios system and the population and sewage flow projections for the Mega Emvolon system but desires to retain the services of consultants to review the wastewater treatment and disposal procedures proposed by the previous consultants for the Mega Emvolon system. This review shall be based on the oceanographic survey which the Institute for Oceanographic and Fishing Research (IOKAE) is presently conducting on the sea around the Cape of Mega Emvolon.

3. It is intended that this review will be conducted by a competent local engineering firm associated with an appropriately experienced foreign firm and that maximum use will be made of local manpower, resources and skills. The consultants will work under the direction of the Ministry of Public Works.

4. The Government of Greece has requested a loan from the International Bank for Reconstruction and Development for partial financing of sewerage development, including the first stage construction of the Axios sewer system. It is intended that part of the proceeds from the loan would be applied towards the foreign exchange payments for the consultant's services.

B. Background

5. Preliminary oceanographic studies carried out by IOKAE in 1975 showed that the sea around Mega Emvolon Cape is shallow, that at least during the summer there is a strong thermal stratification, and that the main ocean currents are wind-induced. It is anticipated, therefore, that the treatment will have to provide high degree of removal of bacteria, suspended solids and BOD.

6. On and adjacent to the Cape of Mega Emvolon there are extensive areas of cultivated land which lack sufficient irrigation water during part of the year so that the Ministry of Public Works is interested in the possible use of the treatment plant effluent for seasonal irrigation. The Ministry also desires to develop local expertise on wastewater reclamation and intends that the Mega Emvolon project becomes, if possible, a pilot project on the use of wastewater effluent for irrigation.

C. Objectives

7. The main objective of this review is to find the least cost process for wastewater treatment and disposal which provides adequate protection of the bathing beaches of Agia Trias and Nei Epivate and of the shellfish beds around the Cape of Mega Emvolon. The secondary objective is to determine the possibility of using the effluent for seasonal crop irrigation.

D. Scope

8. The work to be carried out by the consultants will include:

(a) Establishment of effluent quality criteria for: (i) ocean disposal, and (ii) irrigation of various types of crops.

(b) Determination of the degree of treatment required for both, ocean disposal and irrigation, at the two alternative outfall locations proposed by the previous consultants as well as for any other outfall location the consultants consider advisable.

(c) Selection of treatment processes. The main selection criteria will be simplicity and reliability of plant operation and back-up safety in case of malfunction of one of the plant components.

(d) Estimates of construction and operation costs (treatment and outfall) of the above alternatives and of the economic benefits derived from irrigation. Calculation of present values of various cash flow streams using suitable discount rates.

(e) Specific recommendations regarding effluent monitoring and quality control of the treatment, disposal and reclamation operations for both ocean disposal and irrigation.

(f) Detailed recommendations on the emergency measures which could be taken in case of accidental spillages of untreated or partially-treated wastewaters.

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Industrial Wastewater Surveys in Salonica and Volos

Tentative Terms of Reference

A. Introduction

1. The Government of Greece intends to retain the services of consultants to conduct industrial wastewater surveys in Salonica and Volos.

2. At present the Ministry of Public Works and the local sewerage authorities are preparing long-range regional sewerage programs to serve the metropolitan areas of Salonica and Volos. The first construction stage for Salonica is being planned on the basis of joint primary treatment of industrial and municipal wastewaters followed by disposal into the Axios River, a short distance upstream from its discharge into the Thermaikos Gulf. For Volos the first construction stage contemplates joint discharge of raw industrial and municipal wastewaters into the Pagasitikos Gulf through an ocean outfall off Agistri Cape. In both cases, the treatment facilities will be upgraded later, if necessary, for preventing deterioration in the quality of the receiving waters.

3. The Institute for Oceanographic and Fishing Research (IOKAE) is carrying out oceanographic studies of the Thermaikos and Pagasitikos Gulfs, and will conduct periodic monitoring of their waters once the proposed treatment and disposal facilities enter into operation. The industrial wastewater surveys should conform to these oceanographic studies as well as to the ongoing projects outlined in paragraph 2 above.

4. It is intended that the industrial wastewater surveys be conducted by a competent local engineering firm associated with an experienced foreign engineering firm so as to allow maximum utilization of local manpower, resources and skills.

5. The consultants will work under the direction of the Ministry of Public Works, which will seek the cooperation of industry to provide the information needed and allow the inspections, measurements and testing required.

6. The Government of Greece has requested a loan from the International Bank for Reconstruction and Development for partial financing of the first construction stage of the Salonica and Volos sewer systems and it is intended that part of the proceeds from this loan be applied towards the foreign exchange payments for the consultant's services.

7. It is expected that the industrial wastewater surveys be conducted simultaneously for both cities and that they be completed during a period not to exceed 18 months.

B. Objectives

8. The objectives of the industrial wastewater surveys are threefold:

(a) To provide the data on present and estimated future flows and characteristics of industrial wastewaters needed for designing the treatment and disposal facilities, and establishing the ocean monitoring program.

(b) To provide specific information on the toxics 1/ and incompatible pollutants 2/ which industry should remove from their liquid wastes prior to their discharge into the municipal sewers or to public land or water bodies, and to establish a time frame for removal and the degree of removal required.

(c) To assist the local sewerage authorities in establishing programs for monitoring industrial wastewater effluents and in the determination of appropriate industrial wastewater charges.

C. Scope

9. The work to be conducted by the consultants will include:

(a) Preparation of a list of major contributing industries 3/ indicating the type and characteristics of each industry; sources, volumes and main flow fluctuations of process and cooling waters, strength of wastewaters, description of existing pretreatment facilities and possibility of accidental spillage of strong wastes.

1/ Toxics - substances which are present in concentrations that are considered to be a threat to life processes.

2/ Incompatible Pollutants - substances which cannot be handled or will interfere with the proposed treatment and/or disposal procedure. For example, substances which will inhibit biological processes if a biological treatment plant is chosen.

3/ Major contributing industry is one that: (a) has a wastewater flow of 200 m3 or more per average work day or (b) has in its waste pollutant concentrations which require special consideration during the design of collection, treatment and/or disposal facilities.

(b) Preparation of a list of the industries which are discharging or could discharge toxics and/or incompatible pollutants, indicating the present average and maximum concentrations of such substances and the degree of removal required.

(c) Preparation of material flow sheets for the entire production process of each one of the potential polluters found from the above surveys. The flow sheets will indicate the amounts of raw materials, additives, end products, by-products and liquid and solid wastes so as to present an accurate mass balance of each production process. The flow sheets will also include wastewater flows and characteristics for each operation of the factory and indicate if the flows are continuous or intermittent and if there are seasonal fluctuations. The waste characterization should identify all important physico-chemical and biological parameters, that is, those in high concentrations or liable to reach toxic levels.

(d) Based on the flow sheets indicated above, economic comparison of inplant measures which may be taken by industry to eliminate or reduce toxics, incompatible pollutants or compatible pollutants in high concentrations. These measures should include the use of non-polluting raw materials, process modifications, recovery and separate disposal of pollutants, pretreatment at factory site, etc.

(e) Estimates of present and future flows and pollutant loadings of industrial wastewaters for each city, including minimum, average and peak flows and loadings. Combining these figures with those to be provided by the Ministry of Public Works for municipal wastewaters, suggestions will be made on the type and degree of treatment for the proposed municipal treatment plants.

(f) Detailed recommendations for establishing a program for monitoring industrial discharges, including staff and equipment required, points and frequency of measurement and sampling and parameters to be monitored.

(g) Recommendations on the tarifs which should be established by the local sewerage authorities for the collection, treatment and disposal of industrial wastewaters.

(h) Recommendations for establishing and subsequent upgrading of wastewater discharge guidelines and suggestions regarding the measures which should be adopted by Government for enforcing such guidelines and time frames for compliance. The initial guidelines, which will be implemented before the first construction stage enters operation, will be aimed to protect the collection system and the primary treatment facilities and to prevent toxicity in the receiving waters. These guidelines will be later modified in accordance with the results of the ocean monitoring and of any upgrading of the treatment processes.

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Oceanographic Studies in the Thermaikos and Pagasitikos Gulfs

Tentative Terms of Reference

A. Background

1. During the summer of 1975 the Institute for Oceanographic and Fishing Research (IOKAE) carried out two cruises on the Thermaikos and Pagasitikos Gulfs to determine the main oceanographic parameters required for the preliminary design of the Salonica and Volos sewer projects.

2. Based on the data obtained during these cruises and on feasibility studies conducted by engineering consultants, the Ministry of Public Works has adopted the following wastewater disposal and treatment procedures:

(a) Salonica - Joint discharge of municipal and industrial wastewaters into the Axios River. Primary treatment will be provided during first-stage construction.

(b) Volos - Joint discharge of municipal and industrial wastewaters into the Pagasitikos Gulf through a submarine outfall off Agistri Cape. Only pretreatment will be provided during first-stage construction.

In either case, the treatment facilities would be upgraded later should the subsequent ocean monitoring indicate deterioration in the water quality of the Thermaikos Gulf and/or Pagasitikos Gulf.

3. The Ministry of Public Works intends now to proceed with the final design and construction of the first-stage facilities outlined above.

B. Objectives

4. IOKAE will conduct additional studies of the Thermaikos and Pagasitikos Gulfs with the following objectives:

(a) to obtain the oceanographic data required for the final design and construction of the first-stage treatment and disposal facilities for Volos;

(b) to obtain the oceanographic data required for the feasibility studies and design of the Mega Emvolon sewer system which would serve the urban area of Greater Salonica south of Micra airport;

(c) to determine baseline conditions and dispersion patterns for monitoring the receiving waters once the disposal facilities enter into operation;

(d) to begin development of mathematical models of the Thermaikos Gulf for projecting water quality conditions under alternative waste loadings.

C. Scope

5. Determination of design data for the Volos submarine outfall at Cape Agistri:

(a) bathymetric survey and topographic mapping of the outfall area;

(b) subsoil profile (to a depth of at least three meters) of the outfall alignment by borings plus seismic bottom profiling or jet probings.

6. Determination of design data for the Mega Emvolon disposal system:

(a) Measurements of water temperatures, salinities and surface and bottom ocean currents in the sea around Mega Emvolon Cape.

(b) Fluctuations on the depth and thickness of the thermocline during various times of the year in the sea around Mega Emvolon Cape.

(c) Bathymetric surveys of the areas selected by the consultants for submarine outfall construction.

(d) Sub-soil profiling along the axis of the outfall alignments proposed by the consultants.

7. Determination of baseline conditions for future monitoring including the following parameters:

(a) physical oceanography: meteorology and physical constants (salinity, transparency, etc.);

(b) geological oceanography: transport and deposition of sediments;

(c) biological oceanography: benthos, phytoplankton, zooplankton, fisheries, microbiology and fish diseases;

(d) chemical oceanography: standard determinations (dissolved oxygen, nutrients, ammonia, etc.), trace metals in water, sediments and animals, chlorinated hydrocarbons in animals;

(e) inventories of fish and shell fish population, physiology and movements in the Thermaikos and Pagasitikos Gulfs.

8. Determination of dispersion patterns at the site where the Axios River flows into the Thermaikos Gulf and at the Agistri outfall area:

(a) establishment of variations on the depth and characteristics of the thermocline throughout the year;

(b) establishment of fluctuations of bottom and surface ocean currents and their relationship with tides and winds;

(c) establishment of the dispersion areas by salinity measurements and fluorescent dyes.

9. Development of a simplified mathematical model for the area where the Axios River waters disperse into the Thermaikos Gulf. A linear model should be developed and verified by field measurements. The model should serve to project physical, chemical and dissolved oxygen conditions in response to alternative waste loadings.

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Estimated Annual Project Expenditures

Item	1977	1978	1979	1980	1981	Total
	million of drachmas					
Salonica Sewerage						
Secondary Networks	-	27.0	38.8	27.0	25.2	118.0
Trunk mains	-	16.0	23.0	16.0	15.1	70.1
Pumping Stations	-	11.0	10.0	5.5	0.5	27.0
Force mains	-	3.0	3.0	2.0	-	8.0
Coastal Interceptors	-	8.0	12.0	12.0	3.5	35.5
Main interceptor	-	56.0	140.0	150.0	130.0	476.0
Treatment Plant	-	54.0	99.0	327.0	282.0	762.0
Maintenance equipment	5.0	-	-	-	-	5.0
Sub-Total	5.0	175.0	325.8	539.5	456.3	1,501.6
Land	60.0	-	-	-	-	60.0
Engineering and administration	54.4	37.5	28.5	32.4	27.4	180.2
Physical Contingencies	0.7	20.8	38.0	70.6	59.8	189.9
Sub-Total	120.1	233.3	392.3	642.5	543.5	1,931.7
Price Contingencies	24.8	73.9	191.8	403.5	442.1	1,136.1
Total	144.9	307.2	584.1	1,046.0	985.6	3,067.8
Volos Sewerage						
Secondary networks	-	29.0	62.0	67.0	42.0	200.0
Trunk mains	-	11.9	11.0	10.0	4.0	36.9
Pumping Stations	-	7.0	11.8	9.2	2.0	30.0
Force mains	-	7.5	6.0	3.2	-	16.7
Industrial area collector	-	9.0	8.7	-	-	19.7
Treatment plant	-	10.0	22.3	10.0	7.5	59.8
Main interceptor	-	-	22.3	10.7	23.0	56.0
Ocean outfall	-	-	15.2	6.6	2.4	24.2
Sub-Total	-	74.4	159.3	128.7	80.9	443.3
Land	8.3	1.2	-	-	-	9.5
Engineering and administration	16.0	13.5	12.5	6.9	4.3	53.2
Physical Contingencies	-	8.3	20.0	15.4	8.9	52.6
Sub-Total	24.3	97.4	191.8	151.0	94.1	558.6
Price Contingencies	5.1	34.1	96.9	98.6	76.5	311.2
Total	29.4	131.5	288.7	249.6	170.6	869.8
Studies and Training						
Industrial surveys	2.5	3.5	-	-	-	6.0
Oceanographic studies	4.4 1/	-	-	-	-	4.4
Mega Envolon design	-	3.4	3.5	-	-	6.9
Accounting and Financial	2.1	2.1	1.1	-	-	5.3
Training	0.8	1.1	0.8	-	-	2.7
Sub-Total	9.8	10.1	5.4	-	-	25.3
Price Contingencies	1.9	3.6	2.8	-	-	8.3
Total	11.7	13.7	8.2	-	-	33.6
GRAND TOTAL	186.0	452.4	881.0	1,295.6	1,156.2	3,971.2

1/ Work costing up to Dr. 20 million is expected to be started during 1976.

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Future Expansions of the Salonica and Volos Sewer Systems

Item	1982	1983	1984	1985	Total
Greater Salonica Sewer System					
Axios System					
Secondary sewers	55.0	55.6	55.0	55.0	220.6
Trunk mains	11.0	11.4	11.3	11.0	44.7
Dendropotamos interceptors	11.0	11.4	11.5	11.0	44.9
Sub-total	77.0	78.4	77.8	77.0	310.2
Engineering and administration - 12%	9.2	9.4	9.4	9.2	37.2
Physical contingencies	7.7	7.8	7.8	7.7	31.0
Sub-total	93.9	95.6	95.0	93.9	378.4
Price contingencies	96.7	118.5	138.7	160.6	514.5
TOTAL	190.6	214.1	233.7	254.5	892.9
Mega Emvolon System					
Secondary sewers	8.1	7.0	7.0	7.0	29.1
Trunk mains	4.6	2.3	2.3	3.4	12.6
Force mains	1.0	0.9	0.9	-	2.8
Pumping stations	3.3	5.6	6.3	-	15.2
Main interceptor	10.0	10.0	10.0	13.3	43.3
Treatment plant	42.2	38.2	32.1	21.9	134.4
Ocean outfall	-	6.0	10.0	12.0	28.0
Sub-total	69.2	70.0	68.6	57.6	265.4
Land	10.0	-	-	-	10.0
Engineering and Administration - 12%	8.3	8.4	8.2	6.9	31.8
Physical contingencies	9.2	10.1	10.3	8.7	38.3
Sub-total	96.7	88.5	87.1	73.2	345.5
Price contingencies	83.0	93.5	113.1	118.0	407.6
TOTAL	179.7	182.0	200.2	191.2	753.1
Total Greater Salonica	370.3	396.1	433.9	445.7	1,646.0
Greater Volos Sewer System					
Secondary sewers	11.5	12.3	12.7	13.7	50.2
Engineering and administration	1.4	1.5	1.5	1.6	6.0
Physical contingencies	1.2	1.2	1.3	1.4	5.1
Sub-total	14.1	15.0	15.5	16.7	61.3
Price contingencies	14.5	18.6	22.6	28.6	84.3
TOTAL	28.6	33.6	38.1	45.3	145.6

Physical contingencies: 10% for sewers, 15% for pumping stations and treatment plant, and 25% for ocean outfall.

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Summary of Estimated Project and Non-Project Capital Expenditures

1977 - 1985

Year	SALONICA				VOLOS			
	Project	Minor Additions during Project Period	Future Expansions	Total	Project	Water Supply Expansion	Future Sewerage Expansion	Total
	Millions of Drachma				Millions of Drachma			
1977	144.9	55.0	-	199.9	29.4	5.0	-	34.4
1978	307.2	65.0	-	372.2	131.5	10.0	-	141.5
1979	584.1	75.0	-	659.1	288.7	17.0	-	305.7
1980	1,046.0	90.0	-	1,136.0	249.6	23.0	-	272.6
1981	985.6	110.0	-	1,095.6	170.6	13.0	-	183.6
1982	-	-	370.3	370.3	-	13.0	28.6	41.6
1983	-	-	396.1	396.1	-	22.0	33.6	55.6
1984	-	-	433.9	433.9	-	42.0	38.1	80.1
1985	-	-	445.7	445.7	-	60.0	45.3	105.3

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ACCOUNTING AND FINANCIAL STUDIES

Cost Estimate

A. Staff Requirements (Man-Days)

	Salonica Sewerage	Salonica Water	Volos	Manager	Partner
Review Present Procedures					
General Accounting and Reporting	3	2	3	-	-
Fixed Assets	1	1	1	-	-
Materials and Supplies	2	1	2	-	-
Customer Accounting	1	2	1	-	-
Purchasing and Accounts Payable	4	2	2	-	-
Cash	2	1	1	-	-
Personnel Information and Payrolls	2	1	2	-	-
Government Regulations	1	1	1	5	1
Tariffs	1	3	2	-	-
General Supervision	-	-	-	10	2
Sub-Total	17	14	15	15	3
Preliminary Design and Recommended Changes					
Reporting	5	5	1	8	2
General Accounting	5	2	2	2	-
Fixed Assets	8	2	2	2	-
Materials and Supplies	8	2	2	2	-
Customer Accounting	4	2	5	2	-
Purchasing and Accounts Payable	8	2	2	2	-
Cash	5	2	2	1	-
Personnel Information and Payrolls	8	2	2	1	-
Government Regulations	-	-	-	5	1
Tariffs	2	6	5	2	-
General Supervision	-	-	-	-	6
Sub-Total	53	25	23	27	8
Draft Report and Review with the Authorities, Government and World Bank	4	4	2	10	4
Detailed Implementation Schedule and Work Program	2	2	2	2	1
Detailed Design, Documentation, Implementation, Training and Follow-up					
Reporting	10	10	10	6	1
General Accounting	10	10	10	6	1
Fixed Assets	10	10	10	6	1
Materials and Supplies	10	10	10	6	1
Customer Accounting	10	10	10	6	1
Purchasing and Accounts Payable	10	10	10	6	1
Cash	10	10	10	6	1
Personnel Information and Payrolls	10	10	10	6	1
Sub-Total	80	80	80	48	8
TOTAL	156	125	122	102	24

B. Estimated Costs

	Drachma (000)	US$ (000)
Partner - 24 man-days @ Dr. 16,000	384	11.0
Manager - (say) 100 man-days @ Dr. 10,000	1,000	28.6
Senior - (say) 400 man-days @ Dr. 6,000	2,400	68.5
Total Personnel Costs	3,784	108.1
Hotels and Meals - 524 days @ Dr. 600	315	9.0
Air Fares - Domestic: 125 @ Dr. 1,600	200	5.7
Foreign : 5 @ Dr. 15,000	75	2.1
Ground Transportation (say)	100	2.9
Office and Clerical Expenses (say)	126	3.6
Total Basic Costs	4,600	131.4
Contingencies (15%)	700	20.0
TOTAL	5,300	151.4

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ENGINEERING AND OCEANOGRAPHIC STUDIES

Cost Estimates

Item	Dr. (000)	US$ (000)
A. Industrial Wastewater Surveys		
Local Personnel:		
Sanitary engineers- 18 man-months at Dr. 90,000	1,620	46
- 6 man-months at Dr.120,000	720	20
Technicians - 30 man-months at Dr. 30,000	900	26
Foreign Personnel:		
Sanitary Engineer - 6 man-months at Dr.170,000	1,020	29
Chemist - 3 man-months at Dr.150,000	450	13
General:		
Equipment and supplies for laboratory and sample collection	280	8
Effluent Analysis - 40 complete tests at Dr. 5,000	200	6
- 60 partial tests at Dr. 3,500	210	6
Local transportation	350	10
Report and Miscellaneous	250	7
Total Industrial Wastewater Surveys	6,000	171
B. Feasibility Studies for the Mega Emvolon Sewerage System		
Local Personnel:		
Sanitary Engineers- 12 man-months at Dr. 90,000	1,080	31
- 10 man-months at Dr. 120,000	1,200	34
Topographer - 6 man-months at Dr. 50,000	300	9
Technicians - 24 man-months at Dr. 30,000	720	21
Draftsmen - 24 man-months at Dr. 35,000	840	24
Foreign Personnel:		
Sanitary Engineer - 10 man-months at Dr. 170,000	1,700	48
General:		
Borings and soil testing	260	7
Local transportation	580	17
Report and Miscellaneous	220	6
Total Feasibility Studies for the Mega Emvolon System	6,900	197
C. Oceanographic Studies (IOKAE)		
Local Personnel:		
Professional staff - - 24 man-months at Dr. 100,000	2,400	68
Laboratory Personnel - 12 man-months at Dr. 60,000	720	21
Secretaries - 12 man-months at Dr. 25,000	300	9
General:		
Laboratory equipment and supplies	520	15
Local transportation	270	8
Report and Miscellaneous	190	5
Total Oceanographic Studies	4,400	126

Notes:

a) For studies A and B costs include overhead and profit. For studies C costs include only overhead.

b) Costs for oceanographic studies include IOKAE personnel and equipment but exclude fully manned vessels provided by the Navy's Hydrographic Office.

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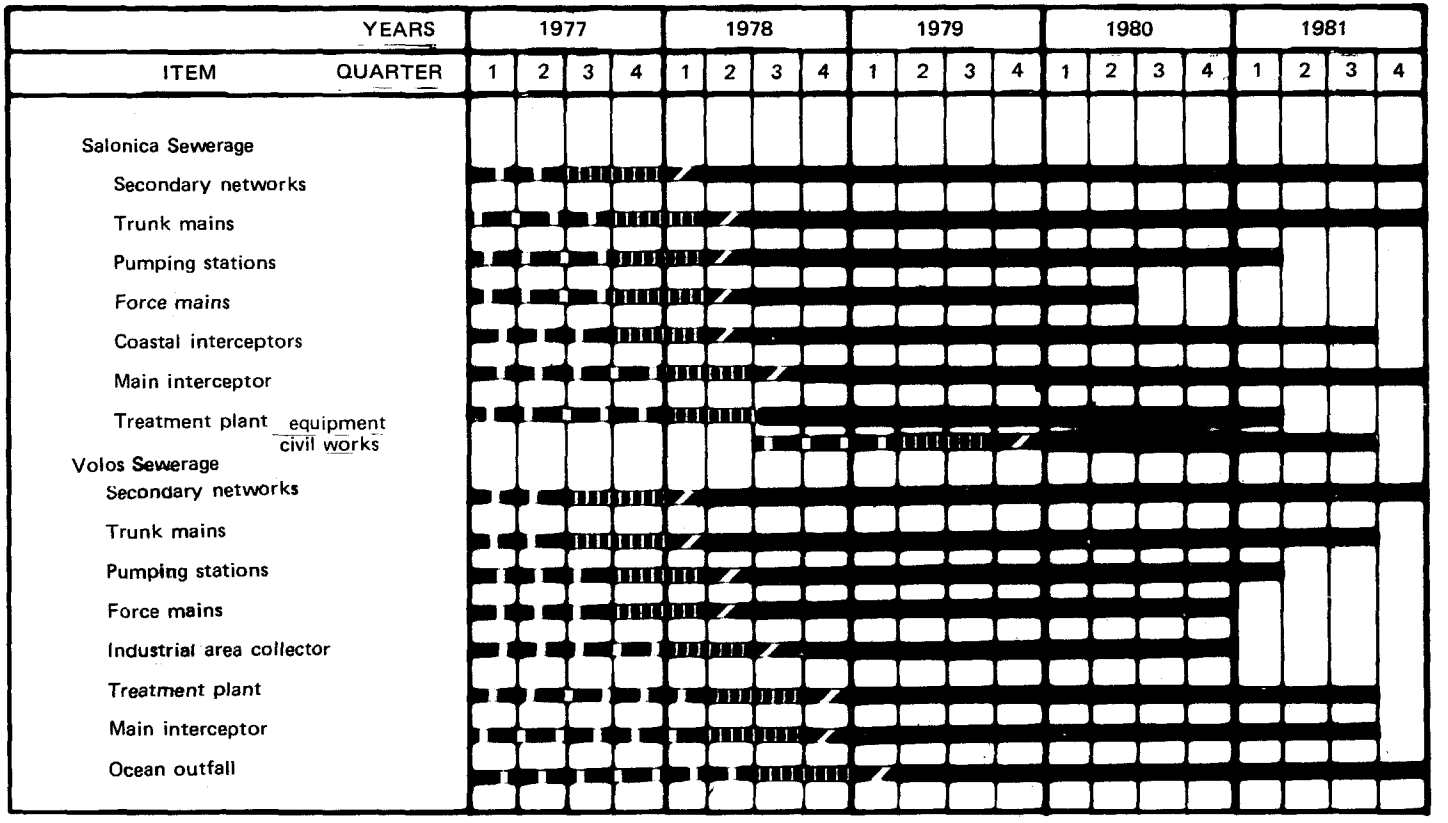
CONSTRUCTION SCHEDULE



Final design and bidding documents

Bidding and bid evaluation

Mobilization

Construction

World Bank—16003 (R)

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Key Indicators for Project Monitoring

The following key indicators will be monitored during and after project execution to measure the achievement of project objectives and to measure the technical and financial performance of the Salonica Sewerage Authority and of the Volos Water and Sewerage Organization. The various criteria will be reported quarterly, with information provided for the latest completed quarter and for the fiscal year to date. Accumulated figures as at the end of each quarter will be provided where appropriate.

1. Salonica

(a) Water Supply

(i) Water produced;

(ii) Water sales;

(iii) Percentage of water unaccounted for;

(iv) Water sales to premises connected to sewerage system;

(v) Number of water connections;

(vi) Population served by water supply system.

(b) Sewerage System

(i) Length and diameter of sewer extensions not included in the project;

(ii) Length and diameter of rehabilitated sewers;

(iii) Number of sewer connections;

(iv) Sewer charges to premises which have their own sources of water supply but are connected to the sewerage system.

(v) Population served by sewerage system.

(c) Axios River

(i) River flows;

(ii) BOD5 in the river, downstream of outfall;

(iii) SS and BOD_5 of raw sewage and plant effluent, indicating periods when chemical coagulation has been used and amount of coagulants.

(d) Salonica Bay

(i) MPN of B coli bacteria at all bathing beaches;

(ii) DO at White Tower outfall water column;

(iii) BOD_5 and SS at sewage outfalls discharging into bay.

(e) Staffing and Training

(i) Number of permanent employees;

(ii) Number of temporary employees;

(iii) Number of employees of each category undergoing training;

(iv) number of contractors' staff (high, low and average) employed.

(f) Financial Indicators

(i) Net plant investment per connection and per 1,000 population served;

(ii) Average revenue per m3 of water sold to sewered premises;

(iii) Rate of return;

(iv) Debt/equity ratio;

(v) Debt service coverage;

(vi) Internal cash ratio.

2. Volos

(a) Water Supply

(i) Water produced;

(ii) Water sales;

(iii) Percentage of water unaccounted for;

(iv) Water sales to premises connected to sewerage system;

(v) Number of water connections;

(vi) Population served by water supply system.

(b) Sewerage System

(i) Number of new sewer connections;

(ii) Number of condemned septic tanks;

(iii) Sewer charges to premises which have their own sources of water supply but are connected to the sewerage system;

(iv) Population served by sewerage system.

(c) Volos Bay

(i) MPN of B coli bacteria at all bathing beaches;

(ii) DO at estuary of Xerias Creek;

(iii) BOD_5 and SS at sewage outfalls discharging into bay.

(d) Staffing and Training

(i) Number of permanent employees;

(ii) Number of temporary employees;

(iii) Number of employees of each category undergoing training;

(iv) Number of contractors' staff (high, low and average) employed.

2. Financial Indicators

(i) Net plant investment per connection and per 1,000 population served (water and sewerage separately);

(ii) Average water revenue per m3 of water sold;

(iii) Average sewerage revenue per m3 of water sold to sewered premises;

(iv) Rate of return (water, sewerage and total);

(v) Debt/equity ratio;

(vi) Debt service coverage;

(vii) Internal cash ratio.

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Estimated Schedule of IBRD Loan Disbursements

IBRD Fiscal Year and Half Year	Salonica Sewerage	Volos Sewerage	Studies and Training	Total	Cumulative Total
			US$ (000)		
FY 1977					
December 31, 1976	-	-	-	-	-
June 30, 1977	-	-	85	85	85
FY 1978					
December 31, 1977	696	103	55	854	939
June 30, 1978	696	103	80	879	1,818
FY 1979					
December 31, 1978	1,477	463	80	2,020	3,838
June 30, 1979	1,477	463	50	1,990	5,828
FY 1980					
December 31, 1979	2,809	1,012	50	3,871	9,699
June 30, 1980	2,809	1,012	-	3,821	13,520
FY 1981					
December 31, 1980	5,028	875	-	5,903	19,423
June 30, 1981	5,028	875	-	5,903	25,326
FY 1982					
December 31, 1981	4,740	597	-	5,337	30,663
June 30, 1982	4,740	597	-	5,337	36,000
TOTAL	29,500	6,100	400	36,000	-

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Organization and Administration of Responsible Authorities

Water and Sewerage Authorities

1. In general, Greek law provides for water and sewerage services to be the responsibility of individual municipalities under the general supervision of the Ministry of Interior. However, legal provision exists for the transfer of these functions to the Government, or to a separate legal entity, if circumstances so require, in which case supervision becomes the responsibility of the Ministry of Public Works. The main reasons for the establishment of a separate authority would be those of financial viability, and technical competence.

A. Salonica Water Authority

2. The Salonica Water Authority (SWA) will not be directly concerned with the construction aspects of the sewerage project but it will be involved with the project in a number of ways. Firstly, as the principal water authority within the project area, its level of production and distribution of water are crucial to the design and operation of the sewerage system and continuous accurate measurement of these factors is essential. Secondly SWA will act as agent for the collection of sewerage charges based on water consumption. Thirdly, it is expected that, in due course, the water and sewerage authorities will combine, making it essential that there be closely related technical standards and common systems of accounting, financial reporting and financial control.

3. In January 1976 there was a total of 28 different water authorities in the Salonica project area. However, SWA supplied almost 95% of the total water and it is understood that it will take over responsibility for all supplies of the area during 1976. Water is at present supplied to the new industrial zones to the west of Salonica mainly from private wells, but SWA has plans to extend its service to these areas in due course.

4. SWA was established by Compulsory Law 1563 in 1939, to take over from a French-based company which had been responsible for water supplies to the city and surrounding district since the days of the Ottoman State in 1888. The authority is governed by a small Board of Directors chaired (ex-officio) by the Mayor of Salonica. The Board is responsible for the control of overall policy and administration and in particular for approving the raising of loans, budgets and annual reports, tariffs and construction projects. The law delegates to the Chairman of the Board a general oversight of the

implementation of its decisions. The Chairman also reviews deposits into and withdrawals from the authority's bank accounts and co-signs payment orders with the Director-General. There is also an Executive Committee which meets regularly on a weekly basis to decide upon matters delegated to it by the Board.

5. The day-to-day operations of the authority are in the hands of a Director-General who reports to the Board of Directors and attends its meetings in an advisory capacity.

6. The organization chart of the authority is given as Attachment 1. There are currently about 430 administrative, technical and professional staff and about 200 manual workers.

7. All decisions of the authority of any importance are subject to approval by various Government departments, such as the Ministry of Northern Greece, Ministry of Public Works and Ministry of Finance. All orders for the payment of money are apparently forwarded for approval to the Ministry of Finance branch office in Salonica, before payment.

8. Tenders for the procurement of goods or the execution of works are subject to approval by the Ministry of Northern Greece and/or the Ministry of Public Works, depending on the estimated costs. Small contracts are approved under delegated powers by the Prefect. Large construction expenditures financed out of Government funds are sometimes handled entirely by the Ministry of Public Works, which carries out construction and hands the works over to SWA on completion.

9. The authority's annual budget, after approval by its Board, is forwarded to the Prefect, Ministry of Public Works and Ministry of Finance for approval. The number of personnel is controlled by the Ministry of Public Works. The budget is drawn up and related accounts are kept on a simple cash basis, with no clear distinction drawn between capital and recurrent revenues and expenditures. Records of stores are kept on a quantity basis only. Annual financial statements in the form normally understood are not prepared. Instead copies of all detailed financial statements, payment orders and supporting documents are sent at the year end to various government offices including the Audit Office of the Ministry of Finance, where they are frequently retained for several years before being returned.

10. Water is charged for by meter, with virtually all paying customers being metered. Meters are read every three months on a rotating basis. Certain classes of customers (industrial, hospitals, municipalities and public services) receive water at reduced rates. Free water is supplied to elementary public schools, and certain Government buildings. Unpaid accounts are followed up and water services disconnected if these are not paid after due reminder.

11. The organization occupies well-appointed offices, which have become, however, somewhat crowded.

12. A computer system is used for billing arrangements and a limited number of other accounting and office machines are in use. There are proposals for introducing a computer system to cover all accounting procedures.

B . Salonica Sewerage Authority

13. Until December 31, 1975 sewerage in the project area was the responsibility of the various Municipalities. On December 31, 1970 the Salonica Sewerage Authority (SSA) was legally established by Legislative Decree 787/70 (as amended by Law No. 59/75) but, apart from undertaking certain construction works in 1975 this authority did not take over active responsibility for the various sewerage systems until January 1, 1976.

14. The new authority, which operates under the supervision of the Ministry of Public Works, is now responsible for the construction, maintenance and operation of all sewerage systems within its area, together with stormwater sewers and certain other land drainage facilities.

15. Neither the new industrial zones to the east of Salonica, nor the Mega Emvalon peninsula to the west, at present fall within the jurisdiction of the new authority. The authority's jurisdiction can be extended by legislative decree on the recommendation of the Minister of Public Works.

16. SSA is controlled by a Board of 5 members, plus a chairman. The members of the Board are appointed by various government departments and by the Salonica municipality. This Board was first appointed in October 1974, with the task of establishing an administrative organization to take over full responsibility for sewerage operations as soon as possible. The Board is responsible for the control of overall policy and administration and, in particular, for approving the raising of loans, budgets and annual reports, tarifs and construction projects. The law delegates to the Chairman of the Board a general oversight of the implementation of its decisions. The Chairman also co-signs payment orders with the Director-General.

17. The day-to-day operations of the authority are in the hands of a Director-General, who reports to the Board of Directors and attends its meetings in an advisory capacity.

18. The organization chart of the authority is given as Attachment 2. By the end of 1977 the authority is expected to have about 135 administrative, professional and technical staff, and about 130 manual workers. By January 1976 about 75 administrative, professional and technical staff and about 45 manual workers had been appointed.

19. The laws governing the authority set out its duties and responsibilities in considerable detail. All decisions of the authority of any importance are subject to approval by various government departments, such as the Ministry of Northern Greece, Ministry of Public Works and Ministry of Finance. Payment orders are forwarded for approval to the Ministry of Finance branch office in Salonica, before payment.

20. Tenders for the procurement of goods or the execution of works are subject to approval by the Ministry of Northern Greece and/or the Ministry of Public Works, depending on the estimated costs. As with the water authority it is expected that large construction works financed out of public funds would be handled entirely by the Ministry of Public Works which would carry out construction and hand over the works to the authority on completion.

21. The authority's annual budget, after approval by the Board, is forwarded to the Prefect, Ministry of Public Works and Ministry of Finance for approval. The number of personnel is controlled by the Ministry of Public Works.

22. The budget is drawn up and the related accounts are to be kept on a simple cash basis, with no clear distinction between capital and recurrent expenses. Stores records have not yet been established but could be expected to be kept on the basis of quantities only.

23. It is not expected that the authority will be required to prepare annual financial statements in the form normally understood. Instead, copies of all detailed financial statements, payment orders and supporting documents are expected to be sent at the year end to various government departments, including the Audit Office of the Ministry of Finance.

24. The law prescribes specific sources of revenue for the authority. Its main revenue source for operations is a 40% surcharge on billings for water. This is handled by the Salonica Water Authority through its computerized billing system. The law also provides for the recovery of costs of connection to the network and, in addition, for a contribution towards network construction costs. Provision is also made in the law for funds equal to 3% of actual or notional income from property rentals to be placed at the disposal of the authority for construction or debt service. This revenue is assessed and collected by the central Government through its income-tax procedures (Annex 21) and has been deposited in a special bank account. The joint authorization of the Ministers of Public Works and Finance is needed for its utilization.

25. The authority has established itself in reasonably satisfactory offices. Its accounts at the present time are kept on a very simple manual basis, using loose leaf ledger cards of a fairly standard pattern.

26. The authority does not operate a cesspit emptying service. This function is carried out by private contractors.

C. Volos Area Water and Sewerage Authorities

27. In the project area of Volos there are, at present, three main authorities concerned with water supply and sewerage.

28. The principal authority is the Volos Municipal Water and Sewerage Authority (VMWSA), which serves the area of Volos municipality and certain surrounding districts. This authority was incorporated as a separate municipal water authority in 1962 under Royal Decree 591/62. In 1971, in accordance with Royal Decree 714/70 the authority took over responsibility for sewerage and stormwater services. Its formal title is now "Municipal Organization of Water Distribution and Sewerage System of Volos."

29. The authority is managed by a six-member Board of Directors appointed by the Municipality, with the approval of the Prefect of Magnisia, and with the Mayor of Volos as chairman.

30. The organization chart of the authority is shown as Attachment 3. As indicated, the authority has no Director-General. The chief technical officer and chief financial officer both report direct to the chairman (mayor) who is consequently involved in a considerable amount of day-to-day activity. In practice, the chairman signs various documents (work orders, payment orders, etc.) which would normally be dealt with by a Director-General.

31. The authority currently employs about 60 administrative, professional, and technical staff and about 60 manual workers.

32. The authority must comply with many detailed regulations relating to municipal operations and is responsible to the Ministry of Interior. All decisions of any importance are subject to the approval of the Prefect, and in certain instances by the Ministry of Interior. These decisions include raising of loans, approval of budgets, fixing of tariffs and authorization of construction work. In addition, the annual budget of the authority must be approved by the Municipal Council before being forwarded to the Prefect.

33. Construction work, with certain exceptions, is handled by the authority. However, decisions on the selection of contractors, after tendering procedures, are subject to the approval of the "Council of Public Works" of the Ministry of Interior. The precise procedures for various approvals depend upon different formal arrangements for funding, and in particular, the extent to which government funds are involved.

34. Arrangements exist for large construction works financed from government funds to be handled entirely by the Ministry of Public Works, which would hand over the works to the authority on completion.

35. The authority's accounts are kept in a manner prescribed by the Ministry of Interior. They follow a simple cash basis, with no clear allocation between capital and recurrent activities. Stores accounts are kept on a quantity only basis. Apart from the use of a computer service bureau for billing (see below) all financial records are kept manually. Accounts are balanced monthly and every four months all financial statements and supporting documents are forwarded for examination to the Prefect. At the end of the year, these documents are forwarded to the Audit Office of the Ministry of Finance where they are retained for several years before being returned to the Authority.

36. The law prescribes specific revenues for the authority. The main revenue source for operations is a metered charge for water. Virtually all charged water supplies are metered, and meters are read every two months. The meter records are sent to a service bureau and the billing is prepared from them by a computer. During the months when the meters are not read, the meter readers are employed on meter repair work.

37. A sewerage charge is levied at present at 40% of the water charge, for those connected to a sewer system. Other water consumers pay a surcharge of 10% to cover the costs of stormwater drainage.

38. Charges are levied for connections to the water and sewer systems and provision exists for contributions from consumers towards network extensions.

39. Free supplies of water (and free sewerage services) are provided to churches and to the municipality for public gardens and street cleaning. Government establishments pay 40% of normal charges, as do hospitals and government schools.

40. The water supply service for the town of Nea Ionea is part of its normal municipal services. There is no sewerage system. There is no separate water department nor separate accounting arrangements. The financial reporting and budget system of the Municipality is on a simple cash basis and the accounting and billing systems are manual. External financial controls are similar to those described above for VMWSA and the Municipality is similarly subject to the control of the Prefect and the Ministry of Interior.

41. Extensions to the water system are carried out by contract and the operation and maintenance by the technical services of the Municipality. There are about 15 personnel on the staff of the Municipality who are wholly or mainly concerned with the water supply system.

42. In the new industrial zone to the north-west of the city a separate water supply system has been provided by the Hellenic Industrial Development Bank (ETVA) as part of the site infrastructure. VMWSA operates and maintains this system at the expense of ETVA and also collects revenues from the sale of water to industrial premises on behalf of ETVA.

D. Ministry of Public Works

43. Attachment 4 is a simplified organization chart of the Ministry of Public Works (MPW) showing in detail only the Ministry's Divisions which will be involved in the project.

44. The Water Supply and Sewerage Department of the Hydraulics Division is responsible for approving all water supply and wastewater projects except those of Athens, for which the Hydraulics Division has created a separate Athens Water Supply Department. The projects are prepared by

private consultants and are usually financed through Government grants. Project approval is granted exclusively on technical grounds and the consultants are not required to provide financial feasibility analysis.

45. Construction of all major projects under the jurisdiction of the MPW (wastewater, water supply, irrigation, drainage, highways, housing, etc.) are carried out by private contractors selected through public bidding and are supervised by the Ministry's Regional Inspectorates. Accordingly, the construction of the proposed Salonica and Volos sewerage projects would be supervised by the Macedonia and Thessalia Inspectorates, respectively.

46. Design and construction of wastewater projects are governed by detailed specifications issued by the MPW many years ago. Today, these are badly outdated. These specifications cover only the collection systems and fail to include most of the design criteria for pumping equipment, piping materials, joints, linings, and coatings which are commonly used in current sanitary engineering practice.

47. The MPW requires now that all wastewater projects include treatment facilities. However, since there are no guidelines in water quality criteria and little expertise in wastewater disposal processes, the consultants have often designed sophisticated treatment plants which have little or no relation to the degree of treatment required. The lack of guidelines on industrial wastewater discharge is a further cause for poorly designed projects.

48. Wastewater projects are usually designed for the flows expected 40-50 years into the future but construction staging is rarely used so that over-design is common. In some of the large interceptors built in Athens in recent years, this over-design is already causing serious odor and corrosion problems.

49. The Ministry is fully aware of the wastewater project's shortcomings and to correct this situation is now creating a separate Wastewater Department within the Hydraulics Division. The Ministry intends to develop expertise within this Department in water pollution control, industrial wastewater management and in wastewater treatment and disposal processes. The Wastewater Department would take over responsibility for approval of all wastewater projects, update design and construction specifications and establish guidelines for water quality criteria and industrial wastewater discharges. The Ministry intends, however, to gradually shift responsibility for construction supervision to local sewerage authorities.

50. The MPW also intends to create a project appraisal unit within its Hydraulics Division. This unit, which would be staffed by engineering economists and financial analysts, would analyze the economic and financial feasibility of all hydraulics projects and would advise local authorities on financial problems.

E. The Institute of Oceanographic and Fishing Research (IOKAE)

51. IOKAE is a semi-autonomous organization created in 1965 under the Ministry of Culture and Science to undertake research on oceanography and fisheries.

52. IOKAE's activities remained confined to ichthyology (study of fish) until 1973 when the Government, at the suggestion of the UNDP, sought IOKAE's participation in the feasibility studies for the sewerage of Athens. Since that time and with UNDP's assistance, IOKAE has been hiring personnel and acquiring equipment for physical oceanography.

53. The Athens studies have been delayed, so in 1975, the Government assigned to IOKAE the preliminary oceanographic surveys for the Salonica and Volos sewerage projects. These surveys, conducted under terms of reference suggested by the Bank, were complete and accurate.

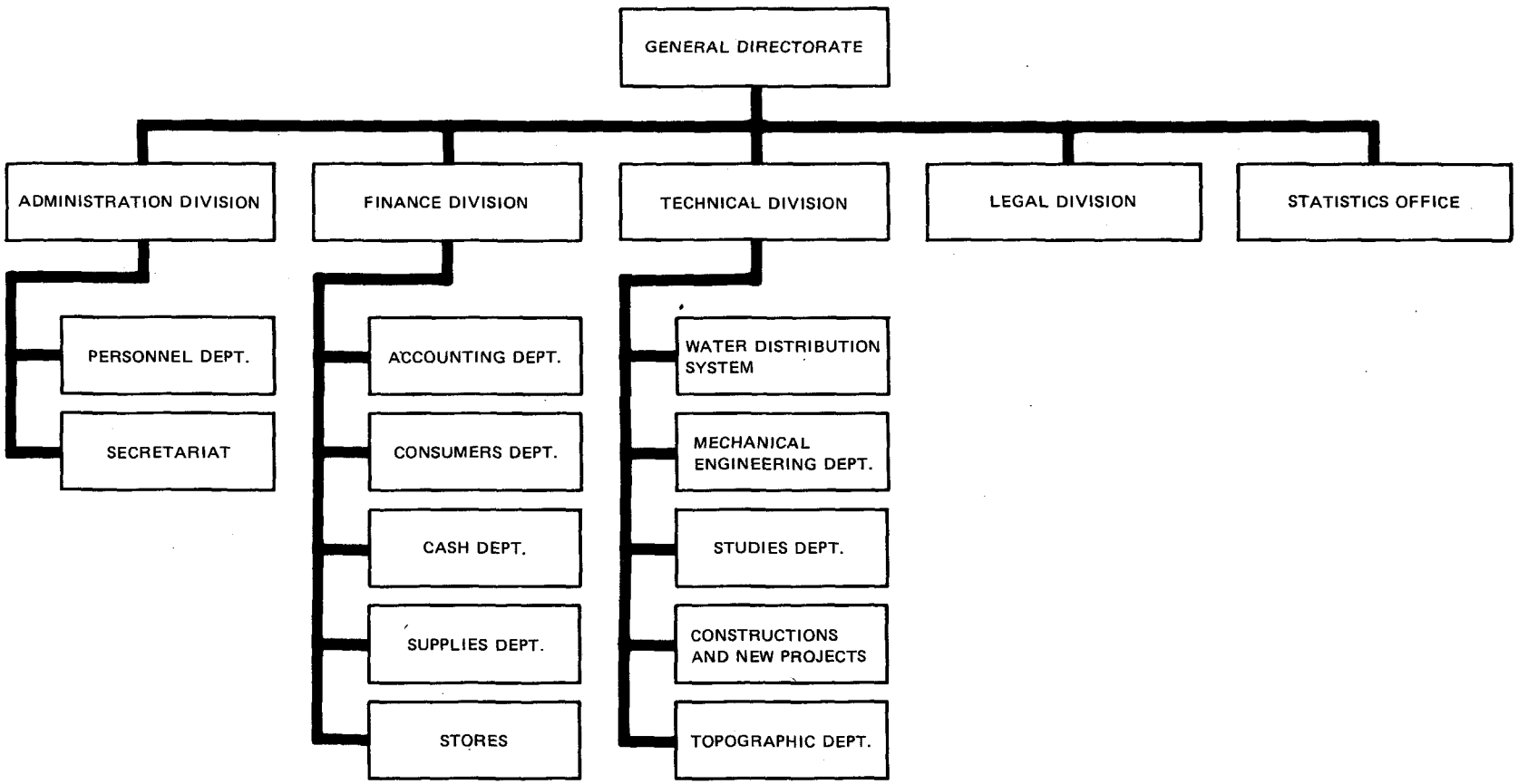
54. IOKAE has now on its staff 28 professionals, of which 23 have studied abroad, and recruitment continues to fill newly created positions. Laboratory space is presently about 400 m3 but plans are already underway to provide an additonal 600 m3 by 1977. Equipment for physical oceanography is adequate but additional equipment is needed for geological oceanography and meteorology.

55. IOKAE has now only two small boats so it needs to borrow oceanographic vessels from the Navy's Hydrographic Office. The Government intends, however, to provide IOKAE with suitably equipped oceanographic and fishing ships in the near future.

56. The Government considers that the participation of IOKAE is essential for controlling the pollution of ocean waters and desires to expand further its technical capabilities. Consequently, the oceanographic studies included in this project were designed to provide not only the data required for final project design, but also to develop within IOKAE expertise on monitoring of ocean waters and preparation of mathematical models of water quality.

November 1976

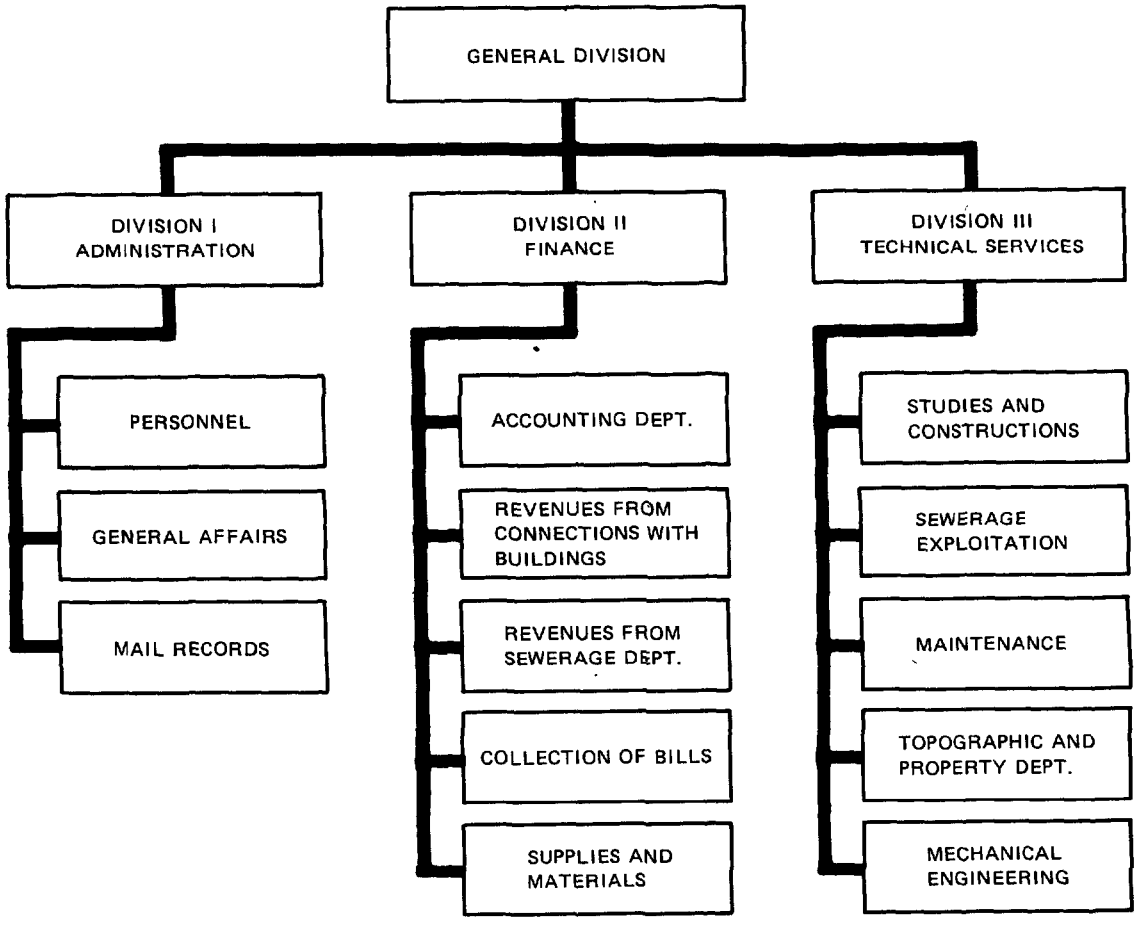
GREECE–SALONICA AND VOLOS SEWERAGE PROJECT
ORGANIZATION CHART OF SALONIKA WATER SUPPLY AUTHORITY



November 1976

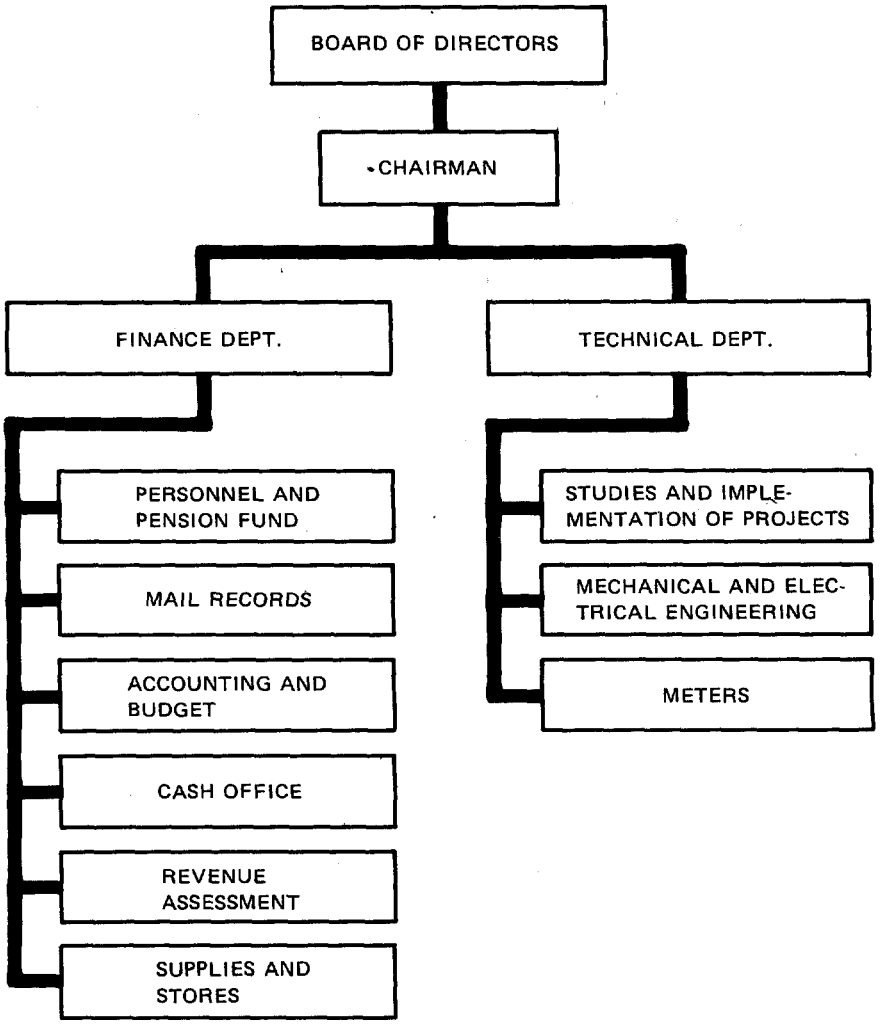
World Bank–16098

GREECE–SALONICA AND VOLOS SEWERAGE PROJECT
ORGANIZATION CHART OF SALONICA SEWERAGE AUTHORITY



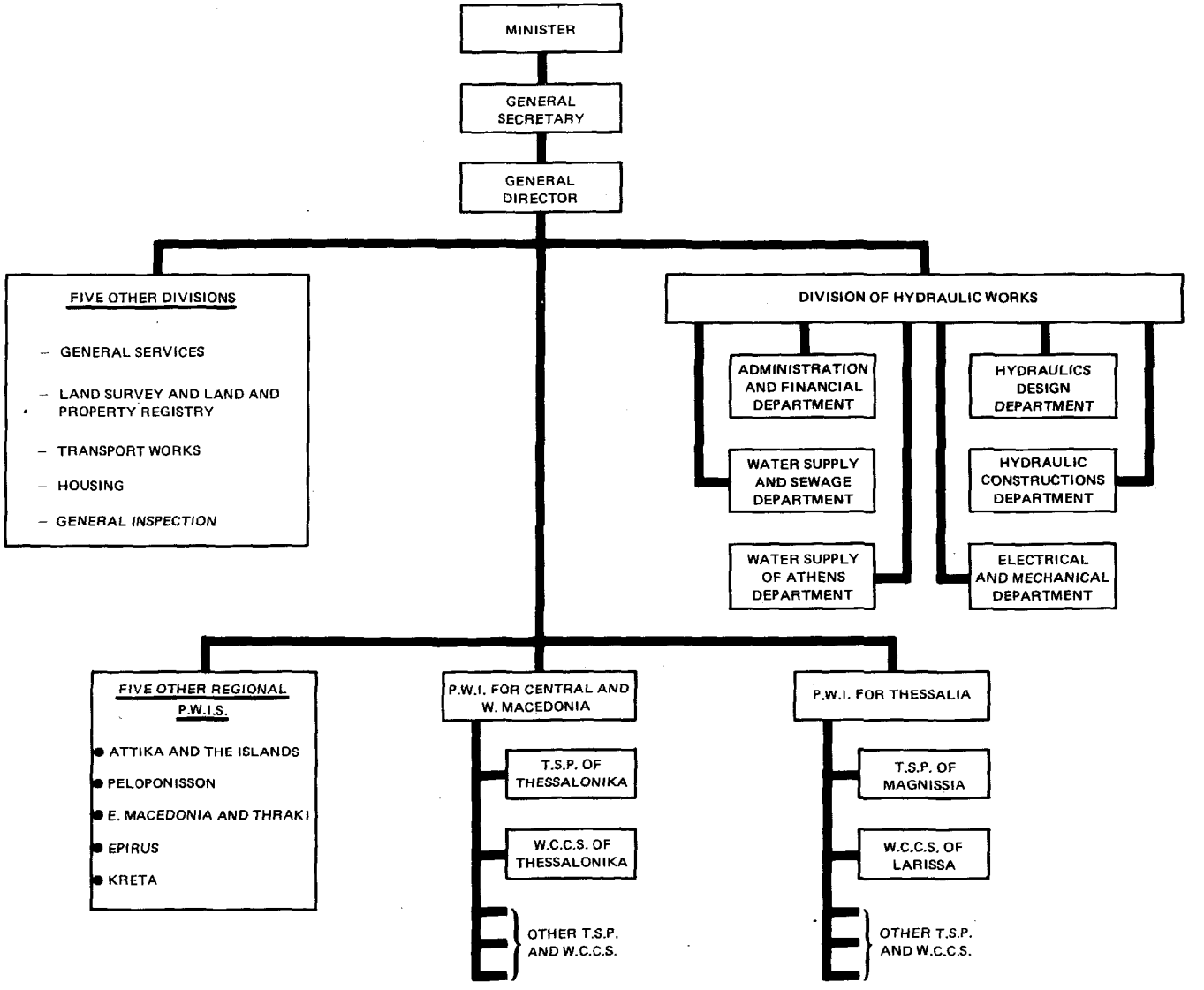
November 1976

GREECE–SALONICA AND VOLOS SEWERAGE PROJECT
ORGANIZATION CHART OF VOLOS WATER SUPPLY AND SEWERAGE AGENCY



November 1976

GREECE–SALONICA AND VOLOS SEWERAGE PROJECT
GENERAL ORGANIZATION CHART OF THE MINISTRY OF PUBLIC WORKS



P.W.I. – PUBLIC WORKS INSPECTORATE
T.S.P. – TECHNICAL SERVICES OF THE PREFECTURE OF
W.C.C.S. – WORKS CONSTRUCTION CONTROL SERVICE

November 1976

World Bank–16200

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

Explanation of Financing Plans

A. Salonica

1. It is proposed that Dr. 1,032.5 million (US$29.5 million) of the Bank loan be allocated to this project component. This would cover about 29% of funds requirements, and the full project foreign exchange costs. (The table shows a disbursement lag, which would be temporarily covered by increased Government finance).

2. Contributions are assumed to be received from industry towards identifiable incremental capital costs of industrial sewers amounting to Dr. 63.6 million and a further Dr. 152.5 million is assumed from capital contributions from non-industrial sources. Together, these contributions would cover about 6% of funds requirements.

3. Property taxes expected to be assigned to SSA during the construction period are estimated to contribute Dr. 693.0 million towards funds requirements and the redemption of the investment of earlier property tax receipts will amount to Dr. 175.5 million. Together, these sources will provide about 24% of funds requirements.

4. Net internal cash generation is estimated at Dr. 321.0 million, which, after having allowed for growing debt service requirements of Dr. 479.9 million, will provide about 9% of funds requirements. This low proportion reflects the fact that present tariffs are far too low and are expected to be gradually raised during the construction period. It also reflects the amortization of the Bank loan in 1980 and 1981 (Dr 86.0 million in each year) resulting from the 3-year grace period.

5. All other funds requirements, after allowing for the foregoing, are assumed to be provided in the form of a loan from the Government, amounting to Dr. 1,516.7 million and providing about 42% of funds requirements.

B. Volos

6. It is proposed that Dr. 213.5 million (US$6.1 million) of the Bank loan be allocated to this project component, which would cover about 22% of funds requirements and the full project foreign exchange costs. (The table shows a disbursement lag, which would be temporarily covered by increased Government finance).

7. Contributions are assumed to be received from industry towards identifiable incremental capital costs of industrial sewers, amounting to Dr. 43.7 million and a further Dr. 93.5 million is assumed from capital contributions from non-industrial sources. Together, these contributions would cover about 14% of funds requirements.

8. Net internal cash generation is estimated at Dr. 216.2 million, which, after having provided for growing debt service requirements of Dr. 127.9 million will provide about 22% of funds requirements. This relatively low proportion reflects the fact that present water tariffs are too low and are expected to be gradually raised during the construction period. It also reflects the amortization of the Bank loan in 1980 and 1981 (Dr. 17.8 million in each year) resulting from the 3-year grace period. Full sewerage tariffs are not expected to be implemented until the project is completed.

9. All other funds requirements, after allowing for the foregoing, are assumed to be provided from Government sources. Half of this sum is assumed to be in the form of equity and the remainder as a loan. Together, these government funds are assumed to provide almost 60% of funds requirements.

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APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

SALONICA SEWERAGE AUTHORITY

WASTEWATER INCOME STATEMENT 1976 - 1985

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Consumption of Water at Premises Connected to Wastewater System (000 m^3)										
Industrial	7,130	8,050	8,620	9,200	9,420	15,180	22,210	25,100	26,860	28,670
Domestic and Commercial	18,460	20,240	22,110	24,060	26,090	27,370	29,100	30,880	32,690	35,110
Total Consumption	25,590	28,290	30,730	33,260	35,510	42,550	51,310	55,980	59,550	63,780
Connections										
New Connections during year	1,000	1,200	1,200	1,200	1,200	1,200	1,800	1,800	1,800	1,800
Total Connections at year end	52,600	53,800	55,000	56,200	57,400	58,600	60,400	62,200	64,000	65,800
Connections Rehabilitated	-	1,400	1,400	1,400	1,400	1,400	1,130	1,000	1,000	1,000
Charges (Average) (Dr/m^3)	1.95	3.0 1/	5.5	7.0	9.0	12.0	13.0	13.0	13.0	13.0
Connection Fees (Average) (Dr) (000)	10.0	9.25	10.0	10.8	11.8	12.7	13.7	14.8	15.9	17.2
Operating Revenues	---------- Drachma (000) ----------									
Industrial	14,000	24,200	47,300	64,400	84,600	189,600	288,600	326,300	349,700	373,100
Domestic - Metered	36,000	60,700	121,600	168,700	234,900	328,800	378,300	401,700	425,100	456,300
Connection Charges	10,000	11,100	12,100	13,000	14,100	15,200	24,600	26,600	28,700	31,000
Total Operating Revenues	60,000	96,000	181,000	246,100	333,600	533,600	691,500	754,600	803,500	860,400
Operating Expenses										
Salaries	34,300	64,900	81,000	95,600	112,100	145,900	176,400	208,900	241,500	279,400
Materials	5,200	16,200	18,700	21,400	24,600	29,600	21,500	25,500	29,600	34,200
Administration	6,300	7,600	9,100	10,600	12,200	16,000	20,500	24,300	27,900	32,200
Fuel and Power	1,000	1,700	2,400	2,600	5,900	7,700	9,100	10,000	11,200	12,300
Treatment Works	0	0	0	0	0	45,600	51,500	58,300	65,600	73,800
Connection Costs	10,000	12,500	13,700	14,700	16,000	17,200	23,100	24,300	26,200	28,300
Depreciation	31,100	33,375	36,625	41,244	46,431	83,973	121,203	126,261	131,859	147,375
Total Operating Expenses	87,900	136,275	161,525	186,144	217,231	345,973	423,303	477,561	533,859	607,575
Operating Income	(27,900)	(40,275)	19,475	59,956	116,369	187,627	268,197	277,039	269,641	252,825
Net Income Before Interest	(27,900)	(40,275)	19,475	59,956	116,369	187,627	268,197	277,039	269,641	252,825
Interest Charged Operations	0	5,500	17,700	39,200	89,800	155,700	191,700	184,300	177,100	171,900
Net Income	(27,900)	(45,775)	1,775	20,756	26,569	31,927	76,497	92,739	92,541	80,925
Rate of Return	(2.3)	(3.1)	1.4	3.9	6.9	6.0	5.9	6.0	5.8	4.9
Operating Ratio %	147	142	89	76	65	65	61	63	66	71
Depreciation/Gross Plant	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50

1/ Dr. 4.0 assumed from mid-1977.

November 1976

APPRAISAL OF

THE SALONICA AND VOLOS SEWERAGE PROJECT

GREECE

SALONICA SEWERAGE AUTHORITY

STATEMENT OF SOURCES AND APPLICATION OF FUNDS (1976 - 1985)

	1976	1977	1978	1979	1980	1981	1977-1981 Total	1982	1983	1984	1985
						Drachma (000)					
Internal Sources											
Net Income Before Interest	(27,900)	(40,275)	19,475	59,956	116,369	187,627	343,152	268,197	277,039	269,641	252,825
Depreciation	31,100	33,375	36,625	41,244	46,431	83,973	241,648	121,203	126,261	131,859	147,375
Consumer Contribution	7,500	23,000	39,500	44,900	51,300	57,400	216,100	39,000	42,800	46,500	51,200
Investments	0	35,000	35,000	35,000	35,000	35,500	175,500	0	0	0	0
Total Internal Sources	10,700	51,100	130,600	181,100	249,100	364,500	976,400	428,400	446,100	448,000	451,400
Operational Requirements											
Working Capital	12,400	8,500	19,400	15,420	20,000	46,700	110,020	35,480	15,820	14,880	17,180
Debt Service	0	5,500	17,700	39,200	175,800	241,700	479,900	310,900	306,100	301,900	301,300
Total Operational Requirements	12,400	14,000	37,100	54,620	195,800	288,400	589,920	346,380	321,920	316,780	318,480
Net Available from Operations	(1,700)	37,100	93,500	126,480	53,300	76,100	386,480	82,020	124,180	131,220	132,920
Construction Requirements											
Ongoing Works	90,000	0	0	0	0	0	0	0	0	0	0
Proposed Project	0	144,900	307,200	584,100	1,046,000	985,600	3,067,800	0	0	0	0
Other	0	55,000	65,000	75,000	90,000	110,000	395,000	370,300	396,100	433,900	445,700
Total Construction Requirements	90,000	199,900	372,200	659,100	1,136,000	1,095,600	3,462,800	370,300	396,100	433,900	445,700
Balance to Finance	91,700	162,800	278,700	532,620	1,082,700	1,019,500	3,076,320	288,280	271,920	302,680	312,780
Financed By:											
IBRD Loan	0	24,300	76,100	150,000	274,300	341,900	866,600	165,900	0	0	0
Government Loan	0	28,500	78,600	245,600	655,400	508,600 1/	1,516,700	(62,600) 1/	64,900	74,700	62,800
Property Tax	97,000	110,000	124,000	137,000	153,000	169,000	693,000	185,000	207,000	228,000	250,000
Total	97,000	162,800	278,700	532,600	1,082,700	1,019,500	3,076,300	288,300	271,900	302,700	312,800
Surplus (Deficit) of Funds											
Annual	5,300	0	0	(20)	0	0	(20)	20	(20)	20	20
Accumulated	5,300	5,300	5,300	5,280	5,280	5,280	5,280	5,300	5,280	5,300	5,320
Net Available from Operations/ Construction Requirements %	(2)	19	25	19	5	7	11	22	31	30	30
Internal Cash Ratio	-	2.4	5.1	5.4	4.2	3.7	4.2	1.8	2.6	2.6	2.4
Debt Service Cover	0.0	9.3	7.4	4.6	1.4	1.5	2.0	1.4	1.5	1.5	1.5

1/ Including a temporary loan of Dr. 62.6 million, raised in 1981 and repaid in 1982.

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THE SALONICA AND VOLOS SEWERAGE PROJECT

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SALONICA SEWERAGE AUTHORITY

BALANCE SHEET AS AT DECEMBER 31, 1976-1985

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
ASSETS	Drachma (000)									
Fixed Assets										
Plant in Operation	1,290,000	1,380,000	1,550,000	1,749,500	1,965,000	4,752,800	4,943,400	5,157,500	5,391,200	6,398,800
Less: Depreciation	31,100	64,475	101,100	142,344	188,775	272,748	393,951	520,212	652,071	799,446
Net Plant in Operation	1,258,900	1,315,525	1,448,900	1,607,156	1,776,225	4,480,052	4,549,449	4,637,288	4,739,129	5,599,354
Work in Progress	0	109,900	312,100	771,700	1,692,200	0	179,700	361,700	561,900	0
Long-term Investments	175,500	140,500	105,500	70,500	35,500	0	0	0	0	0
Current Assets										
Cash and Banks	16,300	16,600	19,200	21,580	24,680	31,280	35,000	40,280	45,700	51,920
Accounts Receivable	12,000	19,200	36,200	49,220	66,720	106,720	138,300	150,920	160,700	172,080
Inventories	1,700	5,400	6,200	7,100	8,200	12,400	12,400	12,400	14,200	16,300
Total Current Assets	30,000	41,200	61,600	77,900	99,600	150,400	185,700	203,600	220,600	240,300
TOTAL ASSETS	1,464,400	1,607,125	1,928,100	2,527,256	3,603,525	4,630,452	4,914,849	5,202,588	5,521,629	5,839,654
LIABILITIES AND EQUITY										
Equity										
Capital	1,385,200	1,385,200	1,385,200	1,385,200	1,385,200	1,385,200	1,385,200	1,385,200	1,385,200	1,385,200
Retained Earnings	(27,900)	(73,675)	(71,900)	(51,144)	(24,575)	7,352	83,849	176,588	269,129	350,054
Property Tax	97,000	207,000	331,000	468,000	621,000	790,000	975,000	1,182,000	1,410,000	1,660,000
Total Equity	1,454,300	1,518,525	1,644,300	1,802,056	1,981,625	2,182,552	2,444,049	2,743,788	3,064,329	3,395,254
Long-term Debt	0	52,800	207,500	603,100	1,446,800	2,211,300	2,195,400	2,138,500	2,088,400	2,021,800
Current Liabilities										
Accounts Payable	2,600	5,300	6,300	7,200	8,900	13,000	12,800	14,900	17,000	19,500
Total Current Liabilities	2,600	5,300	6,300	7,200	8,900	13,000	12,800	14,900	17,000	19,500
Consumer Contribution	7,500	30,500	70,000	114,900	166,200	223,600	262,600	305,400	351,900	403,100
TOTAL LIABILITIES AND EQUITY	1,464,400	1,607,125	1,928,100	2,527,256	3,603,525	4,630,452	4,914,849	5,202,588	5,521,629	5,839,654
Debt/Equity Ratio	0	3:97	11:89	25:75	42:58	50:50	48:52	44:56	41:59	37:63

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SALONICA SEWERAGE AUTHORITY

Tariffs

1. Within three months after entering into the Salonica Subsidiary Agreement, SSA is to increase its tariff so as to charge a weighted average of not less than Dr. 4.00 per m3. It is assumed for the purposes of the financial projections that this tariff increase will take place no later than July 1, 1977.

2. Estimated average tariffs for the years 1977-1985, as used in the financial projections, are as follows:

Fiscal Year	Dr. per m^3 (Average)
1977	4.0
1978	5.5
1979	7.0
1980	9.0
1981	12.0
1982-1985	13.0

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Salonica Sewerage Authority
Assumptions for Financial Projections

A. General

1. Because the authority keeps its accounts on a simple cash basis, the financial forecasts are pro-forma only, prepared by the application of generally accepted accounting principles to the basic data. Provision has been made for inflation of capital cost in accordance with guidelines shown in para 4.08 of the report. Operating costs allow for inflation of 10% in 1976, 9% in 1977, and 8% in each subsequent year. Forecasts for 1976 are based on the authority's budget, with subsequent extrapolations in accordance with principles described below.

B. Income Statements

Revenues

2. The average tariffs based on water consumption are assumed as indicated in the income statement. Differentials between industrial and other tariffs must await the substantial completion of the industrial wastewater survey.

3. Connection charges for 1976 are based on the authority's budget. For subsequent years, they represent increases due to inflation, based on full cost recovery but with a 20% allowance for costs not recovered and lags in implementation.

Operating Expenses

4. Salaries and wages reflect expected increases in staffing until the end of 1976 as the authority builds up to full capacity. Expenses for fuel and power, materials and administration have been based on 1976 estimates with provision for system growth. Connection costs and operating costs of the proposed sewage treatment plant are estimated by the mission based on the reports of consulting engineers.

Depreciation

5. Present accounting practice does not provide for the charging of depreciation. The forecasts assume a depreciation rate of 2-1/2% on original costs, thus writing off assets, on average, over 40 years.

Interest

6. Interest, on the proposed Bank loan at 8.7%, and on the assumed Government loan at 8%, has been charged to operations throughout.

Net Income

7. All net income is assumed to be retained earnings.

C. Funds Flow Statements

Borrowing

8. (a) IBRD - Dr. 1,032.5 million (US$29.5 million equivalent) for 15 years, including a grace period of 3 years, interest at 8.7% per annum, commitment charge of 0.75% on the undisbursed balance and repayment by equal installments of principal.

(b) Government - Dr. 1,516.7 million (US$43.3 million equivalent) during the project period (1977-1981), at 8%, with repayment beginning in 1982, by equal installments of combined principal and interest over 20 years.

(c) Government - for each separate year of the period 1982 - 1985 with repayment beginning in each case in the year following disbursement and otherwise on the same terms as in (b) above, in annual amounts as follows:

1983 Dr. 64.9 million
1984 Dr. 74.7 million
1985 Dr. 62.8 million

Capital Contributions

9. Contributions are assumed from industries towards project construction costs amounting to 40% of the costs of Gallikos and Esso estate secondary networks, 60% of the cost of trunk mains for the Gallikos and Esso estates and 60% of the cost of the Gallikos trunk sewer. These contributions are estimated as follows:

1977 Dr. 5.0 million
1978 Dr. 12.6 million
1979 Dr. 14.1 million
1980 Dr. 15.6 million
1981 Dr. 16.3 million

10. Contributions from other sewer users are assumed to be recovered towards 25% of the costs of secondary network construction.

Property Tax

11. By law, receipts from property tax can be used only to finance construction costs and related debt service. Furthermore, the tax is collectible only for a 20-year period. Because of these legal restrictions, receipts from this tax have been treated as capital receipts rather than as annual revenues. Estimates are based on the budget figure for 1976, increased in proportion to population growth and with appropriate allowance for inflation. During the project period, the funds from this source are estimated to total Dr. 693 million (US$19.8 million equivalent).

12. Sums accumulated from property taxes prior to January 1, 1976 and amounting to Dr. 175.5 million (US$5.0 million equivalent) have been separately invested. The forecasts assume that these funds will be made available to finance construction during the five years of the project period, in equal annual installments.

Credit for Connection Fees and Capital Contributions

13. The law provides for credit to be made available for up to 2 years to assist consumers in paying for connection fees and capital contributions. Because estimates of these credit requirements are subject to wide margins of error, no provision has been made for them in the forecasts. It is expected however, that any necessary credit would be financed by loans, on terms and conditions broadly equivalent to the credit terms themselves. Consequently, the flow of funds should not be materially affected by this omission.

Internal Cash Ratio

14. The internal cash ratio is the percentage ratio of net funds available from operations to the average net value of fixed assets in operation and under construction. Industrial contributions in the period 1977 to 1981 (para 9) have been excluded from the calculation of net funds available from operations. In addition, amortization of the Bank loan in 1980 and 1981 has been excluded from the calculation of debt charges. Because of the shortened grace period (3 years) these payments represent premature debt redemption which must be covered by raising equivalent finance from other sources.

D. Balance Sheet

Fixed Assets

15. Fixed assets in operation at January 1, 1976 have been valued according to information provided by financial and engineering consultants. Subsequent additions to fixed assets provide for project construction and

for the construction of additional secondary networks during the period 1977-1981. From 1982 to 1985, provision is made for the construction of additional secondary networks, trunk mains, interceptors and pumping stations and for a treatment plant and ocean outfall at Mega Emvalon. No revaluation of assets has been assumed, pending the establishment, in due course, of more precise valuations for the presently existing system and also because of the material significance of the costs of newly constructed assets.

Long-Term Investments

16. Long term investments represent accumulated collections of property tax as at January 1, 1976 reduced annually by utilization towards construction costs as explained in paragraph 12.

Current Assets and Current Liabilities

17. Accounts receivable have been projected on the basis of about 2-1/2 months revenues. Inventories represent 4 months' usage of materials for maintenance. Cash represents about 1-1/2 months' cash operating expenses. Accounts payable represent 2-1/2 months' purchase of materials for operation maintenance and administration.

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A. Volos Area - Pro-forma Income Statements for 1974 and 1975

	1974			1975		
	Water	Sewerage	Total	Water	Sewerage	Total
	----------	----------	Drachma million	----------	----------	----------
Revenues from water and sewer charges	16.8	0.8	17.6	19.6	1.0	20.6
Storm water surcharge	-	1.0	1.0	-	1.3	1.3
Connection fees	2.3	1.8	4.1	2.4	2.5	4.9
Total Revenue	19.1	3.6	22.7	22.0	4.8	26.8
Salaries and Wages	6.9	0.7	7.6	7.6	0.9	8.5
Other Expenses	6.8	0.4	7.2	7.4	0.5	7.9
Depreciation	3.8	0.4	4.2	3.9	0.4	4.3
Total Operating Expenses	17.5	1.5	19.0	18.9	1.8	20.7
Net Income Before Interest	1.6	2.1	3.7	3.1	3.0	6.1
Interest			0.4			1.0
Net Income			3.3			5.1

B. Volos Area - Pro-forma Balance Sheet as at December 31, 1975

	Dr. Million
Fixed Assets	
Water (at valuation)	203.0
Less: Depreciation	21.2
Net Value	181.8
Sewerage (at valuation)	15.7
Less: Depreciation	2.1
Net Value	13.6
Under Construction	20.0
Total Fixed Assets	215.4
Current Assets (Net)	4.4
TOTAL ASSETS	219.8
Long Term Liabilities	37.5
Equity Capital	182.3
TOTAL LIABILITIES AND CAPITAL	219.8

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THE SALONICA AND VOLOS SEWERAGE PROJECT

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VOLOS WATER AND SEWERAGE ORGANIZATION

WATER INCOME STATEMENTS 1976 - 1985

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Consumption (000 m^3)										
Domestic and Commercial	3,328	3,489	3,653	3,803	4,327	4,456	4,639	4,773	4,914	5,106
Industrial	720	980	1,280	1,620	2,000	2,070	2,140	2,210	2,270	2,330
Total Consumption	4,048	4,469	4,933	5,423	6,327	6,526	6,779	6,983	7,184	7,436
Connections										
Number of Connections during the year	788	1,071	948	925	4,048 1/	669	956	678	560	960
Total Connections at year end	30,945	32,016	32,964	33,889	37,937	38,606	39,562	40,240	40,800	41,760
Charges (Average)										
User charges (Dr./m^3)	6.6	8.0	9.6	10.1	10.1	10.4	10.9	11.3	11.9	13.1
Connection Fees (Dr. 000)	1.5	1.7	2.2	2.8	3.4	3.8	4.0	4.4	4.7	5.0
	---------- Drachma (000) ----------									
Operating Revenues										
Industrial	4,800	7,800	12,300	16,400	20,200	21,500	23,300	25,000	27,000	30,500
Domestic - Metered	22,100	27,900	35,100	38,400	43,700	46,300	50,600	53,900	58,500	66,900
Connection Charges	1,200	1,800	2,100	2,600	3,400	2,500	3,800	3,000	2,600	4,800
Other	1,000	1,100	1,200	1,300	1,400	1,500	1,600	1,700	1,800	1,900
Total Operating Revenues	29,100	38,600	50,700	58,700	68,700	71,800	79,300	83,600	89,900	104,100
Operating Expenses										
Salaries	9,300	10,900	12,800	15,100	18,600	20,800	23,200	25,600	28,100	31,600
Materials	3,100	3,600	3,900	4,400	5,400	5,900	6,600	7,300	7,900	8,700
Administration	1,700	2,000	2,200	2,600	3,100	3,400	3,900	4,200	4,500	5,100
Fuel and Power	4,000	5,000	6,000	7,200	9,100	10,200	11,400	12,700	14,000	15,800
Chemicals	100	100	100	200	300	400	400	400	500	500
Connection Costs	2,400	3,500	3,400	3,700	4,300	3,100	4,800	3,700	3,300	6,000
Depreciation	6,600	7,125	7,350	7,755	8,355	8,895	9,285	9,810	10,470	12,000
Total Operating Expenses	27,200	32,225	35,750	40,955	49,155	52,695	59,585	63,710	68,770	79,700
Net Income Before Interest	1,900	6,375	14,950	17,745	19,545	19,105	19,715	19,890	21,130	24,400
Rate of Return	1.0	3.1	7.2	8.4	8.7	8.2	8.3	8.1	8.2	8.2
Operating Ratio %	93	83	71	70	72	73	75	76	76	77
Depreciation/Gross Plant	3.01	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

1/ 1000 only new connections assumed (remainder assumed taken over from neighbouring system).

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VOLOS WATER AND SEWERAGE ORGANIZATION

WASTEWATER INCOME STATEMENTS 1976 - 1985

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Consumption of Water at Premises Connected to Wastewater System (000 m^3)										
Domestic and Commercial	356	358	368	374	1,493	2,170	2,401	2,624	2,867	3,150
Industrial	75	980	1,280	1,620	2,000	2,070	2,140	2,210	2,270	2,330
Total Consumption	431	1,338	1,648	1,994	3,493	4,240	4,541	4,834	5,137	5,480
Connections										
Number of Connections during the year	800 1/	1,042	1,094	1,164	1,420	525	576	646	689	720
Total Connections at year end	-	1,042	2,136	3,300	4,720	5,245	5,821	6,467	7,156	7,876
Charges (Average)										
User Charges (Dr./m^3)	2.5	3.2	3.8	4.0	11.5	14.0	14.0	14.0	14.0	14.0
Connection Fees (Dr. 000)	3.0	3.3	3.7	4.7	5.8	6.1	6.8	7.2	7.8	8.5
	---------- Drachma (000) ----------									
Operating Revenues										
Industrial	200	3,100	4,900	6,500	23,000	29,000	30,000	31,000	31,800	32,600
Domestic - Metered	900	1,200	1,400	1,500	17,200	30,400	33,600	36,700	40,100	44,100
Connection Charges	2,400	3,400	4,000	5,400	8,200	3,200	3,900	4,600	5,400	6,100
Other	1,600	2,500	3,200	3,500	2,900	2,400	2,400	2,400	2,400	2,500
Total Operating Revenues	5,100	10,200	13,500	16,900	51,300	65,000	69,900	74,700	79,700	85,300
Operating Expenses										
Salaries	900	1,000	1,100	1,200	7,800	10,200	11,400	12,700	14,500	15,800
Materials	300	300	400	400	1,200	1,400	1,700	1,800	2,000	2,300
Administration	200	200	200	300	1,000	1,600	1,700	2,000	2,400	2,500
Fuel and Power	0	0	0	0	2,000	2,600	3,000	3,400	3,900	4,600
Connection Costs	0	5,700	6,700	7,700	10,200	4,000	4,900	5,800	6,700	7,600
Depreciation	400	393	393	393	6,605	18,419	24,378	25,155	26,051	27,094
Total Operating Expenses	1,800	7,593	8,793	9,993	28,805	38,219	47,078	50,855	55,551	59,894
Net Income Before Interest	3,300	2,607	4,707	6,907	22,495	26,781	22,822	23,845	24,149	25,406
Rate of Return	24.6	20.0	37.3	56.5	8.7	3.7	2.4	2.5	2.5	2.6
Operating Ratio %	35	74	65	59	56	59	67	68	70	70
Depreciation/Gross Plant	2.55	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50

1/ Temporary connections which will be discontinued or replaced during project construction.

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THE SALONICA AND VOLOS SEWERAGE PROJECT

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VOLOS WATER AND SEWERAGE ORGANIZATION

WATER AND WASTEWATER INCOME STATEMENT FOR THE YEARS 1976 - 1985

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
	Drachma (000)									
Operating Revenues										
Industrial	5,000	10,900	17,200	22,900	43,200	50,500	53,300	56,000	58,800	63,100
Domestic - Metered	23,000	29,100	36,500	39,900	60,900	76,700	84,200	90,600	98,600	111,000
Connection Charges	3,600	5,200	6,100	8,000	11,600	5,700	7,700	7,600	8,000	10,900
Other	2,600	3,600	4,400	4,800	4,300	3,900	4,000	4,100	4,200	4,400
Total Operating Revenues	34,200	48,800	64,200	75,600	120,000	136,800	149,200	158,300	169,600	189,400
Operating Expenses										
Salaries	10,200	11,900	13,900	16,300	26,400	31,000	34,600	38,300	42,600	47,400
Materials	3,400	3,900	4,300	4,800	6,600	7,300	8,300	9,100	9,900	11,000
Administration	1,900	2,200	2,400	2,900	4,100	5,000	5,600	6,200	6,900	7,600
Fuel and Power	4,000	5,000	6,000	7,200	11,100	12,800	14,400	16,100	17,900	20,400
Chemicals	100	100	100	200	300	400	400	400	500	500
Connection Costs	2,400	9,200	10,100	11,400	14,500	7,100	9,700	9,500	10,000	13,600
Depreciation	7,000	7,518	7,743	8,148	14,960	27,314	33,663	34,965	36,521	39,094
Total Operating Expenses	29,000	39,818	44,543	50,948	77,960	90,914	106,663	114,565	124,321	139,594
Operating Income										
Net Income Before Interest	5,200	8,982	19,657	24,652	42,040	45,886	42,537	43,735	45,279	49,806
Interest Charged to Operations	1,700	2,000	1,900	1,700	1,700	1,600	38,500	38,000	38,800	41,700
Net Operating Income	3,500	6,982	17,757	22,952	40,340	44,286	4,037	5,735	6,479	8,106
Total Interest	1,700	3,200	6,200	13,900	26,100	34,800	38,500	38,000	38,800	41,700
Less: Interest Charged to Construction	0	1,200	4,300	12,200	24,400	33,200	0	0	0	0
Interest Charged to Operations	1,700	2,000	1,900	1,700	1,700	1,600	38,500	38,000	38,800	41,700
Rate of Return	2.5	4.1	9.0	11.0	8.7	4.8	3.6	3.7	3.7	3.9
Operating Ratio %	85	82	69	67	65	66	71	72	73	74
Depreciation/Gross Plant	2.98	2.97	2.97	2.97	2.76	2.64	2.62	2.62	2.63	2.63

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VOLOS WATER AND SEWERAGE ORGANIZATION

STATEMENT OF SOURCES AND APPLICATION OF FUNDS (1976 - 1985)

	1976	1977	1978	1979	1980	1981	1977-1981 Total	1982	1983	1984	1985
					Drachma	(000)					
Internal Sources											
Net Income Before Interest	5,200	8,982	19,657	24,652	42,040	45,886	141,217	42,537	43,735	45,279	49,806
Depreciation	7,000	7,518	7,743	8,148	14,960	27,314	65,683	33,663	34,965	36,521	39,094
Consumer Contribution	0	8,100	41,500	47,000	30,900	9,700	137,200	10,800	14,200	15,800	14,200
Total Internal Sources	12,200	24,600	68,900	79,800	87,900	82,900	344,100	87,000	92,900	97,600	103,100
Operational Requirements											
Working Capital	2,400	3,860	3,480	2,580	9,980	4,660	24,560	2,780	2,320	2,860	4,260
Debt Service	2,900	4,900	7,600	15,600	45,700	54,100	127,900	64,100	64,200	66,000	71,100
Total Operational Requirements	5,300	8,760	11,080	18,180	55,680	58,760	152,460	66,880	66,520	68,860	75,360
Net Available from Operations	6,900	15,840	57,820	61,620	32,220	24,140	191,640	20,120	26,380	28,740	27,740
Construction Requirements											
Ongoing Works	12,000	0	0	0	0	0	0	0	0	0	0
Proposed Project	0	29,400	131,500	288,700	249,600	170,600	869,800	0	0	0	0
Other-Water	0	5,000	10,000	17,000	23,000	13,000	68,000	13,000	22,000	42,000	60,000
Other-Wastewater	0	0	0	0	0	0	0	28,600	33,600	38,100	45,300
Total Construction Requirements	12,000	34,400	141,500	305,700	272,600	183,600	937,800	41,600	55,600	80,100	105,300
Balance to Finance	5,100	18,560	83,680	244,080	240,380	159,460	746,160	21,480	29,220	51,360	77,560
Financed By											
Existing Loans	5,100	0	0	0	0	0	0	0	0	0	0
Government Loans	0	7,500	31,900	96,300	87,100	54,000	276,800	500	29,200	51,400	77,500
IBRD Loans	0	3,600	19,800	51,600	66,100	51,500	192,600	20,900	0	0	0
Government Equity	0	7,500	32,000	96,200	87,100	54,000	276,800	0	0	0	0
Total	5,100	18,600	83,700	244,100	240,300	159,500	746,200	21,400	29,200	51,400	77,500
Surplus (Deficit) of Funds											
Annual	0	40	20	20	(80)	40	40	(80)	(20)	40	(60)
Accumulated	0	40	60	80	0	40	0	(40)	(60)	(20)	(80)
Net Available from Operations/ Construction Requirements %	58	46	41	20	12	13	-	48	47	36	26
Internal Cash Ratio	-	5.1	12.2	7.5	6.0	3.9	-	1.7	2.2	2.4	2.2
Debt Service Cover	4.2	5.0	9.1	5.1	1.9	1.5	-	1.4	1.4	1.5	1.5

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VOLOS WATER AND SEWERAGE ORGANIZATION

BALANCE SHEET AS AT DECEMBER 31, 1976 - 1985

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
	Drachma (000)									
ASSETS										
Fixed Assets - Water										
Plant in Operation	235,000	240,000	250,000	267,000	290,000	103,000	316,000	338,000	360,000	440,000
Less: Depreciation	27,800	34,925	42,275	50,030	58,385	67,280	76,565	86,375	96,845	108,845
Net Plant in Operation	207,200	205,075	207,725	216,970	231,615	235,720	239,435	251,625	263,155	331,155
Fixed Assets - Wastewater										
Plant in Operation	15,700	15,700	15,700	15,700	512,700	960,800	989,400	1,023,000	1,061,100	1,106,400
Less: Depreciation	2,500	2,893	3,286	3,679	10,284	28,703	53,081	78,236	104,287	131,381
Net Plant in Operation	13,200	12,807	12,414	12,021	502,416	932,097	936,319	944,764	956,813	975,019
Work in Progress	0	30,600	166,400	467,300	244,300	0	0	0	20,000	0
Current Assets										
Cash and Bank	3,300	4,040	4,660	5,480	7,600	7,640	8,760	9,440	10,520	11,960
Accounts Receivable	6,300	9,760	12,840	15,120	24,000	27,360	29,840	31,660	33,920	37,880
Inventories	700	1,100	1,500	1,700	2,300	2,600	2,900	3,200	3,500	3,800
Total Current Assets	10,300	14,900	19,000	22,300	33,900	37,600	41,500	44,300	47,900	53,600
TOTAL ASSETS	230,700	263,382	405,539	718,591	1,012,231	1,205,417	1,217,254	1,240,689	1,287,868	1,359,774
LIABILITIES AND EQUITY										
Equity										
Capital	182,300	182,300	182,300	182,300	182,300	182,300	182,300	182,300	182,300	182,300
Retained Earnings	3,500	10,482	28,239	51,191	91,531	135,817	139,854	145,589	152,068	160,174
Government Equity	0	7,500	39,500	135,700	222,800	276,800	276,800	276,800	276,800	276,800
Total Equity	185,800	200,282	250,039	369,191	496,631	594,917	598,954	604,689	611,168	619,274
Long Term Debt	41,400	50,800	101,100	247,300	380,900	467,100	462,900	465,900	490,100	538,200
Current Liabilities										
Accounts Payable	3,500	4,200	4,800	5,500	7,200	6,200	7,400	7,900	8,600	10,100
Total Current Liabilities	3,500	4,200	4,800	5,500	7,200	6,200	7,400	7,900	8,600	10,100
Consumer Contribution	0	8,100	49,600	96,600	127,500	137,200	148,000	162,200	178,000	192,200
TOTAL LIABILITIES AND EQUITY	230,700	263,382	405,539	718,591	1,012,231	1,205,417	1,217,254	1,240,689	1,287,868	1,359,774
Debt/Equity Ratio	18:82	20:80	29:71	40:60	43:57	44:56	44:56	44:56	45:55	46:54

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VOLOS WATER AND SEWERAGE ORGANIZATION

Tariffs

1. Within three months after entering into the Volos Subsidiary Agreement VWSO is to increase its tariff by a weighted average of 45%. It is assumed for the purposes of the financial projections that this tariff increase will take place no later than July 1, 1977.

2. Estimated average tariffs for the years 1977-1985, as used in the financial projections, are as follows:

Fiscal Year	Dr. per m^3 (Average) Water	Sewerage
1977	9.6	3.8
1978	9.6	3.8
1979	10.1	4.0
1980	10.1	11.5
1981	10.4	14.0
1982-1985	10.9	14.0

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Proposed Volos Water and Sewerage Authority
Assumptions for Financial Projections

A. General

1. Because of the intention to set up a single water and sewerage authority for the entire Volos project area, the financial forecasts are prepared as if this single authority were already in operation. In preparing such composite forecasts for 1976, information has been drawn from budgets relating to the present Volos Water and Sewerage Authority, the water services of Nea Ionia municipality and the water services of the new industrial area. Where relevant information has been lacking, estimates have been made by the mission, based on data supplied by the financial consultants. Subsequent extrapolations from 1977 onwards are in accordance with principles described below.

2. Since the various authorities keep their accounts on a simple cash basis, the financial forecasts are pro-forma only, prepared by the application of generally accepted accounting principles to the basic data. Provision has been made for the inflation of capital costs in accordance with guidelines shown in para 4.08 of the report. Operating costs allow for inflation at 10% in 1976, 9% in 1977 and 8% in each subsequent year.

B. Income Statements

Revenues

3. The average tariffs for water usage, and for sewer usage based on water consumption are assumed as indicated in the respective income statements. Differentials between industrial and other wastewater tariffs must await the substantial completion of the industrial wastewater survey. Differentials may also be appropriate for water tariffs, at the option of the authority, particularly to allow for the gradual equalization of tariffs between adjoining areas incorporated within the authority's jurisdiction.

4. Sewerage tariffs are assumed to remain at 40% of water tariffs until the new sewer system begins to come into operation in 1980. It is assumed that the 10% surcharge on water tariffs presently levied upon water users

not connected to the sewerage system will continue indefinitely. From 1977 it is assumed that all industrial premises connected to a sewerage network, including the new industrial zone, will be subjected to the 40% sewer surcharge.

5. Connection charges are based on 50% of cost in 1976 and 1977, 60% in 1978, 70% in 1979 and 80% thereafter, finally reflecting full cost recovery, but with a 20% allowance for costs not recovered and lags in implementation. Water connections anticipated to be taken over from outlying areas of Volos have been left out of account in the calculation of connection charges.

Operating Expenses

6. Salaries and wages, materials, administration, fuel, power and chemicals for water supply reflect annual growth in system capacity and in water consumption. For sewerage, operating costs are assumed to remain constant, except for inflation, until the new system begins to become operational in 1980. Operating costs thereafter are based on mission estimates and will reflect annual system growth.

Depreciation

7. Present accounting practice does not provide for the charging of depreciation. The forecasts assume depreciation rates on the original costs of fixed assets of 3% for water and 2-1/2% for sewerage.

Interest

8. Interest on debt outstanding at January 1, 1976 has been computed by the mission for each separate loan on the basis of information provided by the financial consultants. During the project construction period until 1981, interest on the proposed Bank loan at 8.7% and on the assumed Government loan of 8% has been charged to construction. Thereafter, all interest has been charged to operations.

Net Income

8. All net income is assumed to be retained earnings.

C. Funds Flow Statements

Borrowing

10. (a) IBRD - Dr. 213.5 million (US$6.1 million equivalent) for 15 years, including a grace period of 3 years, interest at 8.7% per annum, commitment charge of 0.75% on the undisbursed balance and repayment by equal installments of principal.

(b) Government - Dr. 276.8 million (US$7.9 million equivalent) during the project period (1977-1981) at 8% with repayment beginning in 1982, by equal installments of combined principal and interest over 20 years.

(c) Government - for each separate year of the period 1981-1985 with repayment beginning in each case in the year following disbursement and otherwise on the same terms as in (b) above, in annual amounts as follows:

1982 - Dr. 0.5 million	1984 - Dr. 51.4 million
1983 - Dr. 29.2 million	1985 - Dr. 77.5 million

Capital Contributions

11. Contributions are assumed from industries to cover the project construction costs of the trunk main from the industrial area to the main interceptor and to cover the costs of the secondary network on the new industrial estate. These contributions are estimated as follows:

1977 - Dr. 3.8 million	1979 - Dr. 20.8 million
1978 - Dr. 19.1 million	

12. Contributions from other sewer users are assumed to be recovered towards 25% of the costs of secondary network construction.

Government Grant

13. A Government grant, or equity contribution, is assumed to cover one-half of each year's net cash requirements after allowing for other sources of finance, during the period of project construction.

Credit for Connection Fees and Capital Contributions

14. It is assumed that credit will be provided, for up to 2 years, to assist consumers in paying for connection fees and capital contributions. Because estimates of these credit requirements are subject to wide margins of error, no provision has been made for them in the forecasts. It is expected, however, that any necessary credit would be financed by loans, on terms and conditions broadly equivalent to the credit terms themselves. Consequently, the flow of funds should not be materially affected by this omission.

Internal Cash Ratio

15. The internal cash ratio is the percentage ratio of net funds available from operations to the average net value of fixed assets in operation and under construction. Industrial contributions assumed during the period 1977-1979 (para 11) have been excluded from the calculation of net funds available from operations. In addition, amortization of the Bank loan in 1980 and 1981

has been excluded from the calculation of debt charges. Because of the shortened grace period (3 years) these payments represent premature debt redemption which must be covered by raising equivalent finance from other sources.

D. Balance Sheet

Fixed Assets

15. Fixed assets in operation at January 1, 1976 have been valued according to information provided by financial and engineering consultants. Subsequent additions to fixed assets provide for project construction and for the construction of additional water and sewer networks. In 1984 and 1985, provision has been made for the construction of an additional source of water supply. No revaluation of assets has been assumed, pending the establishment in due course, of more precise valuations for the presently existing systems and also because of the material significance of the costs of newly constructed assets.

Current Assets and Current Liabilities

16. Accounts receivable have been projected on the basis of about 2-1/2 months' revenues. Inventories represent 4 months' usage of chemicals and of materials for maintenance. Cash represents 1-1/2 months' cash operating expenses. Accounts payable represent 2-1/2 months' purchase of materials for operation maintenance and administration.

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Tariffs and Other Revenues

I. Present Situation

A. Salonica - Present Water Tariffs

1. The Salonica Water Authority (SWA) levies a basic tariff in Drachma per m3 with discounts to certain classes of consumer, as follows:

Industrial	15%
Hospitals and medical centers	25%
Municipality (bulk supplies) and non-elementary schools	50%
Public services	15%
Elementary schools and official Government residences	100%

2. As a result of these arrangements, water tariffs over recent years have been (in general) as follows:

Consumer Class	Price (Dr. per m3) 1970-1974	1975 to date
Domestic and Commercial	4.50	7.00
Industrial	3.75	5.95
Hospitals and medical centers	3.30	5.25
Municipalities (bulk) and non-elementary schools	2.20	3.50
Public services	3.75	5.95
Elementary schools and official Government residences	-	-
Minimum consumption (per customer every 3 months)	6 m3	15 m3

3. In addition to the above, certain special arrangements are made with individual consumers. For example, in 1976 it is estimated that about 10 million m3 will be supplied to the Esso industrial complex at Dr. 2.45 per m3 representing a discount of 65% from the basic tariff (60% from the above discounted industrial tariff).

4. For all customers other than domestic and commercial, a special 60% surcharge is being levied on the basic (discounted) charges as a contribution towards the development of new sources of supply. (In the case of the Esso complex, this surcharge is only 15%.)

5. Other revenues of SWA (e.g. connection fees, etc.) will not be described in detail as they do not affect sewer revenues.

B. Salonica - Present Sewer Tariffs

6. Until December 31, 1975 sewer services were under the control of the various municipalities in the Salonica area and their operations were financed by various municipal revenues. For example, in the Municipality of Salonica sewer fees were based on 20% of charges for garbage collection and street cleaning levied directly upon frontagers.

7. From January 1, 1976, with the coming into full operation of the Salonica Sewerage Authority, sewer charges are to be based on 40% of the water charges to those water consumers connected to the sewerage system. The 40% charge is not to be levied upon the water surcharge levied for the development of new water supply sources.

8. Based on the tariffs for water, the sewerage tariffs would approximate to the following:

Consumer Class	Price (Dr. per m3)
Domestic and Commercial	2.80
Industrial	2.40
Hospitals and Medical Centers	2.10
Non-elementary Schools	1.40
Public Services	2.40
Elementary Schools and official Government residences	-

9. Charges are made by SSA to cover the costs of house connections at the rate of Dr. 1500 per meter of connection pipe.

10. Consumer contributions towards network construction are collected according to the following formula:

$$y = \frac{a \times b \times c}{d}$$

Where:

y = amount of contribution per property
a = length of property frontage in meters
b = number of floors
c = estimated cost per meter of pipe (currently Dr. 1,500)
d = average number of floors per building (assumed to be 6)

11. Since 1972 SSA has been assigned the proceeds of a tax of 3% on nominal rental values, collected through the income tax system as described below. These funds are intended to be used for financing construction expenditures or meeting debt charges. The proceeds of the tax are deposited in a special bank account and can only be withdrawn on the joint authorization of the Ministers of Works and Finance.

12. Annual collections over past years have been as follows:

Year	Dr. (million)
1972	35.8
1973	46.6
1974	56.3
1975	81.9
	220.6

13. About Dr. 45 million has apparently been used for construction work during 1975 and for initial expenses of setting up the authority, leaving a balance of Dr. 175.5 million as at January 1, 1975 invested in the special bank account.

C. Volos - Present Water and Sewer Tariffs

14. The Volos Water and Sewerage Authority levies a basic tariff in Drachma per m3 for water supply. However, various Government institutions, including schools and hospitals, pay only 40% of the normal charge. Water for municipal parks and street cleaning is provided free.

15. For water consumers connected to the present sewerage system, there is a surcharge of 40% on the water charge. For all other water consumers, there is a surcharge of 10%, to cover the costs of the stormwater system.

16. Based on the above principles, the various water and sewerage tariffs over recent years have been as follows:

Consumer Class	Price (Dr. per m3) 1970-1974 Water	1970-1974 Sewerage	1975 to date Water	1975 to date Sewerage
Domestic, Commercial and Industrial	5.00	2.00 1/	7.00	2.80 1/
Government Premises	2.00	0.80	2.80	1.12
Municipal Services	-	-	-	-

17. Charges are made by VMWSA to cover the cost of house connections at the rate of Dr. 1,500 per connection for water and Dr. 3,000 per connection for sewerage. Provision also exists for the recovery of capital contributions towards network extensions. This is apparently done on an ad hoc basis.

18. In the Municipality of Nea Ionea there is a present water charge of Dr. 5.00 per m3 subject to similar discounts for special classes of consumers as in Volos.

D. Property Tax System

19. Because SSA derives part of its funds from a property tax and since this system could be extended to other areas in the future, a brief description of the present system of property tax follows.

20. Unlike the situation in many countries, property tax in Greece is not collected as local (municipal) revenue on the basis of an approved list of property valuations. Instead, it is assessed and collected through the income tax system by regional tax collection offices of the Central Government, controlled from Athens.

21. There are three main systems of property tax:

(a) a transfer tax levied at 11%-13% on the market value of property at the time of sale;

(b) a tax on total personal real estate held in Greece in excess of a valuation of Dr. 10 million; and

(c) an annual tax on actual or notional rents.

22. The transfer tax is straightforward and self explanatory. The tax on total personal real estate is a new tax designed to tax excess wealth. At a guess, it applies to only about 5,000 taxpayers in the whole country.

1/ For premises connected to the sewerage system. For other premises the charge would be Dr. 0.50 and Dr. 0.70 respectively.

23. The annual tax on rental values is the tax which currently is partially appropriated for sewerage purposes in Salonica (and also in Athens). This is a little more complicated.

24. Every year each taxpayer includes on his income tax return a statement of his earnings from the rental of properties owned. In the case of owner-occupiers, the taxpayer makes an assessment of the probable annual rent to be derived from his property if it were to be let to a tenant. This value is either accepted by the tax authorities or arbitrarily changed following discussion with the taxpayer. The annual rental value cannot exceed 4% of capital value and tax is not payable on annual rents or rental valuations of less than Dr. 36,000 (about $85 per month). Consequently, no tax is payable on a property with a capital value of less than Dr. 900,000 (about US$25,000). The actual or nominal rental income is incorporated into the taxpayer's total taxable income, which becomes subject to assessment for income tax in accordance with normal procedures. If a sewerage tax is levied upon the rental value, this would be in addition to normal rates of income tax.

II. Observations on Specific Aspects of Water and Sewerage Tariffs

A. Volos - Differential Tariffs

1. A flat rate tariff is charged (with certain exceptions) for all water supplied. In Volos, this is Dr. 7.00 per m3 and in Nea Ionea Dr. 5.00 per m3. When the various authorities are merged it seems reasonable for the tariffs in the different areas to be brought into line gradually over (say) 3 or 4 years. For example, the present tariff of Nea Ionea is about 70% of that for Volos. In 1977 it could remain at 70%, in 1978 go up to 80%, in 1979 to 90% and in 1980 to 100% of the Volos tariff. This would help to meet the legitimate concerns of the Nea Ionea community about being "taken over" by Volos.

B. Free and Subsidized Supplies

2. Many public buildings are provided with water at concessional rates or, in certain cases free. There can be no rational justification for this and if the new authority is to have financial autonomy these concessions should be eliminated. Furthermore, experience tends to show that the use of water charges as an income distribution device is not very effective and therefore other organizations being supplied at concessional rates should also have these eliminated, as far as possible.

3. There may be some justification, on grounds of equity, in providing a limited supply, at low prices, with a steep rise in tariffs for supplies beyond the minimum. This could have a possible effect of conserving water sold at the higher prices.

C. Stormwater Sewers and Water for Municipal Gardens and Standpipes

4. Conventionally, stormwater systems should be paid for from municipal taxes, or by the highway authority. Water for municipal gardens and standpipes should be paid for from municipal taxes. However, in Greece, there are few, if any, independent sources of local revenue. The traditional local tax in many countries is a property tax but in Greece this is appropriated by the Central Government. Furthermore, with the present partial combination of wastewater and stormwater sewers it is very difficult if not impossible to separate the costs of operation of each. It may therefore be appropriate, in these special circumstances, for the stormwater service and the free supplies of water to municipal parks and standpipes to be borne by the water and sewer authority from increased water and sewer charges, at least until other, more satisfactory arrangements have been formulated. Conceptually the increase in charges to cover these additional costs is analogous to a "public utility tax" which might, in other circumstances, be levied by a municipal authority to finance the stormwater and municipal parks service (including the purchase of water). It should be stressed that these arrangements are not ideal and any review of municipal finances should allow for the payment of water charges and a full-cost recovery basis from public revenue sources. This would, among other things, assist in the control of waste consumption. In any event, all public supplies should be metered for purposes of control and measurement, even if no charge is to be made.

III. Future Tariffs for Industrial Wastewater

1. The introduction in Salonica of sewerage tariffs based on metered water consumption and the continuation of such arrangements in Volos is consistent with practice increasingly followed elsewhere. These tariff arrangements are expected to continue. The use of metered water consumption as a measure of usage of sewerage facilities is only approximate. However, where domestic and commercial premises only are involved, the advantages of using the metered water consumption as a basis for sewer charges usually outweigh the disadvantages. In certain circumstances, refinements can be fairly easily developed, such as the use of winter billings to eliminate excessive sewer charges relative to non-sewered use of water in summer (e.g. irrigation of gardens).

2. Where there is heavy industrial usage of water, or production of wastewater, additional complications arise. In particular:

(a) Certain industries, such as breweries or soft-drink manufacturers, may use large quantities of water which are incorporated into their products and not disposed of into the sewers; and

(b) Certain industries may produce wastes which, for various reasons may:

(i) be toxic to natural life, such as plants and fish, in the areas in which they will be disposed of; or

(ii) inhibit the operation of the sewerage system, for example by the corrosion of pipes or damage to treatment works; or

(iii) require transmission, treatment and disposal arrangements out of proportion to the volume of wastewater produced, for example because of heavy loadings of BOD5 or suspended solids, or because of high temperatures.

3. For those industries not discharging wastewater proportionate to water supplied, suitable formulae can be established to give the necessary financial relief. Ideally, toxics and inhibitors should be prohibited from entering the system at all. This could be achieved by a suitable combination of penalty charges and/or enforceable regulations. Heavy pollutant loadings can be treated either by the polluting industries themselves, or by the sewerage authority at the expense of such industries, with costs being recovered through a suitable industrial waste surcharge.

4. The establishment of suitable industrial wastewater surcharges will entail a matching of such surcharges with incremental costs of the conveyance, treatment and disposal of the relevant wastes. The establishment of pollutant loadings will result from the proposed industrial wastewater surveys (Annex 7). A relatively small number of heavy polluters will be specifically identified and their pollutant loadings determined. For the remaining industries, it is probable that standard pollutant loadings could be calculated by the use of technical formulae, taking into account of the type of process, unit quantities of water consumption and other known process inputs. These ascertained or standard pollutant loadings could then be used as the basis for industrial wastewater surcharges. A particular industry claiming that the standard pollutant loadings were an incorrect reflection of the actual loadings produced, would have the onus of proving this claim to the sewerage authority at its own expense.

5. Incremental costs of handling industrial wastewater could be obtained from the sewerage authority's financial records and from engineering estimates.

6. Industrial wastewater surcharges calculated on the basis of the above information could be imposed upon measured or imputed volumes of effluent or converted to a suitable factor for imposition upon water charges.

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Tariffs - Long-Term Cost Recovery

1. Although the proposed investments are the least cost solutions to the sewerage problems of Salonica and Volos (paragraph 7.01) the tariffs being proposed have been established largely to meet short-term financial considerations dominated by cash-flow requirements. These tariffs cannot be given meaningful economic interpretation because of the difficulties of quantifying the numerous benefits from the projects (paragraph 7.03), because the concept of willingness to pay cannot be established, and because long-run incremental unit costs cannot be meaningfully calculated. The tables on pages 2 and 3, therefore, give a general indication for each city of the average tariffs required to recover estimated long-term financial costs at constant 1976 prices using a 10% discount rate.

2. For Salonica, the tariff to recover such costs in 1976 prices would be approximately Dr. 6.80 per m3. The proposed tariff of Dr. 13 per m3 for 1982, the first full year of operation of the new system, expressed in 1976 constant prices, would be equal to about Dr. 8.00 per m3.

3. For Volos, the tariff to recover costs in 1976 prices would be approximately Dr. 10.30 per m3. The proposed tariff of Dr. 14.00 per m3 for 1981, the first full year of operation of the new system, expressed in 1976 constant prices would be equal to about Dr. 8.60 per m3, with the charge from non-sewered water users equivalent to about a further 0.40 per m3.

4. This cost recovery analysis suggests that the proposed tariff policies for each of the two areas are broadly reasonable. Any implied element of subsidy, for example, in Volos, would be minor, and would be adeqquately justified by the Government's objective of meeting national environmental goals. It is expected that industrial waste surcharges, would, in any case, be based on full recovery of the costs of handling the additional industrial pollution.

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SALONICA - COST RECOVERY

Year	Water Sales (Sewered Premises) (Million m^3)	Project Costs	Other Capital Costs [1]	Operation & Maintenance Costs	Total Costs	Connection Fees	Consumer Contributions (Industrial)	Consumer Contributions (Other)	Total Revenues	Net Costs	Property Tax
					Drachma (Million)						
1975	24.0	-	-	-	-	-	-	-	-	-	-
1976	25.6	-	1279	57	1336	10	-	8	18	1261	357 [2]
1977	28.3	120	45	94	259	10	4	15	29	224	87
1978	30.7	233	50	104	387	10	9	20	39	357	90
1979	33.3	392	50	112	554	10	9	20	39	512	92
1980	35.5	643	55	122	820	10	9	22	41	779	95
1981	43.2	544	60	174	778	10	-	22	32	746	97
1982	51.3	-	191	185	376	15	-	19	34	342	99
1983	56.0	-	184	200	384	15	-	19	34	350	102
1984	59.6	-	182	212	394	15	-	19	34	360	104
1985	63.8	-	167	225	392	15	-	19	34	358	106
1986	67.1	-	58	236	294	11	-	15	26	268	108
1987	70.5	-	58	248	306	11	-	15	26	280	111
1988	74.1	-	58	261	319	11	-	15	26	293	113
1989	77.9	-	58	274	332	11	-	15	26	306	115
1990	82.0	-	58	289	347	11	-	15	26	321	117
1991	85.5	-	49	301	350	9	-	12	21	329	-
1992	89.2	-	49	314	363	9	-	12	21	342	-
1993	93.0	-	49	327	376	9	-	12	21	355	-
1994	97.0	-	49	341	390	9	-	12	21	369	-
1995	101.0	-	49	355	404	9	-	12	21	383	-
1996	103.7	-	408	365	773	8	-	11	19	754	-
1997	106.5	-	108	375	483	8	-	11	19	464	-
1998	109.4	-	163	385	548	8	-	11	19	529	-
1999	112.4	-	443	396	839	8	-	11	19	820	-
2000	115.4	-	468	406	874	8	-	11	19	855	-
2001	118.3	-	39	416	455	7	-	10	17	438	-
2002	121.3	-	39	427	466	7	-	10	17	449	-
2003	124.5	-	39	438	477	7	-	10	17	460	-
2004	127.6	-	39	449	488	7	-	10	17	471	-
2005	130.9	-	39	461	500	7	-	10	17	483	-
2006	134.2	-	39	472	511	7	-	10	17	494	-
2007	137.7	-	39	485	524	7	-	10	17	507	-
2008	141.2	-	39	497	536	7	-	10	17	519	-
2009	144.8	-	39	510	549	7	-	10	17	532	-
2010	148.4	-	39	522	561	7	-	10	17	544	-
2011	152.1	-	404	535	939	7	-	10	17	922	-
2012	155.8	-	39	548	587	7	-	10	17	570	-
2013	159.7	-	39	562	601	7	-	10	17	584	-
2014	163.6	-	39	576	615	7	-	10	17	598	-
2015	167.6	-	484	590	1074	7	-	10	17	1057	-

At a discount rate of 10% the average net unit cost in 1976 constant prices after allowing for other revenues and for property taxes is Dr. 6.80, obtained by dividing the present value of the net costs by the present value of total water sales to sewered premises.

[1] Other capital costs include the 1976 book value of the existing system plus annual network construction together with the following special items:

	New S.T.P. at Axios	Equipment Renewal
1996	-	365
1997	65	-
1998	120	-
1999	400	-
2000	345	80
2011	-	365
2015	-	445

[2] Includes Dr. 273 million, representing compounded present value of collections prior to 1976.

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VOLOS - COST RECOVERY

Year	Water Sales (Sewered Premises) (Million m^3)	Project Costs	Other Capital Costs [1]	Operation & Maintenance Costs	Total Costs	Connection Fees	Consumer Contributions (Industrial)	Consumer Contributions (Other)	Total Revenues	Net Costs
		Drachma (Million)								
1976	1.1	-	-	2	2	2	-	-	2	-
1977	1.3	24	-	7	31	3	3	4	10	42
1978	1.6	97	-	7	104	3	14	17	34	159
1979	2.0	192	-	7	199	4	14	18	36	167
1980	3.5	151	-	16	167	6	-	20	26	122
1981	4.2	94	-	13	107	2	-	4	6	21
1982	4.5	-	14	14	28	2	-	4	6	23
1983	4.8	-	15	15	30	3	-	4	7	24
1984	5.1	-	15	16	31	3	-	4	7	26
1985	5.5	-	17	16	33	3	-	4	7	25
1986	5.8	-	14	13	27	2	-	3	5	22
1987	6.0	-	12	13	25	2	-	3	5	20
1988	6.3	-	12	14	26	2	-	3	5	21
1989	6.6	-	12	14	26	2	-	3	5	21
1990	6.9	-	10	14	24	2	-	3	5	19
1991	7.2	-	41	14	55	2	-	3	5	50
1992	7.6	-	55	15	70	2	-	3	5	65
1993	7.9	-	67	15	82	2	-	3	5	77
1994	8.3	-	58	15	73	2	-	3	5	68
1995	8.7	-	87	15	102	2	-	3	5	97
1996	9.2	-	9	27	36	2	-	3	5	31
1997	9.4	-	9	27	36	2	-	3	5	31
1998	9.7	-	9	27	36	2	-	3	5	31
1999	9.8	-	9	28	37	2	-	3	5	32
2000	10.0	-	9	28	37	2	-	3	5	32
2001	10.3	-	9	28	37	2	-	3	5	32
2002	10.6	-	9	29	38	2	-	3	5	33
2003	10.9	-	9	29	38	2	-	3	5	33
2004	11.2	-	9	29	38	2	-	3	5	33
2005	11.5	-	9	29	38	2	-	3	5	33
2006	11.8	-	10	30	40	2	-	3	5	35
2007	12.1	-	10	30	40	2	-	3	5	35
2008	12.4	-	10	30	40	2	-	3	5	35
2009	12.8	-	10	30	40	2	-	3	5	35
2010	13.1	-	77	31	108	2	-	3	5	103
2011	13.4	-	11	31	42	2	-	3	5	37
2012	13.8	-	11	31	42	2	-	3	5	37
2013	14.1	-	11	32	43	2	-	3	5	38
2014	14.4	-	11	32	43	2	-	3	5	38
2015	14.8	-	11	33	44	2	-	3	5	39

At a discount rate of 10% the average net unit cost in 1976 constant prices, after allowing for other revenues is Dr. 10.30, obtained by dividing the present value of the net costs by the present value of total water sales to sewered premises.

[1] Other capital costs include annual network construction, together with the following special items:

	S.T.P. Extension	Equipment Renewal
1991	31	-
1992	45	-
1993	57	-
1994	48	-
1995	30	47
2010	-	67

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Project Justification

General

1. There is increasing recognition of the important public health benefits which derive from well conceived sewerage projects. However, implementation of such projects has often been lagged because formulae for economic quantification of these health benefits are not available and also because industries, which are usually the main polluters, have been generally reluctant to accept the costs for preventing environmental deterioration, which effects are often controversial and sometime unknown.

2. Throughout the world, industrialization and heavy urban concentration have resulted in massive discharges of chemical and organic wastes into the oceans and fresh water bodies which have caused important environmental modifications never before experienced or anticipated. In a few cases certainty of the dangers inherent to such modifications have been found, but more commonly medical certainty is likely to be achievable only long after the fact. However, common sense demands regulatory action to prevent harm even if there is less than certainty that harm is otherwise inevitable.

Expertise on Water Pollution Control

3. The Government is aware of the conflict between industrial and urban expansion and public health protection through preservation of the environment. However, the Government is also concerned with the high incidence of waterborne diseases (see Attachment 1) and the damage being caused to the tourist and fishing industries by the gross pollution of the coastal waters. Consequently, the Government has considered that the main objectives of the present project should be the upgrading of local expertise sewerage design, in water pollution control and industrial wastewater management and the establishment of entities capable of coping with the technical and financial aspects of these problems. To attain these objectives the project includes a number of technical, financial and institutional studies which constitute, in themselves, an important justification of the project.

Public Health

4. Incidences of water-borne diseases in Salonica and Volos are tabulated in Attachment 1. Even though this data is far too sketchy to provide accurate conclusions, it shows some general trends, as follows:

(a) Incidence of water-borne diseases has been consistently higher in Salonica, where the coastal waters are heavily contaminated, than in Volos, where only incipient contamination exists.

(b) The reduction in the incidence of hepatitis registered in Salonica since 1972 coincides with the closing of the beaches located in the heavily contaminated inner Salonica Bay.

(c) The typhoid outbreak recorded in 1972 in Volos was thought to be due to contamination of the drinking water aquifer by percolation from septic tanks. This outbreak was one of the main reasons for the city's decision to proceed with the new Kaliakouda water supply, which is presently being completed at an estimated cost of Dr. 51 million.

5. The Axios River valley is the largest available area for future urban development of Greater Salonica, but at the same time it contains the main underground aquifer presently providing drinking and industrial water to the city. Wastewater disposal through septic tanks is unacceptable in this area.

6. Outside of the danger to public health, the actual proliferation of septic tanks represents heavy expenditures to the population of both cities. In Greater Salonica the present annual cost of maintenance and cleaning of septic tanks was estimated by the consultants at Dr. 80 million and in Volos at Dr. 14 million.

Recreational Benefits

7. Recreational benefits resulting from the construction of the Salonica sewerage project are likely to be significant, since the beaches located in the inner bay, which have already been closed can be re-opened following completion of the project. The project will also protect the beaches of Perea and Agia Trias in the outer bay which are presently threatened by the growing pollution.

8. In Volos, recreational benefits are further into the future since bacteriological contamination has reached significant values only in the part of Goritsa beach, close to the city.

Fisheries

9. Fishing within Salonica Bay has been forbidden for several years. The economic importance of this ban has been relatively small since it affects only recreational and small scale fishing. However, the main commercial shellfish beds, located at Mega Emvolon Cape, are in waters already being threatened by the expanding pollution. The Xerias Creek, which carries wastewater from

the Industrial Estate into Volos Bay, is already affecting the water quality of the Bay, so that the expansion of pollution from this source is an increasing threat to the adjacent commercial fisheries.

Land Values

10. Increases of land costs have been a favorite tool for attempting to quantify economical benefits due to water pollution control projects, so that in both cities the consultants studied this approach in some detail. In Salonica the consultants concluded that land value increases resulting from the proposed project could be in the range between Dr. 5,000 - 12,500 million. In Volos the consultants reached a total estimate of Dr. 400 million. These increases in land values can only be a very general indicator of project benefits and, to a considerable extent, will overlap the benefits described above.

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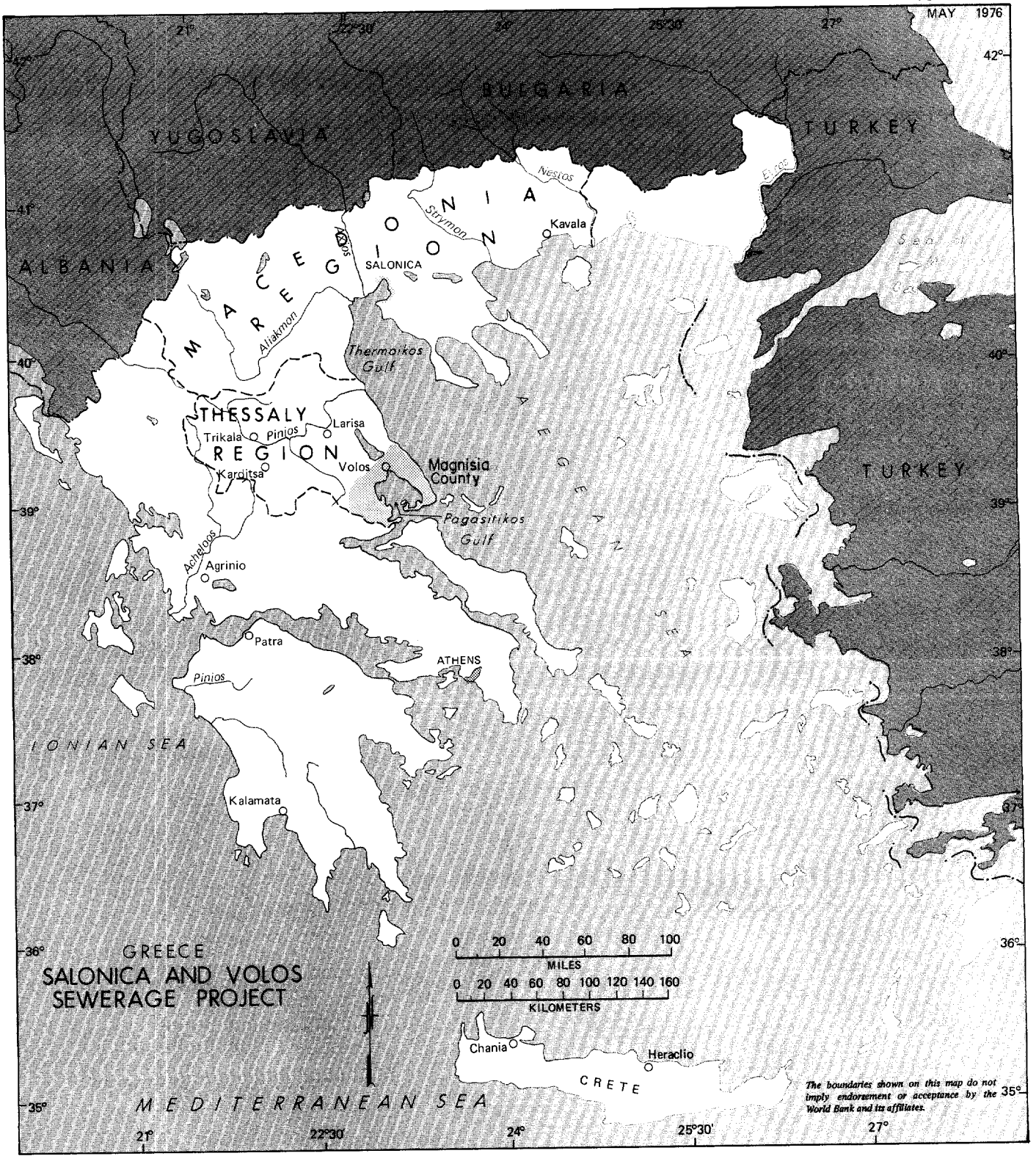
Incidence of Water-borne Diseases

	Number of Reported Cases			Cases per 100,000 Population		
Year	Typhoid	Paratyphoid	Hepatitis	Typhoid	Paratyphoid	Hepatitis
			A. Greater Salonica			
1969	42	1	283	7.7	0.2	52.1
1970	63	7	301	11.2	1.2	53.4
1971	45	5	675	7.7	0.9	115.4
1972	22	4	546	3.6	0.7	90.2
1973	44	3	348	7.0	0.5	55.6
1974	51	-	346	7.9	-	53.4
			B. Greater Volos			
1972	24	12	14	26.1	13.0	15.2
1973	3	-	11	3.2	-	11.8
1974	3	-	88	3.2	-	93.0
1975	2	-	12	2.1	-	12.5

IBRD 12211
MAY 1976



GREECE
SALONICA AND VOLOS SEWERAGE PROJECT

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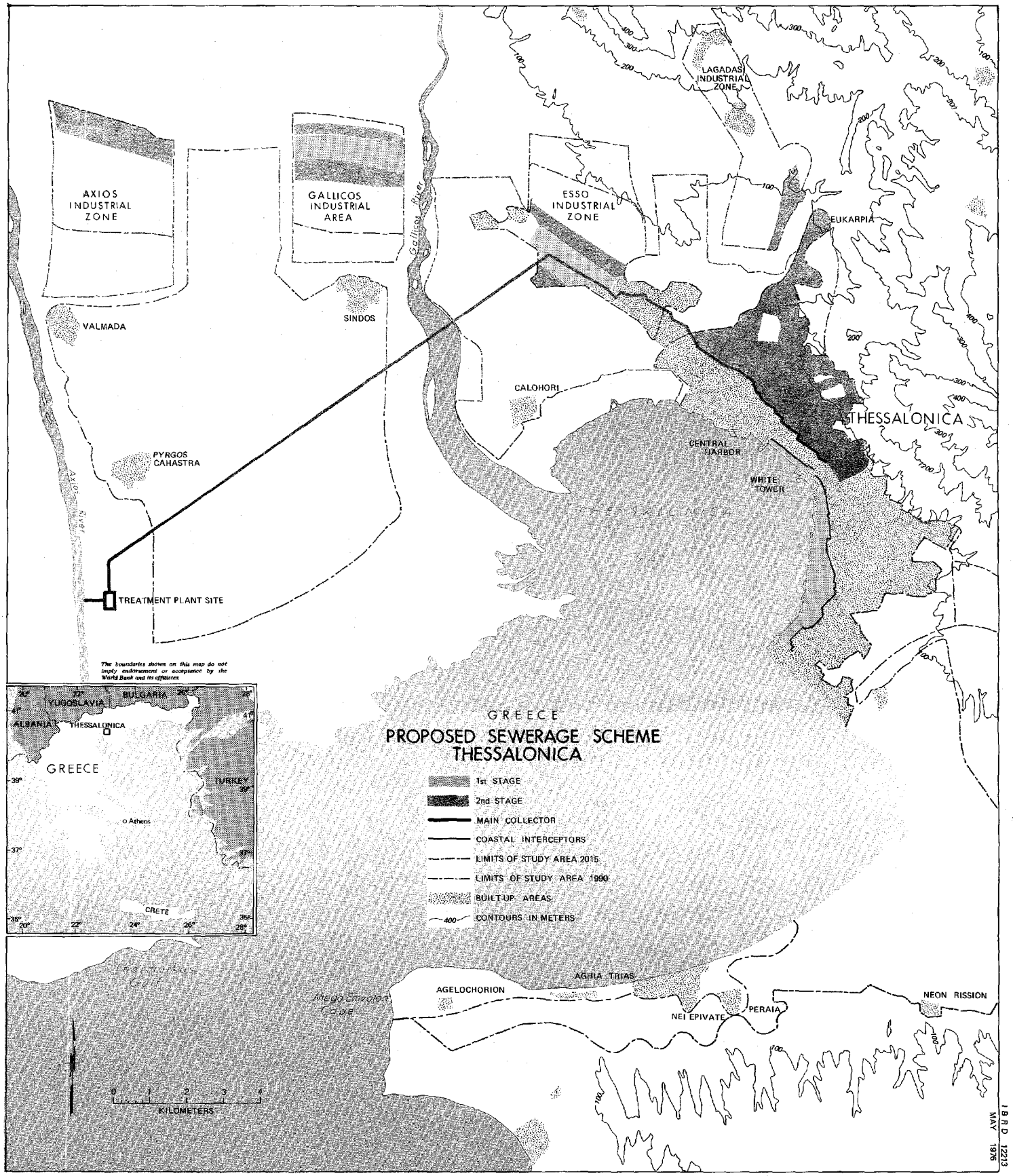
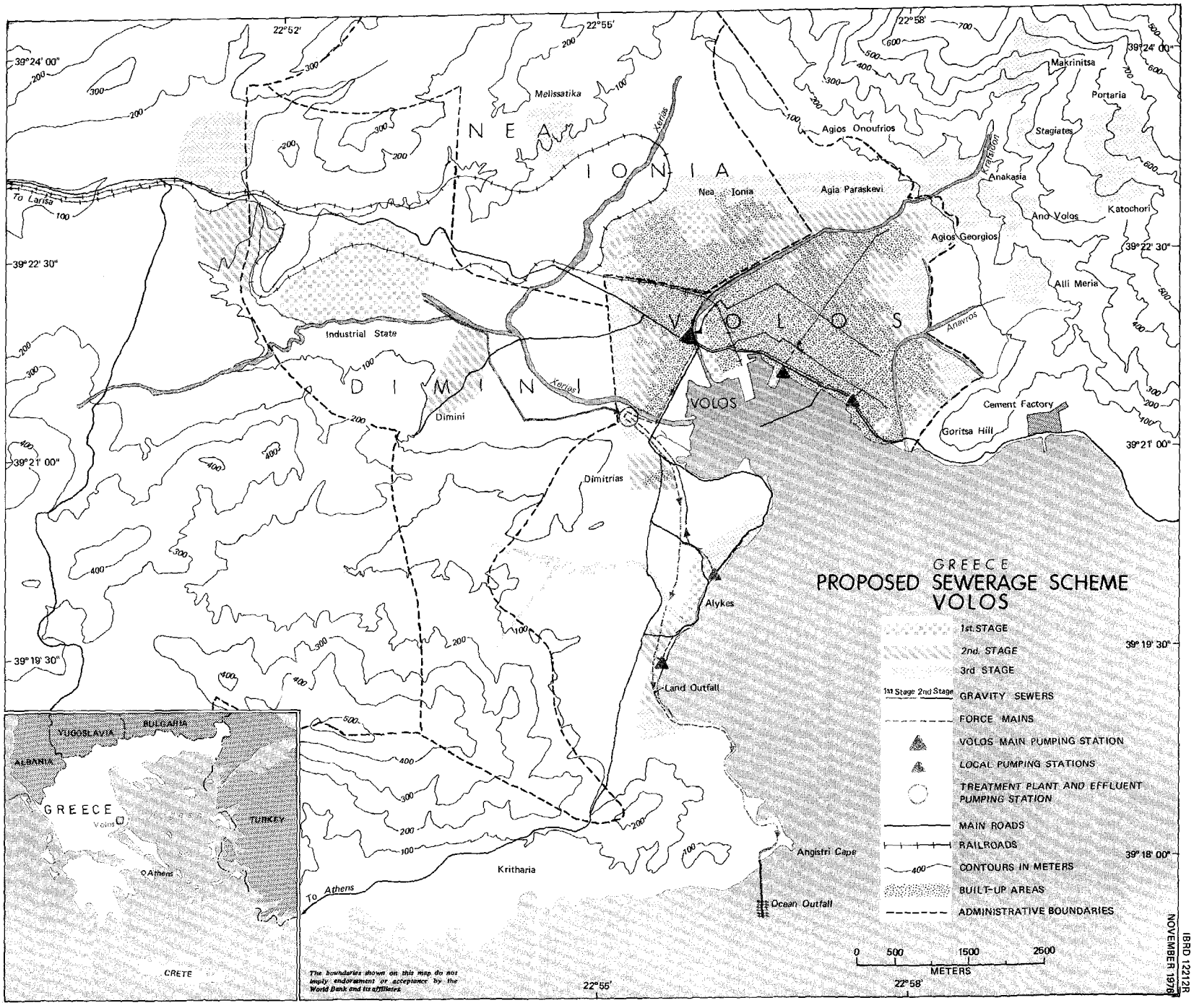

AXIOS INDUSTRIAL ZONE
GALLICOS INDUSTRIAL AREA
ESSO INDUSTRIAL ZONE
LAGADAS INDUSTRIAL ZONE
EUKARPIA
Gallikos River
VALMADA
SINDOS
CALOHORI
THESSALONICA
CENTRAL HARBOR
WHITE TOWER
PYRGOS CAHASTRA
Axios River
TREATMENT PLANT SITE
The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.
YUGOSLAVIA
BULGARIA
ALBANIA
THESSALONICA
GREECE
TURKEY
Athens
CRETE
GREECE
PROPOSED SEWERAGE SCHEME
THESSALONICA
1st STAGE
2nd STAGE
MAIN COLLECTOR
COASTAL INTERCEPTORS
LIMITS OF STUDY AREA 2015
LIMITS OF STUDY AREA 1990
BUILT-UP AREAS
CONTOURS IN METERS
AGHIA TRIAS
AGELOCHORION
NEI EPIVATE
PERAIA
NEON RISSION
Mega Embolo Cape
KILOMETERS
IBRD 12213
MAY 1976


GREECE
PROPOSED SEWERAGE SCHEME
VOLOS
1st STAGE
2nd STAGE
3rd STAGE
1st Stage 2nd Stage GRAVITY SEWERS
FORCE MAINS
VOLOS MAIN PUMPING STATION
LOCAL PUMPING STATIONS
TREATMENT PLANT AND EFFLUENT PUMPING STATION
MAIN ROADS
RAILROADS
CONTOURS IN METERS
BUILT-UP AREAS
ADMINISTRATIVE BOUNDARIES
0 500 1500 2500
METERS
NOVEMBER 1978
IBRD 12212R
N E A I O N I A
D I M I N I
V O L O S
VOLOS
Nea Ionia
Agia Paraskevi
Agios Onoufrios
Makrinitsa
Portaria
Stagiates
Anakasia
Ano Volos
Katochori
Agios Georgios
Alli Meria
Cement Factory
Goritsa Hill
Industrial State
Dimini
Dimitrias
Alykes
Land Outfall
Angistri Cape
Ocean Outfall
Kritharia
Melissatika
To Larisa
To Athens
Kerias
Anavros
Xirias
22°52'
22°55'
22°58'
39°24' 00"
39°22' 30"
39°21' 00"
39°19' 30"
39°18' 00"
YUGOSLAVIA
BULGARIA
ALBANIA
GREECE
TURKEY
Volos
Athens
CRETE
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