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REPUBLIC OF CYPRUS

MINISTRY OF AGRICULTURE AND NATURAL RESOURCES

DEPARTMENT OF WATER DEVELOPMENT

ANNUAL REPORT OF THE DEPARTMENT OF WATER DEVELOPMENT FOR THE YEAR 1973

By

C. A. C. KONTEATIS

Director of the Department of Water Development

NICOSIA — CYPRUS

December, 1974

Reg. No. 6809

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ANNUAL REPORT
OF THE
DEPARTMENT OF WATER DEVELOPMENT
FOR THE YEAR
1973

By
C.A.C. KONTEATIS
Director
of the Department of Water Development

CONVERSION TABLE

One Meter	=	3.281 feet
One Kilometer	=	3281 feet or 0.621 Statute mile
One Millimeter	=	0.039 Inches
One Square Kilometer	=	0.386 Square Statute mile
One hectar	=	10000 Square meters (7.5 Donums)
One cubic meter per second	=	35.315 cubic feet per second
One Liter	=	0.224 gallon

ABBREVIATIONS USED

mm	=	Millimeter
MCM	=	Million cubic meter
m^3/s	=	Cubic meter per second
m^3/h	=	Cubic meter per hour
ha	=	Hectar

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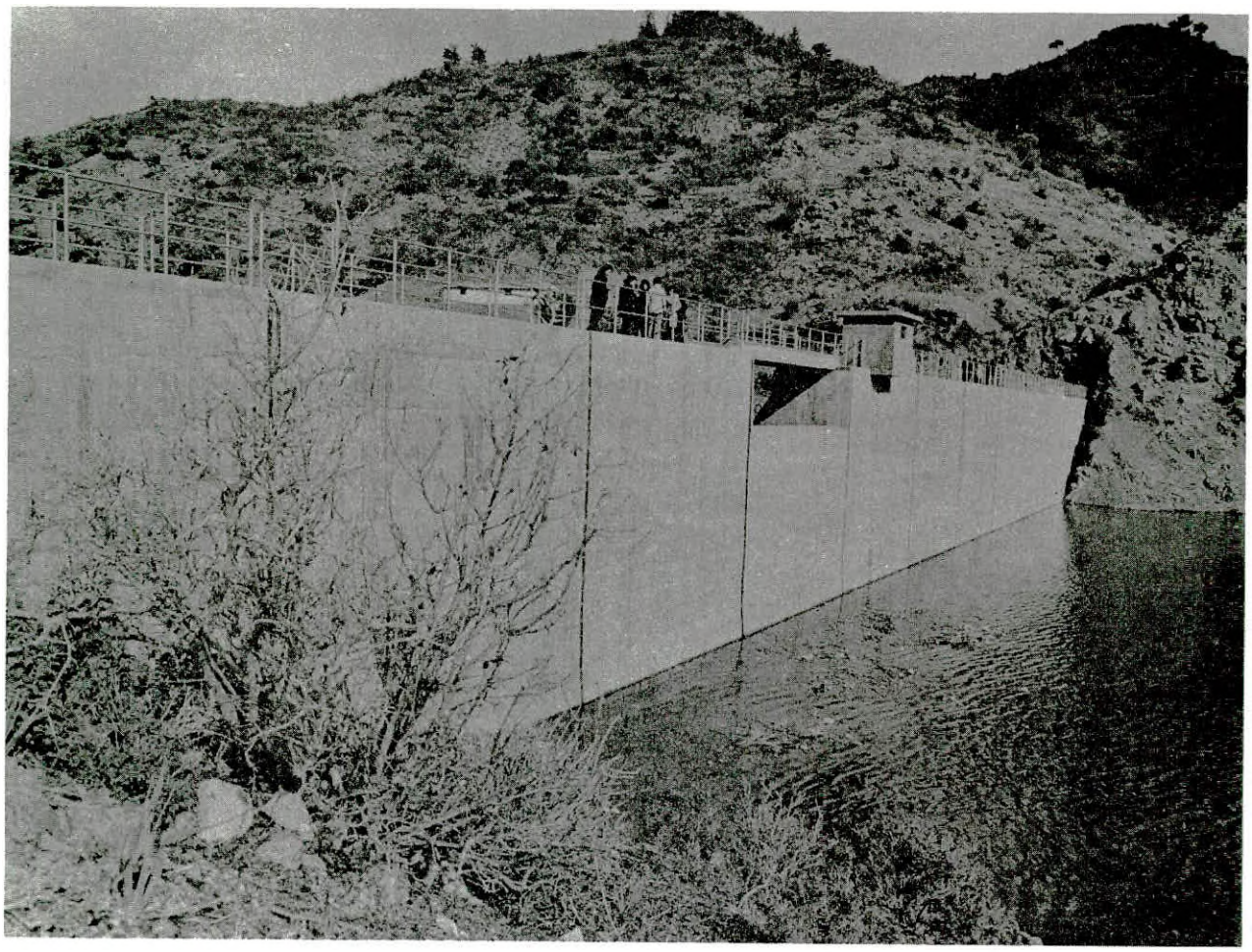
Evaporation Control Experiment at Mia Milia Dam



Palekhori Dam

I. GENERAL

1.1 Introduction

The Department of Water Development is one of the Departments of the Ministry of Agriculture and Natural Resources and is responsible for the Government's overall policy water resources, planning, design and construction on the Island. It also contributes towards the management of water resources and water development projects together with other interested Ministries and Departments. Such water development projects include domestic water supplies, irrigation and drainage projects, flood protection works, protection works against pollution of water resources, groundwater recharge works and other relevant works. Soil Conservation and agricultural problems involved in the economic use of water are responsibilities of the Department of Agriculture. The Government institutional set up for water resources conservation and development and the role of the Department of Water Development is shown on page 12.

1.2 Departmental Organization

The Departmental Organization is shown on page 13 and is made up of:

1.2.1 Division of Water Resources

This Division groups together all services required for the collection study and interpretation of hydrological and hydrogeological data both for ground and surface water, control of groundwater extraction and engineering geology problems as connected with the planning and execution of water works projects.

1.2.2 Division of Planning

This Division deals with the preparation of reconnaissance and feasibility studies prior to the detailed design of such projects. The works for planning include field investigations for hydraulic structures, laboratory testing for these structures, water use studies, hydrological evaluations, evaluation of benefits, techno-economic studies, as well as, engineering geology problems.

1.2.3 Division of Design

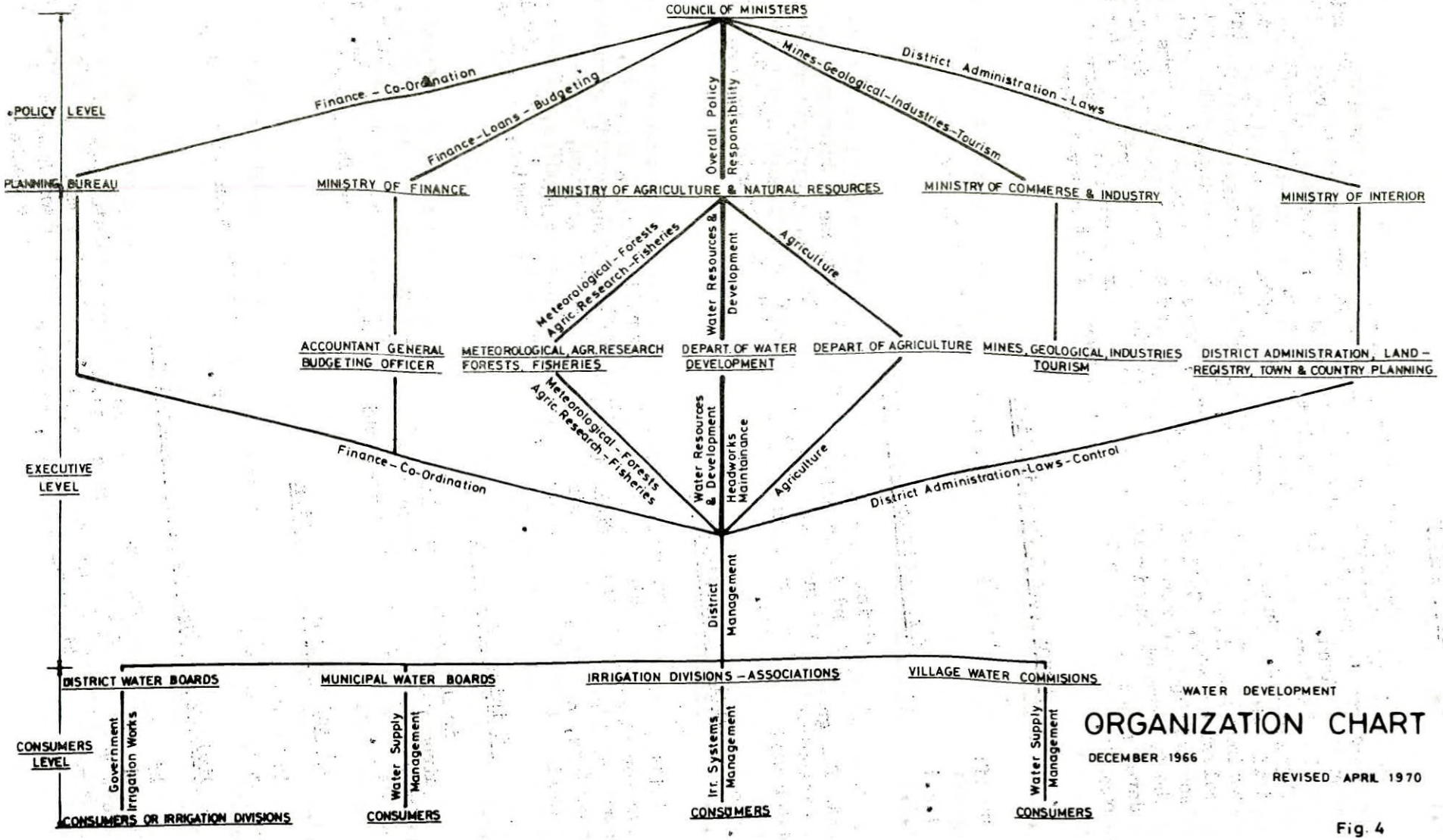
This Division deals with the detailed design and specification work required for major projects after they have approved as feasible. In this Division the drawing and topographic functions of the Department are incorporated.

1.2.4 Division of Construction

This Division is responsible for all construction work whether carried out by direct labour or by contract.

1.2.5 Division of Operation and Maintenance

This Division assists in the operation and maintenance of the major projects such as dams and town water supplies. For every major project there is a Project Water Board in the case of Irrigation or a Town Water Board in the case of town domestic water supplies, to which we are a member.



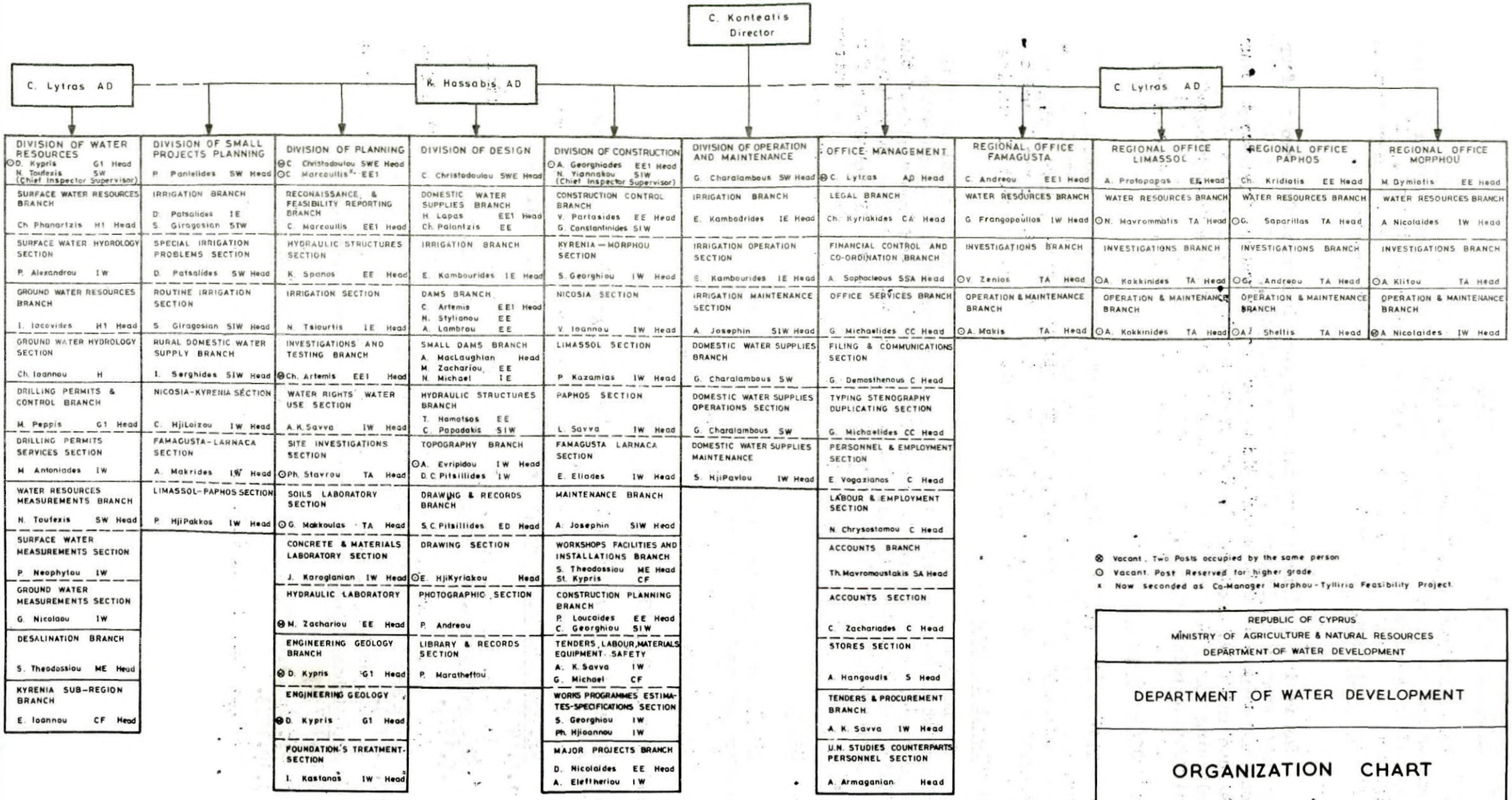
WATER DEVELOPMENT

ORGANIZATION CHART

DECEMBER 1966

REVISED APRIL 1970

Fig. 4



⊗ Vacant. Two Posts occupied by the same person
⊙ Vacant. Post Reserved for higher grade
x Now seconded as Co-Manager Morphou-Tylliria Feasibility Project

REPUBLIC OF CYPRUS
MINISTRY OF AGRICULTURE & NATURAL RESOURCES
DEPARTMENT OF WATER DEVELOPMENT

DEPARTMENT OF WATER DEVELOPMENT

ORGANIZATION CHART

DECEMBER 1973 | D.O. | DRG. No. BM/G/20

1.2.6 Division of Small Projects Planning

This Division deals with the planning and designing of small irrigation and domestic water supply projects which are of a rather routine nature and do not need elaborate planning and design procedures.

1.2.7 Regional Offices

The regional offices have this year been increased from two to four being now Famagusta, Limassol, Paphos and Morphou. In these regional offices the mainwork carried out is hydrological measurements, collection of engineering data, operation and maintenance of projects investigation and planning for small projects and control of construction work from the administrative point of view.

1.2.8 Office Management

This office is responsible for the office services, accounts, labour, personnel and stores. At the same time a financial control and co-ordination branch is included which deals with financial aspects including the control of expenditure.

1.2.9 Legal Advisor

The Legal Advisor gives advice on the various legal problems of the Department which include water legislation, contractor's works, and water right problems. Also he drafts new water legislation whenever required for approval by the Attorney General. He also deals with important legal matters of the Ministry of Agriculture and Natural Resources whenever requested to do so.

1.3 Staff

A list of the Senior Technical Staff is given on page 47
The numbers of staff by post are given on page 49

1.3.1 Appointments

1.3.1.1 On a monthly (Unestablished or Temporary) basis

During the period under review the following persons have been appointed to the posts as indicated:

Mr. Kyriacos A. Spanos, Executive Engineer, Class II, with effect from 1.6.1973.

Mr. Saverios A. Vrahimis, Executive Engineer, Class II, with effect from 1.6.1973.

Mr. Elias Kambourides, Topographer/Irrigation Engineer, with effect from 1.2.1973.

Mr. Michael Michaelides, Technical Assistant, with effect from 1.10.1973.

Mr. Antonios Papageorghiou, Technical Assistant, with effect from 1.10.1973.

Mr. Andreas Sophocleous, Technical Assistant, with effect from 1.10.1973.

Mr. Andreas M. Ashiotis, Foreman 2nd Grade, with effect from 1.10.1973.

Mr. Costas N. Papallis, Foreman 2nd Grade, with effect from 1.10.1973.

Mr. Andreas Loizou, Clerical Assistant, with effect from 1.5.1973.

Mr. Georghios Georghallides, Clerical Assistant, with effect from 1.5.1973.

Mrs. Chariklia E. Phinikaridou, Clerical Assistant, with effect from 1.5.1973.

1.3.1.2 On a Permanent Basis

Mr. Pantelis Loucaides, Executive Engineer, Class II, with effect from 1.6.1973.

Mr. Charalambos Palantzis, Executive Engineer, Class II, with effect from 1.6.1973.

Mr. Charalambos Kridiotis, Executive Engineer, Class II, with effect from 1.6.1973.

Mr. Christos Phanartzis, Hydrologist, Class I, with effect from 1.6.1973.

Mr. Savvas Theodosiou, Mechanical Engineer, Class II, with effect from 1.1.1973.

Mr. Stavros Chr. Pitsillides, Engineering Draughtsman, with effect from 1.1.1973.

Mr. Athanasios Klitou, Technical Assistant, with effect from 1.6.1973.

Mr. Georghios Andreou, Technical Assistant, with effect from 1.6.1973.

Mr. Andreas Karoullas, Technical Assistant, with effect from 1.6.1973.

Mr. Takis Ioannou, Technical Assistant, with effect from 1.6.1973.

Mr. Vassos Ch. Zenios, Technical Assistant, with effect from 1.6.1973.

Mr. Kyprос Chr. Mourouzides, Technical Assistant, with effect from 1.6.1973.

Mr. Anthoullis Th. Kokkinides, Technical Assistant, with effect from 1.6.1973.

Mr. Georghios Koumides, Technical Assistant, with effect from 1.6.1973.

Mr. Sofoclis Kyriacou, Foreman 1st Grade, with effect from 1.10.1973.

Mr. Meletios Michael, Foreman 2nd Grade, with effect from 1.10.1973.

Mrs. Chrystalla J. Koursoumba, Machine Operator, 2nd Grade, with effect from 2.4.1973.

Mrs. Androulla Kaspari, Clerical Assistant, with effect from 1.4.1973.

Mrs. Anna Ioannou, Clerical Assistant, with effect from 1.4.1973.

Miss Athina Koronellou. Clerical Assistant, with effect from 1.4.1973.

1.3.1.3 On Contract

Mr. Charalabos Kyriakides, was appointed Legal Advisor, with effect from 1.7.1973, in the place of Mr. Antonakis Ioannides.

1.3.1.4 Promotions, Secondments

A number of Officers were promoted or seconded to the posts appearing opposite their names:

1.3.1.4.1 Promotions

Mr. Christodoulos A. Christodoulou, from Executive Engineer, Class I, to Senior Water Engineer, with effect from 1.1.1973.

Mr. Charis Lapas, from Executive Engineer, Class II, to the permanent post of Executive Engineer, Class I, with effect from 1.1.1973.

Mr. Christodoulos Ch. Artemis, from Executive Engineer, Class II, to the permanent post of Executive Engineer, Class I, with effect from 15.10.1973.

Mr. Marcos Dymiotis, Executive Engineer, Class II, to the permanent post of Executive Engineer, Class I, (on probation) with effect from 1.12.1973.

Mr. Costas Georghiou, from Senior Inspector of Works, (on secondment), to the permanent post of Senior Inspector of Works, with effect from 1.1.1973.

Mr. Doloros Pitsillides, from Inspector of Works, (on secondment), to the permanent post of Inspector of Works with effect from 1.6.1973.

Mr. Elias Chr. Eliades, from Inspector of Works, (on secondment), to the permanent post of Inspector of Works, with effect from 1.6.1973.

Mr. Styllis Kypri, from Chief Foreman, (on secondment), to the permanent post of Chief Foreman, with effect from 1.1.1973.

Mr. Vassos Athanassiou, from Assistant Chief Foreman, (on secondment), to the permanent post of Assistant Chief Foreman, with effect from 1.6.1973.

Mr. Andreas Ioannides, from Assistant Chief Foreman, (on secondment), to the permanent post of Assistant Chief Foreman, with effect from 1.6.1973.

Mr. Nicos Kaisis, from Assistant Chief Foreman, (on secondment), to the permanent post of Assistant Chief Foreman, with effect from 1.10.1973.

Mr. Antonios Nicola, from Assistant Chief Foreman, (on secondment), to the permanent post of Assistant Chief Foreman, with effect from 1.10.1973.

Mr. Omiros Ioakim, from Foreman 1st Grade, (on an unestablished basis) to the permanent post of Foreman 1st Grade, with effect from 1.6.1973.

Mr. Chysanthos Metaxas, from Foreman 1st Grade, (on an unestablished basis), to the permanent post of Foreman 1st Grade, with effect from 1.6.1973.

1.3.1.4.2 Secondments

Mr. Tassos N. Hamatsos, from the post of Assistant Labour Officer, was seconded to the Temporary post of Executive Engineer, Class II, with effect from 1.6.1973.

Mr. Georghios A. Constantinides, from the permanent post of Inspector of Works, was seconded to the Temporary post of Senior Inspector of Works, with effect from 1.10.1973.

Mr. Andreas K. Savva, from the Temporary (Development) post of Inspector of Works, (on secondment) was seconded to the permanent post of Inspector of Works, with effect from 1.10.1973.

Mr. Andreas N. Eleftheriou, from the permanent post of Technical Assistant, was seconded to the Temporary post of Inspector of Works, with effect from 1.10.1973.

Mr. Costas Charalambous, from Foreman 1st Grade to the Temporary post of Assistant Chief Foreman, with effect from 1.10.1973.

Mr. Andreas Christodoulou, from Foreman 1st Grade, to the Temporary post of Assistant Chief Foreman, with effect from 1.10.1973.

1.3.2 Resignations, transfers, retirements

1.3.2.1 Resignations

The following officers resigned from the Department during the year.

Mr. Antonakis Ioannides, Legal Advisor to the Department, resigned from his post as from 10th March 1973 to take up the post of temporary Judge in the Nicosia Courts.

Mr. Costas S. Constantinou, Executive Engineer, Class II, tendered his resignation, with effect from 15.4.1973.

1.3.2.2 Transfers

Mr. Georghios HjiSoteriou, Accounting Officer, 1st Grade, was transferred from this Department to the Department of Welfare Services, with effect from 1.3.1973.

Mr. Themos Mavromoustakis, Supervisor of Accounts, was transferred to this Department from the Office of the District Officer, Nicosia, with effect from 1.3.1973.

Mr. Nicos Christou, Messenger 2nd Grade, was transferred from this Department to the office of the Accountant-General, with effect from 5.7.1973.

Mr. Andreas Petrou, Messenger 2nd Grade, was transferred to this Department from the Office of the Accountant-General, with effect from 5.7.1973.

Mrs. Maroulla HjiGeorghiou, Clerical Assistant, was transferred from this Department to the Department of Forests, with effect from 17.9.1973.

Mrs. Maroulla P. Hepi, Clerk 2nd Grade, was transferred to this Department from the Department of Public Works, with effect from 17.9.1973.

1.3.2.3 Retirements

No member of the staff retired during the year.

1.3.3 Scholarships - Fellowships - Duty Abroad

During 1973 a number of officers were granted scholarships, others were sent on short courses or attended Congresses. All the officers who have participated derived the maximum of benefit:

1.3.3.1 Scholarships - Fellowships

The officers thus concerned are the following:

Mr. Christodoulos Christodoulou, Senior Water Engineer, was awarded a fellowship by F.A.O. in the Water Research Association, U.K., from 24.3.1973 - 19.5.1973 where he worked on the production of a mathematical model for proposed Southern Conveyor Project.

Mr. Christos Ioannou, Hydrologist Class II, who had been granted a six-month scholarship by the Government of Israel for the International Postgraduate Course in the Exploration and Development of Groundwater Resources completed his scholarship and resumed his duties on the 17th April, 1973.

Mr. Kyprianos Hassabis, Assistant Director, attended a two-month course on Water Supply and Waste Disposal at the Economic Development Institute of the International Bank for Reconstruction and Development in Washington, U.S.A., from the 21st May 1973 to the 20th July, 1973.

Mr. Michalakis Peppis, Geologist Class I, was awarded a Fellowship by the Government of Austria in the Seminar for the Tracing of Subterranean Water, from the 27th August, 1973 to the 29th September, 1973. This Seminar has been organized within the framework of UNESCO.

Mr. Demosthenis Patsalides, Topographer/Irrigation Engineer, who had been granted a Fellowship by the Netherlands Government in Hydraulic Engineering completed his studies and was awarded a Diploma in International Course in Hydraulic Engineering. He resumed his duties on the 24th September, 1973.

Mr. Marcos Dymiotis, Executive Engineer who had likewise been awarded the same fellowship, as Mr. Patsalides completed his studies and resumed his duties on the 1st October, 1973.

1.3.3.2 Conferences and Duty Abroad

Mr. C.A.C. Konteatis, Director, W.D.D., attended the following Meetings on Duty abroad:

In the Water Research Association U.K. for work on the mathematical model for the Southern Conveyor Project between the 6th to the 13th May, 1973.

The 11th Congress of the International Commission on Large Dams which was held in Madrid, between the 8th to the 17th June, 1973.

Washington DC from the 5th to the 15th November, 1973, where, together with the Director-General, Ministry of Agriculture and Natural Resources and the Director-General, Planning Bureau, they negotiated with the International Bank the grant of a loan for financing the Paphos Irrigation Project.

Mr. Chr. Artemis, Executive Engineer, Class I, attended with Mr. Konteatis the 11th Congress of the ICOLD in Madrid from the 8th to the 17th June 1973.

Mr. Christos Phanartzis, Hydrologist, Class I, participated in studies connected with Hydrological Long term Stochastic series in Lebanon from the 5th to the 10th July 1973.

Mr. Savvas Theodosiou, Mechanical Engineer, Class II, participated in a meeting concerning the proposed Mobile Desalination Plant, to be offered by the U.K. Government and which was held at A.E.A. Harwell, U.K. on the 29th November, 1973.

Mr. Charalambos Palantzis, Executive Engineer, Class II, proceeded on duty to Toronto (Canada) from the 28th May 1973 to the 21st July, 1973, to work with the Consultants in the computer analysis of the Distribution Systems of Nicosia and Famagusta Water Supply Schemes.

1.4 Foreign Technical Assistance

The technical assistance received by the Department during the year was:

1.4.1 United Nations

The following technical assistance was provided through the United Nations:

1.4.1.1 Morphou-Tylliria Feasibility Study

This project officially called "Feasibility Studies for Irrigation Development in the Morphou-Tylliria Area", (SF CYP 513-1/AGL) was undertaken by Electro-Watt Engineering Services Ltd., of Zurich Switzerland, acting as contracted consultants employed by UNDP with the participation of the Food and Agriculture Organization of the United Nations as the executing Agency. The study which commenced in June 1972 and scheduled to last two and a half years, is now anticipated to be completed with the edition of the Final Report in Summer 1974.

The main objectives of the Project, as set in the plan of operation, include the provision of adequate supply of water for the Morphou area by the diversion of excess water from Pendayia and Tylliria rivers and through the control of ground water utilization, and the irrigation development of the Pendayia-Tylliria area up to Pyrgos River.

The various individual studies which constitute this Feasibility Study were described in the 1972 Annual Report (p. 67) and are summarised here, together with the progress achieved during 1973.

1.4.1.1.1 Hydrological study. This study was completed early in 1973.

1.4.1.1.2 Hydrological study. The calibration of the ground water mathematical model for the Morphou aquifer was completed in October 1973 and about five simulation runs were performed until the endof the year. Pending a couple of more simulation runs this work can be considered as substantially completed. The study of the small aquifers on the Pendayia-Tylliria catchments was very much impeded by the lack of recharge data due to the dry conditions which prevailed in 1973.

1.4.1.1.3 Water mobilization planning. The early completion of the hydrological studies enabled the advancement and completion of this study during 1973. In general the project development is planned in two stages. In the first stage a quantity of about $20 \times 10^6 m^3$ of water in an average year can be diverted to cover the immediate needs of Morphou area. In second stage an additional quantity of 23×10^6 m^3 of water can be developed to provide for local agricultural development and further diversion.

1.4.1.1.4 Engineering Studies. The work on the design of the various structures envisaged within the project continued and was completed by the end of the year. The main works include as a first phase, diversion structures on the Xeros, Marathassa and Karyotis river with a conveyor canal up to a major reservoir to be built at Prastio from where the water will be pumped into a pipe distribution system. The second phase includes for a water diversion conduit from the Pyrgos and Limnitis rivers to Morphou. Also local irrigation works for the benefit of the valleys from which the water is to be diverted have been provided.

1.4.1.1.5 Agricultural studies. During 1973 all data required was collected and compiled and studies such as on land classification, land use, irrigation practices and methods, cropping patterns, irrigation water requirements, cultural practices and crop production parameters were completed by the end of 1973.

1.4.1.1.6 Economic Studies. The various cost and benefit inputs to the model of economic analysis and optimization were made available by the end of 1973. This study which will test the economic feasibility of the formulated alternative agricultural development schemes will be completed early in 1974.

The interim report on the conclusions of all the above studies, which was planned for December, 1973, was delayed and is now expected early in 1974. This delay however will allow the preparation of an advanced interim report which will subsequently enable the preparation of the final report by Autumn 1974 instead of the end of the same year.

During the year Mr. W. Rodger FAO Resident Engineer of the Project resigned from his post and joined the International Bank on Recreation and Development. Mr. Latham from FAO replaced Mr. Rodger as Resident Engineer from December 1973.

1.4.1.2 Technical Assistance

1.4.1.2.1 We were very happy to acquire again the services of Mr. Branco Milinusic FAO Senior Irrigation Engineer who joined the Department in February. Mr. Milinusic has been assigned work mainly in connection with Paphos and Morphou Irrigation Schemes.

1.4.1.2.2 Mr. Poolman, FAO Associate Expert from the Netherlands has been working throughout the year with the Morphou Feasibility Study Team.

1.4.2 British Technical Assistance

During the year British Technical Assistance was continued as follows:

1.4.2.1 Southern Conveyor Project

In February a meeting was held in the Department for discussions on the Southern Conveyor Project Study in which Mr. D. FitzGibbon of the ODA Middle East Office Beirut and Mr. M. McDonald of the British High Commission Nicosia Participated.

Subsequently Mr. C.A. Christodoulou S.W.E. spent two months within the Water Research Association of Great Britain where a preliminary model of the Southern Conveyor Project has been prepared. During the same period Mr. Konteatis spent a few days at the Association for discussions on the preparation of the Model.

The said Model consists of two main parts: The Engineering part and the Economics part.

The Engineering part calculates the total diversion of the Paphos rivers into the Kouris reservoir, and does the simulation of it in connection with a terminal storage at Famagusta. The objective is to satisfy a number of demands from Akrotiri to Famagusta areas, with a given order of priority.

The Economics part calculates the economic parameters i.e. the internal rate of return and the cost benefit ratios, for various alternatives. In a very short time the sensitivity of the above parameters, can be checked by changing any variable input. Such a variable input may be the wages or the export price of a certain crop.

The study of the above model has been done on a C.D.C. 6500 computer of the London University computer services. Later it has been modified so that it can operate on an I.B.M. System 3 computer which is available in Cyprus.

Having in mind the Southern Conveyor study which may start soon under the British O.D.A. financing this preliminary model may be considered as the first step towards the final model.

1.4.2.2 Brackish Water Desalination

During April Mr. Owen Pugh, the Desalination Manager of the U.K.E.A. visited Cyprus and made recommendations about the application of Reverse Osmosis for the treatment of brackish water.

He recommended that before making a final commitment to large static desalination plant we should purchase a mobile commercial size Reverse Osmosis plant and undertake a test programme lasting about one year. This test was recommended to be carried under the guidance of the U.K.E.A.

These recommendations were adopted by the Government and the U.K.E.A. has gone ahead under British Technical Assistance with the preparation of a mobile Reverse Osmosis plant with the possibility of interchanging the membranes to the three best known types and of a capacity of 310 cu.m/daily. This plant is expected to be available for commissioning in Summer 1974.

During the year Mr. Konteatis and Mr. Theodossiou the Desalination Expert of the Department visited the U.K.E.A. at Harwel, where they had discussions regarding the preparation of the mobile plant.

1.5 Desalination Studies

During the year negotiations started with IBRD in connection with the financing of a 1½ million cu.m./a desalting sea water distillation plant to be established in conjuction with the new generating power station at Dhekelia, for commissioning between the years 1978 and 1980. In introducing this plant which is to be connected into the water supply system of Famagusta-Larnaca it is also aimed to be a pilot project for gaining knowledge and experience in distillation plants. Certain queries were raised by the IBRD which are being answered and a decision is expected to be taken in 1974.

In addition as mentioned in the previous paragraph discussions were held with the U.K.E.A. in connection with the introduction of Reverse Osmosis plants for desalting of brackish boreholes. Tenderes were invited for the supply of treatment plants for brackish boreholes, but it was decided to go ahead as a first step with the proposals of the U.K.E.A. for a testing mobile plant.

Finally during the year a small Reverse Osmosis plant of 2 to 5 cu.m/day output was given to the Department by the West German Company Kalle through a local agent, which was used for experimental purposes on various types of brackish water. After two months use the membranes of the plant broke down which was most probably due to a biological degradation of the membrane. There is no doubt that the Reverse Osmosis plants present a lot of technical problems as regards the various chemical and organic constituents in the water, and only by testing and experimenting with the various types of Reverse Osmosis systems it would be possible to establish the best method. The mobile plant to be presented by the U.K.E.A. is hoped to resolve some of these problems.

1.6 Cyprus National Inter-Departmental and Departmental Committees

1.6.1 International Hydrological Decade

This Committee was set up on 19th August, 1964 for U.N.E.S.C.O.'s Hydrological Decade (1965-1974) and is composed of the following persons:-

Chairman	Mr. C.A.C. Konteatis, Director, Water Development Department
Secretary	Mr. N. Chr. Toufexis, Assistant Head of Water Resources Division
Members	Mr. Y. Hji Stavrinou, Director, Geological Survey Deparment
	Mr. A. Papasolomontos, Director, Agricultural Department
	Mr. Th. Christou, Director, Agricultural Research Institute
	Mr. G. Seraphim, Director, Forest Department
	Mr. C. Philaniotis, Meteorologist, Meteorological Office

The main activities during the year were hydrometeorological observations taken in the Representative basin of Limnitis and Vasilikos rivers, as well as the evaporation observations taken at Athalassa. The results are reported to the Secretary, Co-ordinating Council for the I.H.D. Paris.

1.6.2 International Commission on Large Dams

The Cyprus National Committee on Large Dams (CNCOLD) was elected to full membership of the International Commission on Large Dams in 1969. During 1973 the National Committee was composed of the following members:

Chairman	Mr. C.A.C. Konteatis, Director, Water Development Department
Secretary	Mr. C.C. Artemis Executive Engineer, Division of Design

DAMS CONSTRUCTED UP TO 1960

No	DAM	TYPE	HT	1000m³	YEAR
1	Kouklia	Earth	6	4,545	1900
2	Lymbia	Gravity	5	18	1945
3	Lythrodhonda	Gravity	11	32	1945
4	Kalokhorio (K1)	Gravity	9	82	1947
5	Akrounda	Gravity	7	23	1947
6	Galini	Gravity	11	23	1947
7	Petra	Gravity	9	32	1948
8	Petra	Gravity	9	23	1951
9	Lythrodhonda	Gravity	10	32	1952
10	Kafizes	Gravity	23	113	1953
11	Ayios Loucas	Earth	3	455	1955
12	Gypsos	Earth	3	100	1955
13	Kandou	Gravity	15	34	1956
14	Perapedhi	Gravity	22	55	1956
15	Pyrgos	Gravity	22	285	1957
16	Trimiklini	Gravity	33	340	1958

Total Storage Capacity 6,192 $m^3 \times 10^6$

MINOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m³	YEAR
47	Sotira	Earth	8	15	1962
48	Panayia (F)	Earth	7	45	1962
49	Paralimni (45)	Earth	5	115	1963
50	Ayia Napa (7)	Earth	8	55	1963
51	F'sta Recharge	Earth	5	50	1963
52	Phrenaros (6)	Earth	5	115	1964
53	Dherynia	Earth	6	23	1964
54	Phrenaros (3)	Earth	7	45	1966
55	Avgorou (7)	Earth	3	68	1966
56	Kondea (2)	Earth	5	82	1966
57	Xylophaghou (4)	Earth	7	86	1966
58	Sotira (4)	Earth	5	32	1966
59	Lysi	Earth	7	77	1967
60	Ay Yeoryios (9)	Earth	3	68	1967
61	Ay Epiktitos (6)	Earth	6	34	1968
62	Akanthou (6)	Earth	6	45	1968
63	Akhna (3)	Earth	4	40	1968
64	Xylotymbou (5)	Earth	5	50	1969

Total Storage Capacity 1,075 $m^3 \times 10^6$

MAJOR DAM PROJECTS FROM 1960-70

No	DAM	TYPE	HT	1000m³	YEAR
17	Prodhromos	Earth	10	122	1962
18	Morphou	Earth	13	1,879	1962
19	Lefka	Gravity	35	368	1962
20	Geunyeti	Earth	15	1,045	1962
21	Athalassa	Earth	18	791	1962
22	Kanli Kevy	Earth	19	1,113	1963
23	Argaka	Rockfill	41	1,150	1964
24	Mia Milia	Earth	22	355	1964
25	Ovgos	Earth	16	845	1964
26	Kiti	Earth	22	1,614	1964
27	Agros	Earth	26	99	1964
28	Liopetri	Earth	18	340	1964
29	Polemidhia	Earth	45	3,864	1965
30	Ayia Marina	Rockfill	33	311	1965
31	Kalopanayiotis	Earth	40	391	1966
32	Mavrokolymbos	Earth	45	2,180	1966
33	Pomos	Rockfill	38	859	1966
34	Yermasoyia	Earth	49	13,600	1968
35	Syngrasis	Earth	7	1115	1968

Total Storage Capacity 32,041 $m^3 \times 10^6$

MAJOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m³	YEAR
36	Ayios Yeoryios	Earth	6	90	1962
37	F'sta Antiflood	Earth	8	165	1963
38	Ayios Nikolaos	Earth	2	1,365	1964
39	Paralimni Lake	Earth	1	1,365	1964
40	Fresh Water Lake	Earth	3	4,545	1964
41	Makrasyka	Earth	8	195	1966
42	Akhna (Mesania)	Earth	4	90	1967
43	Morphou spreading grounds	Earth	5	130	1969
44	Ormidhia	Earth	5	100	1968
45	Vrysoules	Earth	7	140	1969
46	Protopapa	Earth	6	90	1970

Total Storage Capacity 8,275 $m^3 \times 10^6$

MAJOR DAM PROJECTS FROM 1971-73

No	DAM	TYPE	HT	1000m³	YEAR
65	Lefkara	Earth Rockfill	74	13,850	1973
66	Massari Recharge dam	Earth	15	2,273	1973
67	Palechori-Kambi	Gravity	33	620	1973

Total Storage Capacity 16,743 $m^3 \times 10^6$

GRAND TOTAL UP TO END OF 1973 : 64.4 $m^3 \times 10^6$

(1) Dams constructed up to 1960

(17) Major dam projects from 1960-70

(65) Major dam projects from 1971-73

(36) Major recharge dams from 1960-70

(47) Minor recharge dams from 1960-70

HT refers to height in meters from foundation

YEAR is the year of completion

Phrenaros (6) means six small dams in Phrenaros area

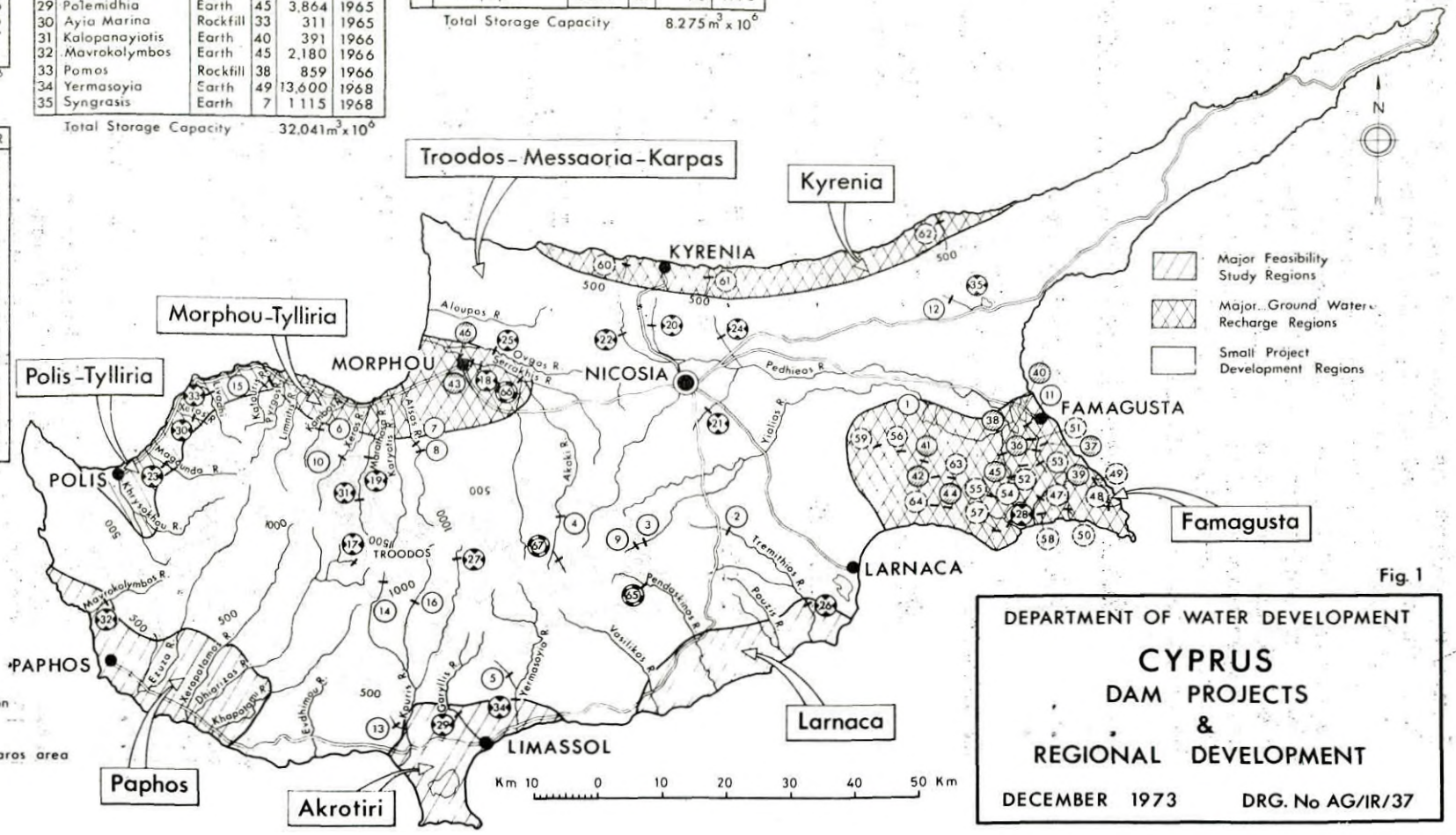


Fig. 1

DEPARTMENT OF WATER DEVELOPMENT

CYPRUS
DAM PROJECTS & REGIONAL DEVELOPMENT

DECEMBER 1973 DRG. No AG/IR/37

REGISTRE DES BARRAGES EN CHYPRE

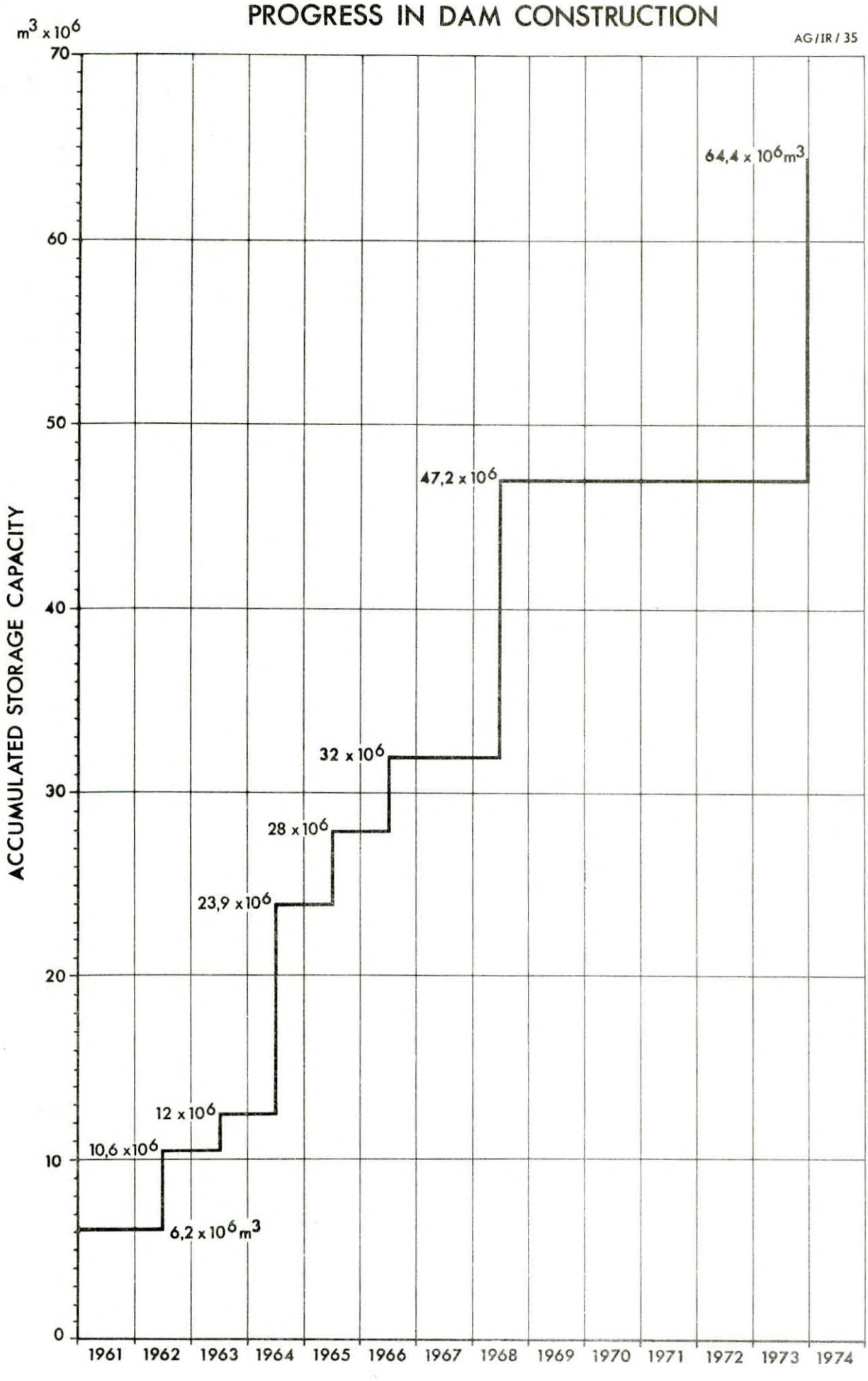
REGISTER OF DAMS IN CYPRUS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
LIGNE / *LINE* No	NOM DU BARRAGE *NAME OF DAM*	ANNEE D'ACHEVEMENT *YEAR OF COMPLETION*	SITUATION *LOCATION* COURS D'EAU *RIVER*	VILLE LA PLUS PROCHE *NEAREST CITY*	ETAT PROVINCE OU DEPARTEMENT *STATE PROVINCE OR COUNTY*	TYPE	HAUTEUR AU DESSUS DE LA PLUS BASSE FONDATION *HEIGHT ABOVE LOWEST FOUNDATION* (m)	LONGUEUR DE CRÊTE *LENGTH OF CREST* (m)	VOLUME DU BARRAGE *VOLUME CONTENT OF DAM* (10^3 m^3)	CAPACITÉ TOTALE DU RESERVOIR *GROSS CAPACITY OF RESERVOIR* (10^3 m^3)	DESTINATION *PURPOSE*	CAPACITÉ MAXIMALE DES EVACUATEURS *MAXIMUM DISCHARGE CAPACITY OF SPILLWAYS* (m^3/s)	TYPE DES EVACUATEURS *TYPE OF SPILLWAYS*	PROPRIÉTAIRE *OWNER*	BUREAU D'ETUDES *ENGINEERING BY*	CONSTRUCTEUR *CONSTRUCTION BY*	LIGNE / *LINE* No
1	KAFIZES	1953	Xeros (Morphou)	Nicosia	Nicosia	PG	23	27	4	113	I	54	L	Lefka Irrigation Division	Department of Water Development	Department of Water Development	1
2	KANDOU	1956	Kouris	Limassol	Limassol	PG	15	53	2	34	I	59	L	Kandou Irrigation Division	Department of Water Development	Department of Water Development	2
3	PERAPEDHI	1956	Kouris	Limassol	Limassol	PG	22	62	4	55	I	107	L	Perapedhi Irrigation Division	Department of Water Development	Department of Water Development	3
4	PYRGOS	1957	Katouris	Nicosia	Nicosia	PG	22	66	5	285	I	125	L	Pyrgos Irrigation Division	Department of Water Development	Department of Water Development	4
5	TRIMIKLINI	1958	Kouris	Limassol	Limassol	PG	33	76	6	340	I	59	L	Trimiklini Irrigation Division	Department of Water Development	Department of Water Development	5
6	ATHALASSA	1962	Pedhieos	Nicosia	Nicosia	TE	18	447	103	791	I	48	L	Government	Department of Water Development	Department of Water Development	6
7	GEUNYELI	1962	Pedhieos	Nicosia	Nicosia	TE	15	254	50	1 045	I	173	L	Geunyeli Irrigation Division	Department of Water Development	Department of Water Development	7
8	LEFKA	1962	Marathasa	Nicosia	Nicosia	PG	35	149	11	368	I	246	L	Lefka Irrigation Division	Department of Water Development	Department of Water Development	8
9	MORPHOU	1962	Serakhis	Nicosia	Nicosia	TE	13	1 436	206	1 879	I	764	L	Morphou Irrigation Division	Department of Water Development	Department of Water Development	9
10	PRODHROMOS	1962	off stream	Limassol	Limassol	TE	10	756	73	122	I		L	Prodhromos Irrigation Division	Department of Water Development	Department of Water Development	10
11	KANLI KEUY	1963	Pedhieos	Nicosia	Nicosia	TE	19	311	47	1 113	I	116	L	Kanli Keuy Irrigation Division	Department of Water Development	Department of Water Development	11
12	AGROS	1964	Kouris	Limassol	Limassol	TE	26	180	61	99	I	6	L	Agros Irrigation Division	Department of Water Development	Department of Water Development	12
13	ARGAKA	1964	Magounda	Paphos	Paphos	ER	41	173	138	1 150	I	0.3	L	Government	Howard Humphreys & Sons of U.K.	Department of Water Development	13
14	KITI	1964	Tremithios	Larnaca	Larnaca	TE	22	990	183	1 614	I	602	L	Government	Il Nuovo Castoro of Italy	Department of Water Development	14
15	LIOPETRI	1964	Potamos	Famagusta	Famagusta	TE	18	579	50	340	R	150	L	Liopetri Irrigation Division	Department of Water Development	Department of Water Development	15
16	MIA MILEA	1964	Pedhieos	Nicosia	Nicosia	TE	22	140	54	355	I	24	L	Mia Milea Irrigation Division	Department of Water Development	Department of Water Development	16
17	OVGOS	1964	Serakhis	Nicosia	Nicosia	TE	16	745	130	845	I	786	L	Morphou Irrigation Division	Department of Water Development	Department of Water Development	17
18	AYIA MARINA	1965	Xeros (Tyllirias)	Paphos	Paphos	ER	33	142	61	311	I	161	L	Ayia Marina Irrigation Division	Energoproject of Yugoslavia	Mediterranean Constructors Greece.-G.P. Zachariades Cyprus	18
19	POLEMIDHIA	1965	Garyllis	Limassol	Limassol	TE	45	196	215	3 864	I	581	L	Government	Energoproject of Yugoslavia	Mowlem & Ridgway of U.K.	19
20	KALOPANAYIOTIS	1966	Marathasa	Nicosia	Nicosia	TE	40	137	156	391	I	207	L	Government	Howard Humphreys & Sons of U.K.	Department of Water Development	20
21	MAVROKOLYMBOS	1966	Mavrokolym-bos	Paphos	Paphos	TE	45	528	267	2 180	I	340	L	Government	Energoproject of Yugoslavia	Cybarco of Cyprus	21
22	POMOS	1966	Livadhi	Paphos	Paphos	ER	38	302	153	859	I	300	L	Pomos Irrigation Division	Energoproject of Yugoslavia	Mediterranean Constructors Greece.-G.P. Zachariades Cyprus	22
23	YERMASOYIA	1968	Yermasoyia	Limassol	Limassol	TE	49	409	539	13 600	I	850	V	Government	Energoproject of Yugoslavia	Cybarco of Cyprus	23
24	LEFKARA	C (1973)	Pendaskinos	Larnaca	Larnaca	TE/ER	74	240	800	13 850	S/I	316	L	Famagusta Water Board & Lefkara Irrigation Division	Howard Humphreys & Sons of U.K.	L. Fairclough & Medcon Construction Ltd.	24
25	MASARI	C (1973)	Serakhis	Nicosia	Nicosia	TE	15	929	245	2 273	I	622	V	Government	Department of Water Development	Department of Water Development	25
26	PALEKHORI-KAMBI	C (1973)	Akaki	Nicosia	Nicosia	PG	33	131	27	620	I	65	L	Government & Palekhori Irrigation Division	Department of Water Development	Ioannou & Paraskevaides Ltd.	26

DEPARTMENT OF WATER DEVELOPMENT

PROGRESS IN DAM CONSTRUCTION

AG/IR / 35



Members

Mr. K. C. Hassabis
Assistant Director, D.W.D.

Mr. A. Papadopoulos
Representative of the Association of
Civil Engineers and Architects

Mr. M. Zambarloukos,
Representative of the Association of
Building Contractors.

The 11th International Congress on Large Dams and the 41st Executive Meeting of the International Commission were held in Madrid on 7-15th June 1973. Cyprus was represented at both these events by Messrs C.A.C. Konteatis, C.C. Artemis, A. Papadopoulos and M.Zambarloukos.

At the 41st Executive Meeting the invitation of the Cyprus National Committee to delegates at the 42nd Executive Meeting (to be held in Athens in May 1974) to participate in a study tour in Cyprus was accepted unanimously.

The technical questions dealt with by the 11th Congress were:

Question No.40: The Consequences on the Environment of Building Dams.

Question No.41: Flow Control and Energy Control During Construction and After Completion.

Question No.42: Impervious Elements and Slope Protection on Earth and Rockfill Dams

Question No.43: New Ideas for More Rapid and Economic Construction of Concrete Dams.

A considerable number of papers were presented and discussed at the Congress on these questions.

During the latter half of 1973 preparations started for the organization of the Cyprus Study Tour in 1974.

1.6.3 International Commission on Irrigation and Drainage

The International Commission on Irrigation and Drainage was set up in 1950 in order to meet the need for a non-governmental International Organization for the stimulation and promotion of the development and application of the science and techniques of irrigation, drainage, flood control and river training in the engineering, economic and social aspects. It is a non profit organization.

Cyprus is a member country of the International Commission on Irrigation and Drainage since 1954. The Cyprus Committee on Irrigation and Drainage was formed in 1964 and at present it is composed of the following:

Chairman: Mr. C.A.C. Konteatis
Director, Water Development Department

Secretary: Mr. E.M. Kambourides
Irrigation Engineer, Water Development Department

Ex-Officio Members: Director, Department of Agriculture

Director, Department of Forest

Director, Agricultural Research Institute

During the year under review the Cyprus Committee on Irrigation and Drainage continued to keep correspondence with the central office of the I.C.I.D. for the interchange of information between the national committees of its member countries.

All publications such as bulletins, annual reports and other documents which were sent by I.C.I.D. or by an other member country of I.C.I.D. were distributed to all members of Cyprus Committee on Irrigation and Drainage. Copies of such publications exist in the library of Water Development Department.

1.6.4 International Water Supply Association

The Department of Water Development was an associate member of the I.W.S.A. until 1969. Late in 1969 a National Committee was established made by of:

Mr. C.A.C. Konteatis,
Director, Water Development Department,
as Chairman

Mr. G. Charalambous,
Superintendent of Works of the Water Development Department,
as Secretary.

and the representatives of the Ministry of Interior and Water Boards of Nicosia, Limassol, Famagusta and Larnaca as members.

1.6.5 Meetings of the Director with the Staff

Several meetings were held during the year under the Chairmanship of the Director with the Heads of the Various Divisions as well as with other members of the staff to discuss various aspects of works and personal matters. Interdepartmental meetings with the Departments of Agriculture, Forests, A.R.I., the Geological Department, Meteorological Office, Fisheries Department and the District Administration were also held during the year.

1.7 Water Resources

1973 was the driest year as regards precipitation ever reported in Cyprus since 1881 when rainfall records were initiated. The total average precipitation over the Island amounted to 182 mm being 37% of the normal average of 490 mm. The lowest precipitation was in the Messaoria plains which was only 20% of the average.

As a result of the low rainfall the surface runoff and groundwater replenishment have been insignificant. Several rivers have not flown at all, whilst the dams received water representing only 9% of the total storage capacity.

An extensive coastal area around Pendayia upto 1½ kilometers inland has been sea-intruded and the salinity in the groundwater has exceeded 1,000 ppm NaCl. In Morphou the drop of the water table has been accelerated reaching upto 4 metres more than it was in the previous year in the vicinity of Morphou town. At Akrotiri, Limassol, water table drops of half a metre were observed at Trakhoni, whilst in Famagusta, in the groundwater pockets still remaining, two metre drops have been observed at Liopetri.

Not all the reason for the water table drop and sea intrusion should be attributed to the very low precipitation. Once more we have to emphasize that the extension of irrigated areas, the uncontrolled extraction of water, and the wasteful methods still applied in irrigation especially in the region of Morphou contribute largely to the catastrophy of the aquifers.

1.8 Planning and Design of Projects

During the year the main planning work was concentrated on to the Morphou-Tylliria Feasibility Study which is described in a previous paragraph of this report.

The Southern Conveyor Inter Basin Study involving a computerized mathematical model was started during the year and has already been described.

Design work for the updating of the distribution systems of the towns of Nicosia and Famagusta has also been completed. MacLaren International of Canada has been employed for this work and a computerized mathematical model has been used for evaluating the optimum distribution system. According to these studies a programme has now been produced for the construction of further storage and distribution works in the two towns.

It is also of interest to note here that the Central Sewerage Schemes for Nicosia and Famagusta, the former designed by MacLaren International of Canada and the latter by Howard Humphreys of the UK have been initiated during the year by the respective Municipalities.

Routine planning and design of small irrigation and rural water supply projects has also been continued.

Extensive field and laboratory investigations and tests have been carried out in connection with the planning and design of the various water projects. Most of the field investigations have been concentrated in the regions of Morphou-Tylliria in connection with the relevant Feasibility Study and a great number of damsites has been explored. In addition, non-Departmental work was carried out for investigating the suitability of foundations for major building work, the most important being for the new Power Station at Dhekelia, for TV installations required by the Cyprus Broad Casting Corporation, for the National Gallery and Library to be built by the Ministry of Education and for the foundations of the proposed Pedhieos river bridge expansion requested by the Public Works Department.

1.9 Construction of Project

During the year a new record of expenditure in the construction of water works was achieved having reached a figure of 1,936,000 pounds. In total 188 different water work projects were under construction, 93 of which were for rural domestic water supply, 3 for town water supplies, 63 for minor irrigation and 29 for major irrigation.

1.9.1 Major Projects

A total of 29 major projects were under construction, the most important of which was the Lefkara dam together with the main conveyor from Lefkara to Khirokitia and the Khirokitia treatment plant itself. A total of 751,000 pounds were spent on this major water supply project, which is going to be the main water supply source for the towns of Famagusta and Larnaca as well as for a number of villages in the district. Other major works under construction were the Massari dam in the region of Morphou for the purpose of the supply of additional water to the citrus plantations against saving water from the overpumped aquifer, the Palekhori

dam which is to provide water to mountainous agricultural land downstream of the village of Palekhori for the irrigation of mainly the deciduous crops and the Arakapas dam which is to provide additional water mostly for supplementary irrigation of existing citrus plantations in the region presently being under irrigated. During the year Lefkara, Massari and Palekhori dams were completed and are now ready for operation.

Also during the year several distribution systems for irrigation purposes from dams were under construction, the most important being that from the dam at Argaka and that from the Yermasoyia dam in Limassol. Both distribution systems are of asbestos cement pressure pipes and supply pressurized water.

1.9.2 Rural Domestic Water Supplies

Some 93 domestic water supplies were carried out during the year involving either new sources of supply, extension of distribution systems, additional storage works and house to house connections.

Amongst the most important of these works were regional water supply schemes for Alona and other surrounding Pitsilia villages from a spring source at Troodos, for Lymbia and other neighbouring villages from a new borehole source at Nisou, for Klirou, Mitsero and Kalo Chorio for Trikomo and surrounding villages from a deep borehole in the limestone at Tripimeni, for Skarinou and neighbouring villages, for Panayia and for Tsada in Paphos and finally for major water supply extensions of the Karavas and Lapithos water supply schemes from deep boreholes in the limestone for the purpose of satisfying extensive touristic development in the coastal region of the two villages.

1.9.3 Routine Irrigation Works

During the year 63 such schemes were under construction in all the districts of Cyprus involving pumped irrigation schemes from boreholes, stream diversion works, conveyor systems and irrigation distribution systems.

Some of the most important works carried out were a piped distribution system from spring water at Pedhoulas, a similar scheme for Saittas-Moniatis, a major irrigation work for Pissouri involving a number of boreholes conveyor and distribution system, recharge works at Akanthou, a major reservoir storage project at Kyperounda, and a borehole pumping irrigation scheme in the Chrysochou valley.

The daily average number of labourers employed by the Department during 1973 was 936 as compared with 980 in 1972. 39% were classed as regulars whilst approximately 59% were skilled employees, 10% semiskilled and 31% unskilled. 5% of the labourers employed were Turks.

The approximate daily average of labourers engaged per month was as follows:-

January	950
February	897
March	905
April	976
May	982
June	949
July	997
August	991
September	903
October	867
November	926
December	893
Monthly Average	936

1.10 Operation and Maintenance of Projects

The Department has been quite busy during the year with the operation and maintenance of major irrigation and domestic water supply projects for which it takes an active part and responsibility. Regarding minor irrigation and rural domestic water supplies the maintenance works are only carried out on demand of the Irrigation Divisions or village water supply Commissions.

1.10.1 Major Irrigation Projects

As the year was a very dry one and the runoff was very little the operation of the various irrigation projects was also limited. A quantity of 970,000 cm of water was sold and a gross income of 11,140 pounds was received, giving an average selling price of 11.5 mils/cm. The total operation costs reached 6,450 pounds whilst maintenance costs were 4,280 pounds.

1.10.2 Town Water Supplies

The main water supply operation and maintenance administered by the Department has been for the Nicosia and Famagusta water supply schemes.

1.10.2.1 Nicosia Water Supply

During the year a total of 7,460,286 cm of water were supplied with a maximum of 28,030 cm per day during Summer giving 42 gallons/day/capita. The total revenue from the sale of water by the Department for the Greater Nicosia scheme only has reached 270,000 pounds against an expenditure of 118,375 pounds.

During the year the distribution system of the Greater Nicosia scheme was extended by 8,030 meters of 6" and 4" diameter asbestos cement pipes.

In addition to the above described work and supply of water, the Nicosia Water Board carries out similar work.

1.10.2.2 Famagusta Water Supply

Pumping of water was continued from a number of boreholes and the Vasilikos sub-surface dam of the Famagusta water supply scheme and water was delivered to the Famagusta and Larnaca Water Boards as well as to the Lefkara village regional scheme. The total quantity of water sold amounted to 1,776,000 cm, giving a revenue from the sale of this water of 57,275 pounds against an expenditure of 23,600 pounds.

1.11 Finance, Expenditure and Revenue

During the year, the total expenditure reached was £2,443,730 including all administration costs (1972 Expenditure was £2,289,675).

This represents a new record of expenditure in the history of this Department. The largest item of expenditure was on Major Irrigation Projects for which the sum of £1,081,463 was spent.

The administration costs, including hydrological observations consultants' fees and major projects investigations, reached the sum of £443,400 during the year, represents 21% of the total departmental expenditure. This, as can be seen from Table 3, is only by 1% higher than that of 1972 (20%). The level ofthe construction works carried out during 1973 was nearly the same as that of 1972.

The monthly expenditure of the Department as can be seen from Table 2 is again very unevenly distributed ranging from 4% in January and increasing to 79% in December. This obviously is very unsatisfactory and it has to be attributed on the institutional set up of the Government in General, and the various Departments and Ministries dealing with water in particular. The formalities to authorize projects obviously take a long time and the first few months of the year are almost wasted as far as construction works are involved.

The sum of £347,900 was collected during the year as revenue mainly from the sale of water for the Greater Nicosia Scheme and the Famagusta Water Supply Scheme.

Table 1 - 1973 Expenditure - Water Development Department

	Details	Government funds £	Contribution by Beneficiaries £	Total
1.	Administration	334,922	-	334,922
2.	Irrigation, Drainage and Dams	1,127,000	114,176	1,241,176
3.	Town Water Supplies	50,266	12,950	63,216
4.	Village Water Supplies	247,752	224,696	472,448
5.	Drilling and Prospecting	10,727	-	10,727
6.	Hydr.Obs.Research and Weirs	19,984	-	19,984
7.	Workshops (Maintenance)	22,674	-	22,674
8.	Purchase of Machinery Tools and Equipment	4,451	-	4,451
9.	Consultants' Fees	19,169	-	19,169
10.	Govt. Water Supplies	2,341	-	2,341
11.	Major Projects Investigations and Surveys	36,357	-	36,357
12.	Greater Nicosia Scheme	210,407	-	210,407
13.	Water Supply-Special Measures Law	20	-	20
14.	Stores	5,838	-	5,838
	Includes Ordinary and Development Expenditure	2,091,908	351,822	2,443,730
	Breakdown of Administration			
1.	Personal Emoluments	204,033	-	204,033
2.	Casual Assistance	12,662	-	12,662
3.	Technical Assistance	38,779	-	38,779
4.	Travelling	26,786	-	26,786
5.	M'oe and Operation of M. Transport	26,215	-	26,215
6.	Office Expenses	4,948	-	4,948
7.	Leave Pay to R.E.	21,269	-	21,269
8.	Local Training of Staff	230	-	230
	Total	334,922	-	334,922

Table 2 - Monthly Statement of Development Expenditure for the year 1973

1973 Approved		£2,238,568
Additional S/Warrants Nos. 57,63/73		10,025
	Total	£2,248,593

Month	Monthly £	Expenditure up-to-date £	Balance £	% to date Expended
January	77,179	77,179	2,171,414	4%
February	114,364	191,543	2,057,050	9%
March	135,985	327,528	1,921,065	15%
April	150,877	478,405	1,770,188	22%
May	181,197	659,602	1,588,991	30%
June	118,141	777,743	1,470,850	35%
July	91,747	869,490	1,379,103	39%
August	245,701	1,115,191	1,133,402	50%
September	91,350	1,206,541	1,042,052	54%
October	91,081	1,297,622	950,971	58%
November	189,943	1,487,565	761,028	67%
December	290,149	1,777,714	470,879	79%

Summary

Approved amount	£2,248,593 (100%)
Less actual expenditure	£1,777,714 (79%)
Unspent Balance	£ 470,879 (21%)

Table 3 - Statement of Expenditure

Serial No.	Details	1973
1.	Administration	334,922
2.	W/shops' M'ce of Plant and Stores	28,512
3.	Purchase of Machinery tools etc.,	4,451
4.	Hydrological Observations	19,984
5.	Consultants' Fees	19,169
6.	Major Projects Investigations	36,357
	Sub-Total "A"	443,395
7.	Drilling and Prospecting	10,727
8.	Water meters for wells and boreholes	20
9.	Town Water Supplies	275,964
10.	Village Water Supplies	472,448
11.	Small Irrigation Projects	159,713
12.	Major Irrigation Projects	1,081,463
	Sub-Total "B"	2,000,335
	Grand Total	2,443,730
	% of A to B	22%

Table 4 - Statement of Revenue Collected during the year 1973

	£
Greater Nicosia Scheme	269,988
Famagusta Water Supply Scheme	57,275
Khirokitia Reg. Water Supply Scheme	2,096
Drilling charges	6,334
Other Fees	12,207
Total	£347,900

Table 5 - Statement of Expenditure as from 1939

Ser. No.	Details	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
1.	Administration	4,716	5,652	4,322	4,111	5,157	8,586	9,245	15,974	15,974	19,033
2.	W/Shops & M'ce of Plant	467	587	500	398	254	284	414	-	350	-
3.	Purchase of Machinery, tools etc.	1,970	224	199	-	184	105	196	-	420	-
4.	Hydrological Observations										
5.	Consultants' Fees										
6.	Major Project investigations										
	Sub-total "A"	£ 7,153	6,463	5,021	4,509	5,595	8,975	9,855	15,974	15,848	19,033
7.	Drilling of water	680	952	527	486	642	2,700	3,180	660	360	25,171
8.	Water Meters for Wells & Boreholes										
9.	Town Water Supplies	1,169	925	908	1,043	1,169	1,827	2,448			
10.	Village Water Supplies	8,980	1,613	5,560	4,956	6,887	5,730	3,413	19,000	31,871	42,190
11.	Small Irrigation Projects	2,770	7,979	10,252	35,809	74,134	116,334	100,470	166,493	177,144	120,278
12.	Major Irrigagion Projects										
	Sub-total "B"	£12,599	19,469	17,247	42,294	82,832	126,591	109,511	186,153	209,375	187,639
	Grand total	£19,752	25,932	22,268	46,803	88,427	135,566	119,366	202,127	225,223	206,672
	% of A to B	56.8	33.2	29.1	10.6	6.7	7.0	8.9	8.5	7.5	10.1

Ser. No.	Details	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
1.	Administration	18,156	19,146	26,270	29,991	38,050	52,950	54,350	61,699	80,790	95,256
2.	W/Shops & M'ce of Plant	-	-	39,111	10,826	14,150	13,000	13,500	15,688	25,960	20,995
3.	Purchase of Machinery, tools etc.	-	-	3,339	2,840	17,000	10,050	10,800	91,989	16,700	15,950
4.	Hydrological Observations	-	-	-	1,066	1,000	1,500	3,500	19,626	13,000	4,450
5.	Consultants' Fees										
6.	Major Projects Investigations										
	Sub-Total "A"	£ 18,156	19,146	68,720	44,723	70,200	77,500	82,150	189,000	136,450	136,651
7.	Drilling of Water	27,349	30,666	26,719	24,712	41,100	48,600	58,350	78,641	75,750	45,824
8.	Water Meters for Wells & B/Hs										
9.	Town Water Supplies	-	-	155,116	119,481	235,000	303,900	93,200	152,476	417,600	648,350
10.	Village Water Supplies	53,410	106,370	100,137	214,732	256,000	255,000	196,850	280,955	215,600	87,225
11.	Small Irrigation Projects	111,352	150,980	172,154	166,493	154,500	116,900	150,850	116,100	168,600	81,075
12.	Major Irrigation Projects	-	-	-	15,000	15,000	20,000	30,000	35,000	35,000	50,000
	Sub-Total "B"	£192,111	288,016	454,126	540,418	701,600	744,400	529,250	663,172	927,550	912,474
	Grand Total	£210,267	307,162	522,846	585,141	771,800	821,900	611,400	852,172	1,064,000	1,049,125
	% of A to B	9.4	6.6	15.1	8.2	10.0	10.4	15.5	28.4	14.7	14.9

Ser. No.	Details	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
1.	Administration	81677	64255	70527	81983	151580	130164	135410	145389	183927	228902	248058	257624
2.	W/Shops & M'ce of Plant & Stores	20441	28979	30238	31789	14000	16150	15500	14147	14848	25594	38268	24896
3.	Purchase of Machinery tools etc.	960	–	–	31712	120000	46030	16875	10973	12927	5918	16910	4103
4.	Hydrological Observations	7090	6059	10640	40520	40500	43223	28200	18863	20538	19768	22365	42393
5.	Consultant's Fees	–	–	–		–	39378	45065	51297	32040	14676	5021	12266
6.	Major Projects Investigations	–	–	–	–	–	10202	15290	7733	20880	34801	25083	22780
	Sub-total "A"	£110168	99293	111405	186004	326080	285147	256340	248402	285160	329659	355705	364062
7.	Drilling of water	45084	48837	83608	82151	63700	47588	40200	24253	35029	49095	22938	46033
8.	Water Meters for wells & B/Hs	–	–	–	–	–	–	–	983	2672	86	116	–
9.	Town water supplies	113853	220370	88282	97724	70900	197871	178010	138390	68782	171190	937325	265062
10.	Village Water Supplies	113493	137825	602436	602537	486600	507679	404600	108926	130340	232253	251805	229746
11.	Small Irrigation Projects	68274	49288	141712	253817	383052	400046	95002	113636	221169	174065	237594	151386
12.	Major Irrigation Projects	50000	50000	120000	150000	414948	369420	691349	689010	941131	493045	263209	283499
	Sub-total "B"	£390704	506320	1036037	1204229	1418600	1522604	1409160	1075198	1399123	1119734	1717987	975726
	Grand Total	£500872	605613	1147442	1390233	1744680	1807751	1665500	1323600	1684283	1449393	2073692	1339788
	% of A to B	28.2	19.6	10.7	15.4	22.9	18.7	18.1	23.1	80.3	20.3	17.2	37.3

STATEMENT OF EXPENDITURE FOR THE YEAR 1973

Major Irrigation Works- (2D-11)

Scheme	Amount	Estimated Cost			Actual Expenditure		
	Dedaggered £ mils	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
CONTRIBUTORY SCHEMES							
Arakapas	50,000,000	30,000,000	15,000,000	45,000,000	7,122,299	3,561,149	10,683,448
Palekhori "Kambi"	142,455,000	142,455,000	47,485,000	189,940,000	133,434,681	44,478,225	177,912,906
Palekhori"Distrib.Sklidros	8,000,000	8,000,000	4,000,000	12,000,000	6,427,796	3,213,898	9,641,694
Agros "Blanket" New	6,500,000	6,500,000	1,000,000	7,500,000	3,005,330	462,224	3,467,554
Agros "Pumping"	9,120,000	9,120,000	4,560,000	13,680,000	5,802,556	2,901,278	8,703,834
Famagusta-Dherenia	1,607,000	1,607,071	803,537	2,410,608	490,960	245,480	736,440
Morphou"Serrakhis" New	6,667,000	6,667,000	3,333,000	10,000,000	4,346,081	2,173,041	6,519,122
Morphou "Serrakhis" Comp.	506,000	505,403	168,802	674,205	-	-	-
Morphou "Spread.Grounds"	13,533,000	13,533,000	6,767,000	20,300,000	-	-	-
Morphou "Rech.Protopapas"	990,000	992,998	675,799	1,668,797	-	-	-
Ovgos	261,000	4,098,085	1,366,029	5,464,114	16,638	5,546	22,184
Syrianokhori "P.House"	188,000	187,872	95,437	283,309	-	-	-
Syrianokhori "Kokkinoyi"	241,000	241,716	241,716	483,432	-	-	-
DAMS - GOVERNMENT ONLY							
Mavrokolymbos	7,728,000	7,728,000	-	7,728,000	-	-	-
Kalopanayiotis	4,334,000	4,334,000	-	4,334,000	70,705	-	70,705
Agros "Old Blanket"	222,000	222,000	-	222,000	-	-	-
Polemidhia	400,000	400,000	-	400,000	-	-	-
Yermasoyia	16,988,000	16,988,000	-	16,988,000	11,169,840	-	11,169,840
Massari	26,352,000	26,352,000	-	26,352,000	22,640,373	-	22,640,373
Lefkara	590,003,000	590,003,000	-	590,003,000	568,929,865	-	568,929,865
Lefkara-Khirokitia Pipeline	58,621,000	58,621,000	-	58,621,000	52,775,459	-	52,775,459
Khirokitia Treatment	140,000,000	140,000,000	-	140,000,000	129,192,328	-	129,192,328
Pomos	581,000	581,000	-	581,000	-	-	-
DISTRIBUTION-GOVT.ONLY							
Arghaka-Magounda	26,127,000	26,127,000	-	26,127,000	23,590,633	-	23,590,633
Mavrokolymbos	4,901,000	4,901,000	-	4,901,000	924,374	-	924,374
Polemidhia	6,813,000	6,813,000	-	6,813,000	2,702,930	-	2,702,930
Ay.Marina	6,099,000	6,099,000	-	6,099,000	-	-	-
Yermasoyia	51,672,000	51,672,000	-	51,672,000	49,069,886	-	49,069,886
Pomos	150,000	150,000	-	150,000	-	-	-
Kalopanayiotis	792,000	792,000	-	792,000	-	-	-
Kiti	1,306,000	1,306,000	-	1,306,000	1,294,588	-	1,294,588
Total Dedaggering	£1,183,157,000	1,166,997,145	85,496,320	1,252,493,465	1,023,007,322	57,040,841	1,080,048,163

STATEMEMT OF EXPENDITURE FOR THE YEAR 1973

Minor Irrigation Works (2D-12)

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
Ay.Georghios)		687,811			671,813	
Petra)	2,084,275	354,327	3,126,413	2,035,800	346,086	3,053,699
Aloa	420,000	210,000	630.000	396,617	198,308	594,925
Akhna	1,957,411	979,706	2,937,117	1,571,756	785,877	2,357,633
Akrounda M'ce of Dam	27,514	13,256	40,770	15,395	7,698	23,093
Agros "P.Taliou"	833,000	417,000	1,250,000	674,921	337,460	1,012,381
Akanthou	11,100,000	5,550,000	16,650,000	5,485,644	2,742,821	8,228,465
Aredhiou	480,000	120,000	600,000	477,858	119,465	597,323
Arghaka "Ay. Varvara"	466,000	234,000	700,000	438,435	219,217	657,652
Amargetis Pumping Scheme	2,800,000	1,400,000	4,200,000	1,899,636	949,817	2,849,453
Ay.Georghios Kyrenia	888,691	445,346	1,334,037	9,264	4,631	13,895
Ay. Marinoudha	459,000	391,000	850,000	383,437	326,632	710,069
Goudhi-Kholi-Skoulli	13,333,000	6,667,000	20,000,000	7,610,372	3,805,186	11,415,558
Elia Karavas	222,445	111,221	333,666	147,400	73,700	221,100
Kato Pyrgos - New	1,511,027	785,514	2,266,541	1,486,235	743,116	2,229,351
Kato Pyrgos - Old	148,530	74,268	222,798	146,667	73,333	220,000
Kyperounda) Earth		5,634,475			4,548,002	
C.A. Mines) Reservoir	5,634,477	5,634,476	16,903,428	4,548,001	4,548,002	13,644,005
Kilani "Asomatos Skolini"	4,333,000	2,167,000	6,500,000	4,275,687	2,137,842	6,413,529
Karakoumi	188,604	95,300	283,904	110,000	55,000	165,000
Kazaphani	4,933,000	2,467,000	7,400,000	3,890,353	1,945,176	5,835,529
Famagusta-Dherenia	2,696,578	1,349,290	4,045,868	89,194	44,596	133,790
Lythrodhontas M'ce of Dam	290,000	145,000	435,000	289,741	144,870	434,611
Lagoudhera	475,000	475,000	950,000	341,631	341,632	683,263
Idhalias River	4,665,000	-	4,665,000	4,614,498	-	4,614,498
Maroni Pumping "Xalona"	6,366,897	3,184,450	9,551,347	4,025,864	2,012,931	6,038,795
Moutoullas	1,035,640	518,821	1,554,461	910,208	455,102	1,365,310
Maroni "Safto"	119,036	60,018	179,054	118,293	59,147	177,440
Morphou M'ce of Dam	67,000	33,000	100,000	54,659	27,329	81,988
Mosphili	5,250,000	1,750,000	7,000,000	4,486,489	1,495,495	5,981,984
Moniatis	8,733,000	4,367,000	13,100,000	6,491,432	3,245,714	9,737,146
Makrasyka	3,200,000	1,600,000	4,800,000	2,235,124	1,117,562	3,352,686
C/F	84,718,125	47,891,279	132,609,404	59,260,611	33,583,560	92,844,171

Minor Irrigation Works (2D-12) Cont'

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	84,718,125	47,891,279	132,609,404	59,260,611	33,583,560	92,844,171
Nata	1,403,313	702,657	2,105,970	1,103,582	551,790	1,655,372
Nata "Diala"	1,066,000	534,000	1,600,000	994,061	497,028	1,491,089
Nea Dhymmata "Symvoulos"	3,425,000	1,713,000	5,138,000	3,249,180	1,624,590	4,873,770
Psematismenos	3,537,284	1,768,218	5,305,502	3,305,826	1,652,911	4,958,737
Pharmakas	1,120,000	880,000	2,000,000	1,093,497	859,176	1,952,673
Pedhoulas Old	7,333,000	3,667,000	11,000,000	7,330,618	3,665,309	10,995,927
Pedhoulas New	2,300,000	1,150,000	3,450,000	1,442,906	721,452	2,164,358
Palekhori"Halkomatas"	2,000,000	1,000,000	3,000,000	1,958,248	979,124	2,937,372
Pissouri	46,666,000	23,334,000	70,000,000	5,641,272	2,820,635	8,461,907
Pera Pedhi M'ce of Dam	90,000	45,000	135,000	45,200	22,600	67,800
Saittas)		1,836,000			1,138,531	
Moniatis)	8,566,000	2,448,000	12,850,000	5,314,025	1,518,481	7,971,037
Skarinou	4,200,000	4,100,000	8,300,000	3,455,458	3,373,511	6,828,969
Thermia Kyrenia	344,269	172,134	516,403	253,667	126,833	380,500
Vitsadha	11,333,000	5,667,000	17,000,000	7,184,434	3,592,213	10,776,643
Yerasa	755,322	387,661	1,142,983	339,876	169,937	509,813
Zigi - Tokhni	548,450	273,725	822,175	475,366	237,682	713,048
Total	179,405,763	97,569,674	276,975,437	102,447,823	57,135,363	159,583,186
Plan Adj. No. 158 of 2/73 Kambi-Agridhia				85,590		
" " " 273 of 3/73 Akanthou				209,650		129,508
" " " 110 of 9/73 Miscell. 2D/21				200,000		
" " " 76 of 12/73 Maroni (Interest)				794,030		159,712,694
" " " 1807 of 12/73 Kato Koutraphas				523,397		
				104,260,490		
Less 2D/14 Maintenance of Dams				404,995		
" 23D/13 Kyperounda Earth Reservoir				4,548,001		
Total 2D/12				99,307,494		

STATEMENT OF EXPENDITURE FOR THE YEAR 1973

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
Ay.Theodhoros Soleas	3,908,740	1,953,870	5,862,610	2,225,083	1,112,542	3,337,625
Akhyritou	2,429,036	2,836,800	5,265,836	1,997,743	2,332,000	4,329,743
Apliki	1,100,000	1,340,000	2,440,000	966,375	1,177,311	2,143,686
Athienou	1,802,519	1,802,518	3,605,037	1,490,394	1,490,395	2,980,789
Ay. Amvrosios Kyrenia	5,428,171	5,428,171	10,856,342	5,314,316	5,314,318	10,628,634
Ay. Demetrios Limassol	3,000,000	3,360,000	6,360,000	2,987,709	3,346,207	6,333,916
Ay.Constantinos L'sol	1,200,000	1,620,000	2,820,000	1,164,652	1,572,485	2,737,137
Alona Phase II	1,949,024	2,218,505	4,167,529	788,005	897,203	1,685,208
Alithinou	1,800,000	900,000	2,700,000	1,317,096	658,548	1,975,644
Ayios Elias	3,500,000	4,040,000	7,540,000	3,145,460	3,630,627	6,776,087
Amarghetis	3,750,000	3,750,000	7,500,000	3,297,128	3,297,129	6,594,257
Armou	5,700,000	6,675,000	12,375,000	3,847,549	4,505,795	8,353,344
Ay.Georghios Church Comm.	200,000	100,000	300,000	172,907	86,453	259,360
Ay. Pavlos Limassol	200,000	200,000	400,000	28,993	28,994	57,987
Ayia Marina)		2,218,000			1,615,500	
Nea Dhimmata)	2,450,000	232,000	4,900,000	1,784,490	168,991	3,568,981
Alona) Part		927,404			766,524	
Platanistassa) II	2,031,314	1,103,909	4,062,627	1,666,355	899,833	3,332,712
Ay. Amvrosios L'sol	2,250,000	2,850,000	5,100,000	1,831,093	2,319,163	4,150,256
Drynia Paphos	950,000	1,280,000	2,200,000	870,317	1,145,238	2,015,555
Drymou Paphos	2,900,000	3,290,000	6,190,000	1,766,052	2,004,340	3,770,392
Eftagonia	3,650,000	3,650,000	7,300,000	1,635,423	1,635,423	3,270,846
Erimi Part III	88,465	88,465	176,930	87,199	87,201	174,400
Erimi)		83,260			83,448	
Kolossi) Part II	181,001	97,740	362,001	181,407	97,961	362,816
Kolossi Part IV	81,623	81,622	163,245	81,500	81,500	163,000
Kolossi New	5,000,000	5,000,000	10,000,000	4,531,236	4,531,237	9,062,473
Elia Kyrenia	826,707	864,703	1,691,410	5,389	5,637	11,026
Fterykha)		951,000			1,159	
Elia)	4,121,000	1,268,000	6,340,000	5,021	1,545	7,725
Fterykha	422,881	170,850	593,731	164,897	66,603	231,500
C/F	60,920,481	60,351,817	121,272,298	43,353,789	44,961,310	88,315,099

Scheme	Estimated Cost			Actual Expenditure		
	Goverentment £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
C/F	60,920,481	60,351,817	121,272,298	43,353,789	44,961,310	88,315,099
Goudhi Paphos	1,631,313	2,002,176	3,633,489	1,526,557	1,869,564	3,396,121
Gourri	2,300,000	2,300,000	4,600,000	2,037,962	2,037,961	4,075,923
Kato Drys Phase II	580,502	788,742	1,369,244	40,032	54,361	94,393
Kato Drys Phase I	696,494	696,493	1,392,987	62,824	62,825	125,649
Kakopetria	4,257,433	4,257,433	8,514,866	3,603,679	3,603,678	7,207,357
Kapouti	1,938,083	2,193,520	4,131,603	461,036	522,612	983,648
Karavas Old	5,047,848	6,169,594	11,217,442			
Karavas New	18,675,000	22,825,000	41,500,000	17,643,637	21,564,444	39,208,081
Kowklia Paphos	1,294,955	1,160,109	2,455,064	865,408	774,865	1,640,273
Kontemenos	534,305	589,287	1,123,592	348,456	384,518	732,974
Kato Lefkara Phase II	251,054	398,052	649,106	200,373	317,653	518,026
Klirou	343,380	343,379	686,759	42,958	42,958	85,916
Kondea	10,250,000	12,350,000	22,600,000	8,831,706	10,638,544	19,470,250
Kannavia	2,533,000	1,267,000	3,800,000	2,241,226	1,120,613	3,361,839
Klirou		2,585,000			2,046,995	
KaloKhorio Part I	380,000	-		303,258	-	
Mitsero	4,730,000	1,805,000	9,500,000	3,790,729	1,440,478	7,581,460
Klirou	8,000,000	6,880,000	16,000,000	7,012,663	6,030,891	14,025,327
KaloKhorio Part II	1,120,000	-		981,773	-	
Mitsero Part IV	9,000,000	9,000,000	18,000,000	7,130,798	7,130,799	14,261,597
Klirou Part VI	1,900,000	1,900,000	3,800,000	1,338,478	1,338,478	2,676,956
Kambos A3	5,000,000	5,000,000	10,000,000	3,930,102	3,930,103	7,860,205
Kambos	1,850,000	925,000		1,179,890	589,945	2,359,782
Tsakkistra A4	925,000	-	3,700,000	589,947	-	
Kambos	1,100,000	735,000	2,200,000	1,094,631	731,433	2,189,262
Tsakkistra A5	365,000	-		363,198	-	
Kambos A6	1,500,000	1,500,000	3,000,000	1,413,094	1,413,095	2,826,189
Kili Paphos	3,100,000	3,760,000	6,860,000	1,895,295	2,298,763	4,194,058
Kato Lefkara Phase I	187,335	187,334	374,669	167,033	167,033	334,066
Kaliana	2,100,000	2,820,000	4,920,000	1,383,977	1,857,947	3,241,924
Katydhata	2,400,000	2,940,000	5,340,000	1,628,116	1,993,943	3,622,059
Korakou	6,800,000	7,640,000	14,440,000	2,508,546	2,817,454	5,326,000
Lapithos Old	4,499,147	6,748,720	11,247,867			
Lapithos New	22,520,000	33,780,000	56,300,000	15,813,439	23,720,157	39,533,596
C/F	188,730,330	205,898,656	394,628,986	133,784,610	145,463,420	279,248,030

Village Water Supplies (2D-21) Cont'

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	188,730,330	205,898,656	394,628,986	133,784,610	145,463,420	279,248,030
Lagoudhera)	1,608,346	1,781,150	3,389,496	568,458	629,556	1,198,014
Lymbia)		2,191,556			778,171	
Shia)		463,098			164,883	
Kornos)		1,302,297			462,480	
Mosphiloti) Part I	11,324,320	595,026	16,986,481	4,021,561	211,131	6,032,341
Psevdas)		611,714			217,165	
Pyrga)		498,470			176,950	
Lymbia Part II	7,119,729	3,559,864	10,679,593	3,155,591	1,577,795	4,733,386
Lyssi	4,200,000	4,200,000	8,400,000	3,811,350	3,811,351	7,622,701
Shia)		1,141,000			949,489	
Kornos)		3,125,000			2,598,966	
Mosphiloti)Lymbia B3	16,667,000	1,417,000	25,000,000	13,861,152	1,178,198	20,791,727
Psevdhas)		1,467,000			1,219,781	
Pyrga)		1,183,000			984,141	
Layia	750,000	250,000	1,000,000	744,373	248,123	992,496
Lemona	1,500,000	1,860,000	3,360,000	1,267,627	1,571,403	2,839,030
Kornos)		361,000			34,651	
Mosphiloti)Lymbia B5	1,666,000	167,000	2,500,000	160,126	16,044	240,188
Psevdhas)		169,000			16,221	
Pyrga)		137,000			13,146	
Kornos B6		3,334,000	3,334,000		734,990	734,990
Mosphiloti)		387,000			271,469	
Psevdas)Lymbia B7	2,201,000	391,000	3,300,000	1,542,439	274,554	2,313,658
Pyrga)		321,000			225,196	
Psevdhas B9		4,400,000	4,400,000		2,093,785	2,093,785
Morphou	1,355,434	2,064,936	3,420,370	392,672	597,923	990,595
Mathikoloni	121,536	121,533	243,069	119,217	119,218	238,435
Makheras Monastery	2,500,000	2,500,000	5,000,000	2,485,390	2,485,391	4,970,781
Mesa Khorio Paphos	1,600,000	2,110,000	3,710,000	1,417,204	1,868,685	3,285,889
Shia B4		1,300,000	1,300,000		412,341	412,341
Nikitari	882,514	1,103,567	1,986,081	759,962	949,738	1,709,700
Pano Lefkara Reg.Scheme	5,521,839		5,521,839	1,369,089		1,369,089
C/F	247,748,048	250,411,867	498,159,915	168,675,477	171,160,509	339,835,986

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	247,748,048	250,411,867	498,159,915	168,675,477	171,160,509	339,835,986
Pano Lefkara Phase IB2	492,714	492,713	985,427	28,266	28,265	56,531
Paphos	143,676	285,352	429,028	58,034	116,069	174,103
Pretori	2,491,240	3,089,140	5,580,380	2,075,646	2,573,055	4,648,701
Potamos-Yermasoyias	543,304	304,487	847,791	143,524	669,641	813,165
Potami Part II	1,651,631	2,169,191	3,820,822	350,265	459,783	810,048
Vyzakia)		1,283,264			706,796	
Potami) Part I	2,272,363	989,099	4,544,726	1,285,085	578,289	2,570,170
Vyzakia Part III	2,678,905	3,165,547	5,844,452	1,631,546	1,927,672	3,559,218
Pissouri	120,355	120,356	240,711	74,825	74,825	149,650
Pano Pyrgos	3,689,102	1,846,551	5,535,653	2,385,984	1,192,990	3,578,974
Pigenia	9,225,200	4,613,100	13,838,300	4,999,267	2,499,633	7,498,900
Paralimni	112,536	112,535	225,071	108,324	108,324	216,648
Platanistassa	257,154	339,075	596,229	235,103	310,378	545,481
Pano Panayia	8,000,000	10,400,000	18,400,000	6,443,981	8,376,582	14,820,563
Polystipos Phase II	494,795	494,795	989,590	469,236	469,237	938,473
Pharmakas	1,900,000	2,680,000	4,580,000	1,876,537	2,606,328	4,522,865
Peristeronari	950,000	1,190,000	2,140,000	638,159	799,137	1,437,296
Pakhyammos	2,425,000	2,875,000	5,300,000	2,242,216	2,657,733	4,899,949
Polis - Prodromi	1,500,000	1,500,000	3,000,000	1,215,065	1,215,066	2,430,131
Petra	704,245	704,244	1,408,489	57,430	57,430	114,860
Pyroi	1,300,000	2,050,000	3,350,000	1,050,766	1,656,687	2,707,463
Phini	5,500,000	7,120,000	12,620,000	2,894,110	3,745,278	6,639,388
Sarandi	2,000,000	2,240,000	4,240,000	1,975,357	2,212,383	4,187,740
Ay. Theodhoros)		4,225,000			2,121,513	
Alaminos)	6,500,000	1,300,000	13,000,000	3,263,866	652,774	6,527,734
Skarinou)		975,000			489,581	
Skarinou Part II	250,000	700,000	950,000	221,687	620,586	842,273
Ay. Theodhoros) Part		608,000			585,487	
Alaminos) III	800,000	192,000	1,600,000	770,378	184,892	1,540,757
Ay.Theodhoros Part IV	1,370,000	3,170,000	4,540,000	1,352,687	3,129,374	4,482,061
Skoulli Paphos	1,100,000	1,340,000	2,440,000	973,343	1,185,323	2,158,666
Trakhypedhoulas	1,284,625	2,124,675	3,409,300	1,237,045	1,746,162	2,983,207
C/F	307,504,893	315,110,991	622,615,884	208,733,209	216,957,792	425,691,001

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	307,504,893	315,110,991	622,615,884	208,733,209	216,957,792	425,691,001
Tokhni Part II	1,275,622	1,658,651	2,934,273	599,045	778,704	1,377,749
Tokhni Part I	188,933	188,931	377,864	3,600	3,600	7,200
Timi	5,300,000	-	5,300,000	4,136,166	-	4,136,166
Tripimeni	72,000,000	-	72,000,000	21,888,618	-	21,888,618
Tsadha	8,500,000	8,500,000	17,000,000	3,274,485	3,274,486	6,548,971
Meloushia)	184,627	-		25,989	-	
Tremetoushia)Vatyli		430,794			60,640	
Arsos)Part I	3,074,521	400,029			56,309	
Vatyli)		1,699,665	6,154,266	446,135	251,223	866,285
Strongylos)		364,630			25,989	
Tremetousia A V	1,371,250	1,371,248	2,742,498	359,822	359,822	719,644
Arsos A VI	261,128	261,126	522,254	1,225	1,225	2,450
Vatyli A VII	1,343,295	1,343,295	2,686,590	16,340	16,340	32,680
Vavla Phase II	823,909	489,811	1,313,720	93,562	55,588	149,150
Ypsonas)		578,985			556,256	
P.Polemidhia)Part I	70,608	-		67,836	-	
K. Polemidhia)	1,412,158	762,565	2,824,316	1,356,720	732,629	2,713,441
Ypsonas) Part V		15,805			15,865	
K.Polemidhia)	88,142	72,336	176,283	88,140	72,275	176,280
Yerasa	1,550,000	1,940,000	3,490,000	1,180,089	1,477,170	2,657,259
Total	404,949,086	335,188,862	740,137,948	242,270,981	224,695,913	466,966,894
Less difference Platanistassa - Alona				6,178		
" " 2D/18 Paphos WS				58,034		
Plus Adjustment 105 of 2/73 Lymbia Reg. Scheme				1,227,405		
" " 215 of 3/73 Dhereneia WS				1,684,115		
" " 39 of 4/73 Prastio-Gaidhouras				770,500		
" " 81 of 4/73 " "				229,500		
" "				200,000		
Less " 110 of 9/73				200,000		
Plus " 362 of 9/73				300,000		
" " 55 of 10/73				514,000		
" " 804 of 12/73				820,000		
Total 2D/21				1,247,752,289		

List of Senior Technical Staff

Name	Post	Qualifications
Christos A. Konteatis	Director	B.Sc. (Civil Eng.) University of London, F.I.C.E., F.I.W.E.
Constantinos Lytras	Assistant Director	Dipl. (Natural Science) University of Athens, M.Sc.(Geology) University of London, D.I.C. Engineering Geology.
Kyprianos C. Hassabis	Assistant Director	B.Sc. (Civil Eng.) University of London, M.E., M.I.C.E., M.A.S.C.E.
Haralambos Karakannas	Engineer Hydrologist	M.A.S.C.E., F.I.P.H.E., F.R.S.H.(London) Registered Civil Engineer
Christodoulos Christodoulou	Senior Water Engineer	Dipl. (Civil Eng.) National Technical University of Athens
Christos Marcoullis	Executive Engineer Class I	M.Sc. in Agricultural and Irrigation Engineering Dipl. (Civil Eng.) National Technical University of Athens
Andreas P. Georghiades	Executive Engineer Class I	Dipl. Tech. (Civil Eng.) University of London, M.Sc.University of Birmingham, M.I.C.E., M.I.W.E.
Costakis Andreou	Executive Engineer Class I	Dipl. (Civil Eng.) University of Dresden, Diploma in Hydraulic Engineering,Delft.
Charis Lapas	Executive Engineer Class I	B.Sc., (Civil Eng.) University of Glasgow
Christodoulos Artemis	Executive Engineer Class I	B.Sc., (Civil Eng.) (Hons) University of London, A.C.G.I., M.Sc. (Soil Mechanics) D.I.C., Assoc.Memb. I.C.E. - F.G.S.
Markos Dymiotis	Executive Engineer Class I	Dipl. (Civil Eng.) National Technical University of Athens, Diploma in Hydraulic Engineer, Delft
Nicos Stylianou	Executive Engineer Class II	Dipl. (Civil Eng.) The Polytechnic London, M.Sc.(Foundation Eng.) University of Birmingham,C.Eng., M.I.C.E.
Vlasis Partassides	Executive Engineer Class II	Dipl. (Civil Eng.) University of Moscow, M.Sc.(Civil and Industrial Eng.) University of Moscow.
Andreas Protopapas	Executive Engineer Class II	B.Sc. (Civil Engineering) University of Newcastle
Charalambos Palantzis	Executive Engineer Class II	B.Sc. (Civil Eng.) University of London, Assoc. Memb. I.C.E.
Pantelis Loucaides	Executive Engineer Class II	B.Sc. (Eng.) Civil Engin. London University, M.Sc.(Foundations) Birmingham University.
Maria Zachariou	Executive Engineer Class II	B.Sc. (Eng.) Civil Eng. London University, Member of Institute of Civil Engineers and Architects.
Andreas Lambrou	Executive Engineer Class II	M.Sc.(Water Building Engineering) Dipl.(Civil Eng.) University of Budapest.

Name	Post	Qualifications
Charalambos Kridiotis	Executive Engineer Class II	B.Sc. (Civil Eng.) University of London
Theodhoros Nicolaides	Executive Engineer Class II	B.Sc. (Eng.) University of London, Kings College, A.K.I. (Associate of Kings College).
Costas S. Constantinou	Executive Engineer Class II	B.Sc.(Eng.) University of West Ham College London U.K. M.Sc. (Eng.) King's College London U.K.
Kyriacos A. Spanos	Executive Engineer Class II	B.Sc. (Civil Eng.) University of Southampton U.K. M.Sc. (Irr.Eng.) University of Southampton U.K.
Saverios A. Vrahimis	Executive Engineer Class II	B.Sc.(Eng.) University of Dartmouth-Hanover N.H U.S.A. M.Sc. (Eng.) University of Dartmouth-Hanover N.H U.S.A
Tassos N.Hamatsos	Executive Engineer Class II	B.Sc.(Civil Eng.) M.Sc.(Dipl.Eng.) Water and Hydraulic Engineering, University of Dresden, East Germany.
Dedalos Kypris	Geologist Class I	Dipl.(Natural Science)University of Athens,D.I.C. Applied Geophysics.
Michalakis Peppis	Geologist Class I	B.Sc. (Geology) American University of Beirut, M.Sc. (Geology) American University of Beirut.
Iacovos Iacovides	Hydrologist Class I	B.Sc.(Hydrology) University of Arizona
Christos Phanartzis	Hydrologist Class I	M.Sc. (Hydrology)B.Sc.(Hydrology)University of Arizona, A.M.A.G.U.
Christos Ioannou	Hydrologist Class II	Diploma(Natural Science) University of Salonica, Dipl.(Hydrogeology) University of London, Dipl.(Groundwater Research)University of Jerusalem
Savvas Theodossiou	Mechanical Engineer Class II	B.Sc.(Mechanical Eng.)University of Manchester, M.Eng. in Desalination Technology University of Glasgow.
Demosthenis Patsalides	Topographer/Irrigation Eng.	B.Sc.(Agricultural Eng.)Techniqn Israel Inst.of Technology,M.A.E.A.I., Assoc.Memb. I.C.E.,Diploma in Hydraulic Engineering, Delft.
Nicos Tsiourtis	Topographer/Irrigation Eng.	M.Sc.(Civil Engineering)B.Sc.(Agricultural Eng.)Technion Israel Inst. of Technology, M.A.E.A.I.,Assoc.Memb. I.C.E.
Elias Kambourides	Topographer/Irrigation Eng.	B.Sc.(Agricultural Eng.) Technion Israel Inst. of Technology M.A.E.A.I. Assoc.Memb. I.C.E.
P. Neophytides	Topographer/Irrigation Eng.	Dipl.(Rural and Topography Engineering)National Technical Univ.of Athens
Niki Michael	Topographer/Irrigation Eng.	Dipl.(Rural and Topography Eng.)National Technical University of Athens
Panos Pantelides	Superintendent of Works	
Nicos Toufexis	" "	
George Charalambous	" "	

TECHNICAL STAFF OF W.D.D. ON 31.12.73

DRG. No. BM/G/25

	MONTHLY AND DAILY PAID TECHNICAL STAFF			D	AD	SWE	EH	EE	ME	Geo	H	QS	TIE	LA	SW	SIW	EDR	IW	CF	ACF	TA	DR	F	Total Nos
1	Permanent staff				2	1	1	13	1	2	2				3	6	1	16	4	8	39		39	139
2	Temporary staff							6			1	1	4	1		*1		6		4	25	8	15	72
3	Daily paid staff							2					2								41			45
	TOTAL NUMBERS			1	2	1	1	21	1	2	3	1	6	1	3	7	1	22	4	12	105	8	54	256
	DISTRIBUTION OF STAFF																							
3	Divisions	i	Water Resources							2	3				1			4			23		2	35
		ii	Planning					2										2			8		1	13
		iii	Design					6					3			1	1	2			25	8	1	47
		iv	Construction				1	9	1							2		8	3	8	2		43	77
		v	Small Projects Planning										1		1	2		3	1	1	4			13
		vi	Operation & Maintenance					.							1	1		1		1	1		3	8
4	Administration (Head Office)			1	2	1								1										5
5	Regional Offices (Limassol Famagusta Paphos & Morphou)							2										2			28		2	34
6	Turkish Officers absent from duly							1													9		2	12
7	On scholarship							1					1											2
8	Vacancies											1	1			1				2	5*			10
	TOTAL NUMBERS			1	2	1	1	21	1	2	3	1	6	1	3	7	1	22	4	12	105	8	54	256

REFERENCE

D Director
AD Assistant Director
SWE Senior water Engineer
EH Engineer Hydrologist
EE Executive Engineer
ME Mechanical Engineer
Geo Geologist
H Hydrologist
QS Quantity surveyor
TIE Topographer/ irrigation Engineer
LA Legal Adviser (on contract)
SW Superintendent of works
SIW Senior inspector of works
EDR Engineering Draughtsman
IW Inspector of works
CF Chief Foreman
ACF Assistant Chief Foreman
TA Technical Assistant
DR Draughtsman
F Foreman

*3 monthly paid & 2 daily paid

W.D.D. LIBRARY STATEMENT FOR 1973

DEPARTMENTAL REPORTS 1973

Library Reg. No.	Title	Author	Date
5744 5745	An Introductory Report to the Western Messaoria Water Conservation and Management Problem. Report No.D/7	KONTEATIS C.A.C	January, 1973
5746	The Karyotis River Present Irrigation & Water Use. (Preliminary Report). Report No. W/2.	PANTELIDES P.	January, 1973
5807, 5808	Arakapas Proposed Dam. Report on the Design of the Embankment.Report No.D/8	STYLIANOU N.P.	January, 1973
5795, 5796, 5797	Arakapas Proposed Dam. Report on Foundation and Material Investigations. Report No. F/27.	STYLIANOU N.P.	January, 1973
5810, 5814	Phinikaria Water Supply. House-to-House Scheme. Completion Report. Report No. C/82.	KAZAMIAS P.TH.	January, 1973
5811, 5812	Louvaras Irrigation Works. Kato Pervolia Irrigation Division. Completion Report. Report No. C/80.	KAZAMIAS P.TH.	January, 1973
5750, 5751	Drawing Branch. Work done during 1972.	PITSILLIDES S.C	February, 1973
5805, 5813	Ayios Andronicos Water Supply. House-to-house Scheme. Completion Report. Report No. C/81.	VRAHIMIS I.	February, 1973
5788, 5815	Aphania Water Supply. House-to-House Scheme. Completion Report. Report No. C/84.	VRAHIMIS I.	February, 1973
5804, 5816	Malounda Water Supply. House-to-House Scheme. Completion Report. Report No. C/85.	CONSTANTINIDES G.A.	February, 1973
5875, 5876	Sina Oros-Tembria-Evrykhou. Water Supply Scheme. Completion Report. Report No. C/87.	CONSTANTINIDES G.A.	February, 1973

Library Reg.No.	Title	Author	Date
5822, 5823	Asha Water Supply. House-to-house Scheme. Completion Report. Report No. C/86.	IOANNOU VR.	February, 1973
5820, 5821	Maroni. Safto-Lourga Irrigation Scheme. Completion Report. Report No. C/83	IOANNOU VR.	February, 1973
5777, 5778	Environmental Isotope Survey (Cyprus). Progress Report (II)) of I.A.E.A. Research contract No:1039/RB Report No.H/14	JACOVIDES J.S.	March, 1973
5809	Village Water Supply Situation.(1972). Report No. L/14	W.D.D.	March, 1973
5817, 5818, 5819, 5975	Ayios Theodhoros (Soleas) Dam. Upper Damsite. Report on Foundation and Material Investigations Report No. F/28.	STYLIANOU N.P.	March, 1973
5865, 5866	Limnitis Dam Site. Report on Foundation and Material Investigations. Report No. F/29.	STYLIANOU N.P.	April, 1973
6109, 6110	Palekhori Kambi Dam. Drilling & Grouting Works. Completion Report. Report No. F/40.	TSANGARIDES T.	April, 1973
6111, 6112	Marathovounos-Pyrga Irrigation Scheme. Completion Report. Report No. C/88.	IOANNOU VR.	April, 1973
5906, 5907	Panayia tis Agapis Dam. Report on Foundation and Material Investigations. Report No. F/32.	STYLIANOU N.P.	May, 1973
5873, 5874	Famagusta Water Supply. Lefkara Dam. Report on Grouting. Report No. F/30.	KASTANAS I.	May, 1973
5861, 5862, 5863	Hydrological Year-Book of Cyprus. 1970-1971 Report No. H/15	TOUFEXIS N. Chr., PHANARTZIS & JACOVIDES J.	June, 1973
5898, 5899	Southern Conveyor Project. Preliminary Model.Report No. P/2.	CHRISTODOULOU C.A.	June, 1973

Library Reg. No.	Title	Author	Date
5979, 5980	Forecast of Groundwater Levels of April to October 1973 for Akrotiri Aquifer, (By the Use of Akrotiri Mathematical Model). Report No.H/16	JACOVIDES J.	June, 1973
5973, 5974	Phlevas Dam. Report on Foundation and Material Investigations. Report No. F/34.	STYLIANOU N.P.	July, 1973
5965 5966, 5967	Report on the Site Investigation for the Proposed National Gallery & Library. Report No. F/31.	LOUCAIDES P. & PETRIDES G.	July, 1973
5971, 5972	Report on the Site Investigation for the Proposed New Engomi Reservoir. Report No. F/35.	LOUCAIDES P.	August, 1973
5968, 5969, 5970	Report on the Site Investigation for the Proposed Pedieos River Bridge Extension. Report No.F/33.	LOUCAIDES P.	August, 1973
6129, 6130, 6131	Arminou Dam. Report on Foundation and Material Investigations. Report No. F/37.	STYLIANOU N.P.	August, 1973
6113, 6114	Armenokhori Water Supply. House-to-House Scheme. Completion Report. Report No. C/89.	KAZAMIAS P.TH.	September, 1973
6020, 6021	Optimization of Kouris Recharge to Minimize Subsurface Losses of Groundwater to the Sea or Lake from Akrotiri Aquifer. (By the Use of Akrotiri Mathematical Model Under Assumed Future Conditions). Report No. H/17.	JACOVIDES J.	October, 1973
6170, 6171	Efficiency of the Use and Re-Use of Water in Cyprus. Report No. L/15.	KONTEATIS C.A.C.	October, 1973
6115, 6116	Ayios Elias Water Supply. House-to-House Scheme. Completion Report. Report No. C/90.	IOANNOU VR.	October, 1973
6022, 6023	Paphos Irrigation Project. Report No.I. Operation Study for the Main Canal Between Asprokremmos Dam and Yeroskipos Reservoir. Report No. D/9.	MILINUSIC B.M.	October, 1973
6025	Dhekelia "B" Power Station Site Investigation. Report No. F/36.	LOUCAIDES P. & PETRIDES G.	November, 1973

Library Reg.No.	Title	Author	Date
6099, 6100	Morphou Tylliria Feasibility Study. Morphou Mathematical Model. (Brief Note on criteria and Methods Used for the Preparation of the Basic Input Data). Report No. H/18.	JACOVIDES J.S.	November, 1973
6101, 6102	Morphou Tylliria Feasibility Study. Simulation I. Projected Water Balance and Groundwater Levels in the Future Under Present Cultural Conditions. (By the Use of the Morphou Mathematical Model). Report No. H/19.	JACOVIDES J.S.	November, 1973
6117, 6118	Akhyritou Water Supply. House-to-House Scheme. Completion Report. Report No. C/91.	IOANNOU VR.	November, 1973
6042, 6043	Paphos Irrigation Project. Report No.2.Main Conveyance System. (3 Alternatives). Report No.D/10.	MILINUSIC B.M. & SPANOS K.A.	November, 1973
6132, 6133	Petra Proposed Dam. Site Investigation. Report No. F/38.	LOUCAIDES P. & PETRIDES G.	November, 1973
6134,	Nicosia Water Supply.	LOUCAIDES P.	November, 1973
6135	New Engomi Reservoir. Additional Site Investigation. Report No.F/39.		
6137	Ἀρδευτικά Ἔργα, Σολέας. Γενική Ἔκθεσις. Ἀρ. C/92.	ΠΑΝΤΕΛΙΔΗΣ	Νοέμβριος, 1973
6103, 6104	Morphou Tylliria Feasibility Study. Simulation 2. Projected Water Balance and Groundwater Levels. Under Present Cultural Conditions and 30% Reduction of Pumpage at a Selected Part of the Aquifer. (By the Use of the Morphou Mathematical Model). Report No. H/20.	JACOVIDES J.S.	December, 1973
6105, 6106	Morphou Tylliria Feasibility Study. Simulation 3 & 4. Projected Water Balance and Groundwater Levels Under Present Cultural Conditions with 33% (sim.3) and 50% (sim.4) Reduction of Pumpage at a Selected Part of the Aquifer. (By the Use of Morphou Mathematical Model). Report No.H/21.	JACOVIDES J.S.	December, 1973

Library Reg.No.	Title	Author	Date
6107, 6108	Morphou Tylliria Feasibility Study. Simulation 5. Projected Water Balance and Groundwater Levels Under Present Cultural Conditions and Substitution of 18 Mcm/a Pumpage by Imported Water Supplied from Prastio Reservoir. (By the Use of Morphou Mathematical Model). Report No. H/22.	JACOVIDES J.S.	December, 1973

II. DIVISION OF WATER RESOURCES

By
D. Kypris
Head of Division

2.1 Note for this chapter

The offices of the Water Resources Division have been destroyed by fire in July, 1974, together with all maps, records and documents kept there and which have been collected for years. The contribution of the Water Resources Division to the Annual Report of the Water Development Department for the year 1973, prepared at the beginning of 1974 and typed on stencils, has been destroyed as well. Since all the records kept in the Water Resources Division have been destroyed, this chapter, which has been prepared for a second time is not containing information usually included in the annual reports of the Department and which could not be recovered otherwise.

2.2 Introduction

The Division of Water Resources deals mainly with the collection and interpretation of Hydrological and Hydrogeological data regarding both ground and surface water, engineering geology problems as connected with the planning and execution of water works projects, carries out ancillary drilling operations and controls groundwater extraction and use.

For reasons of better control on the collection of hydrogeological data and thorough hydrogeological studies, Cyprus has been divided into eleven hydrogeological regions based on both hydrogeological and administrative criteria

During 1973 Mr. D.C. Kypris, Geologist Class I, acted as the Head of the Division. Mr. N. Toufexis, Superintendent of Works was the Assistant Head. Mr. M. Peppis, Geologist Class I, was the Head of the Hydrometry, Hydrology, Drilling and Geological and Ground Water Control Sections. In June, 1973, Mr. Peppis has been appointed president of the specially formed advisory committee for the issue of well permits. Mr. Chr. Ioannou, Hydrologist Class II, returned from Israel in April, 1973 and resumed his duties. Since June, 1973, he was acting as head of the Hydrometry, Hydrology, Drilling and Geological sections. Mr. Chr. Phanartzis, Hydrologist Class I and Mr. J. Jacovides, Hydrologist Class I, were still serving during 1973, as Hydrologists Counterparts in the Paphos and Morphou-Tylliria Projects.

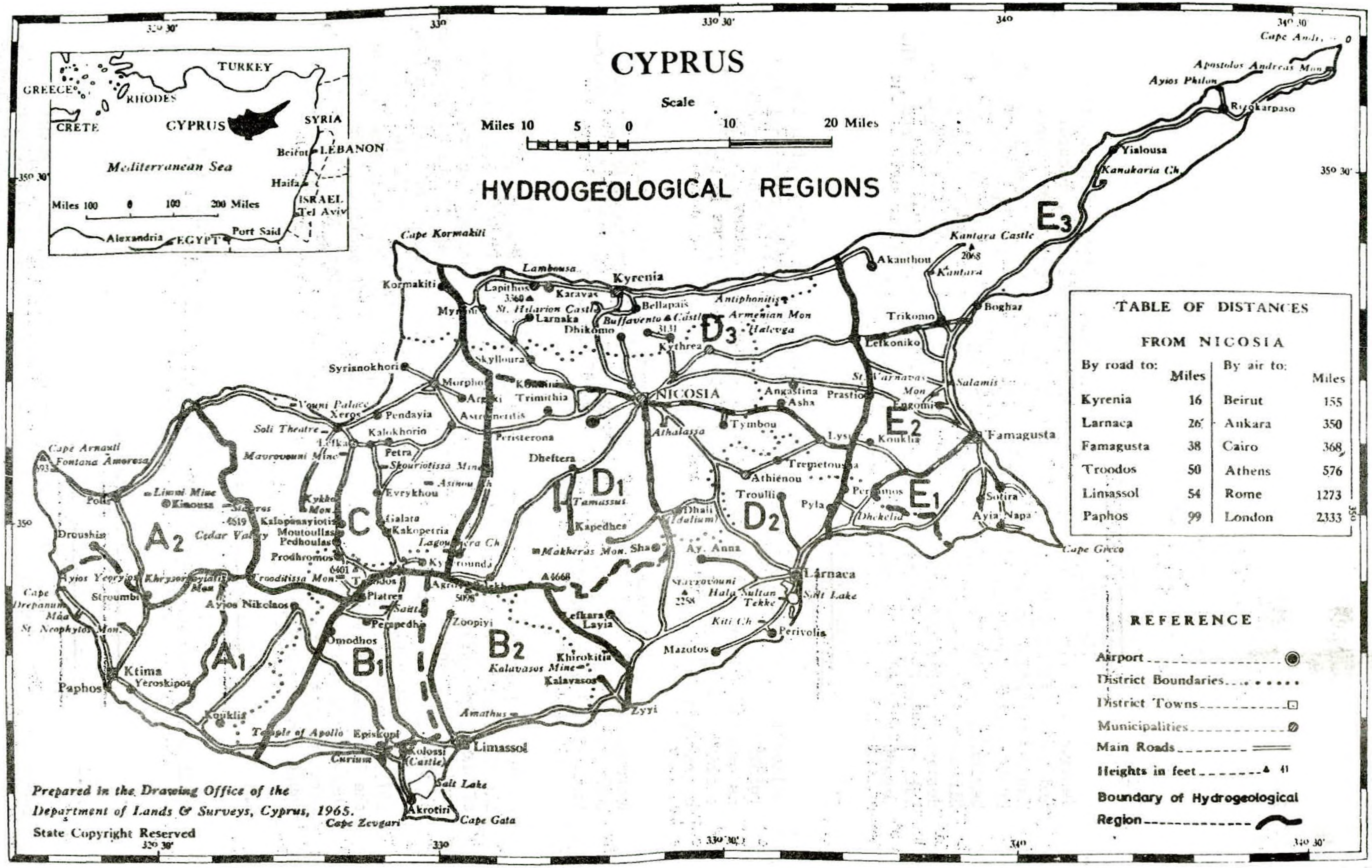
2.3 Drilling Operations

Drilling operation for water continued this year on a small scale with one drilling rig Ruston Bucyrus 22W.

2.4 Surface Hydrology work

2.4.1 Meteorological Notes

The precipitation and other climatological elements recorded at the observing stations of the Cyprus Government Meteorological Service have been analysed and the principal weather features during the hydrometeorological year from 1st October, 1972 to 30th September, 1973 are summarized hereunder:


CYPRUS
Scale
Miles 10 5 0 10 20 Miles
HYDROGEOLOGICAL REGIONS
TURKEY
GREECE
RHODES
CRETE
CYPRUS
SYRIA
Beirut
LEBANON
Mediterranean Sea
Haifa
ISRAEL
Tel Aviv
Miles 100 0 100 200 Miles
Alexandria
EGYPT
Port Said
A1
A2
B1
B2
C
D1
D2
D3
E1
E2
E3
Cape Kormakiti
Kyrenia
NICOSIA
Famagusta
Larnaca
Limassol
Paphos
Ktima
Morphou
Lefka
Polis
Troodos
Akrotiri
Cape Gata
Cape Greco
Cape Arnauti
Kantara Castle
Rizokarpaso
Yialousa
Boghaz
Trikomo
Lefkoniko
Athienou
Dhali
Zyyi
TABLE OF DISTANCES
FROM NICOSIA
By road to: Miles
Kyrenia 16
Larnaca 26
Famagusta 38
Troodos 50
Limassol 54
Paphos 99
By air to: Miles
Beirut 155
Ankara 350
Cairo 368
Athens 576
Rome 1273
London 2333
REFERENCE
Airport
District Boundaries
District Towns
Municipalities
Main Roads
Heights in feet
Boundary of Hydrogeological Region
Prepared in the Drawing Office of the Department of Lands & Surveys, Cyprus, 1965.
State Copyright Reserved

2.5 Precipitation

(a) The total precipitation averaged over the whole island for the year under review was the lowest on record in Cyprus, i.e. since 1881 when precipitation measurements were initiated in the island. The total annnal average over the island was only 182 mm which is 37.4 of normal (489 mm) this being the average for the period 1941-1970. The percentage of actual precipitation to normal varied over the various areas with extreme values around 55% over parts of Paphos district, a little above 50% over the extreme southeast peninsula and less than 20% over part of Mesaoria plain and Karpas Peninsula.

(b) Except for June and July which has rainfall higher than the average and for April when precipitation was around normal all other months were much drier than normal. In particular December, January, February and March were exceptionally dry with the known repercussions on water resources and agriculture.

(c) The highest daily rainfall of the year was recorded at the climatological station at the Gymnasium of Lefkara on 17th May, 1973, and amounted to 114 mm.

(d) The first snowfall occurred on Mount Olympus on 28th November, 1972 which was slightly earlier in the season than usual. The last snowfall on the Troodos range was on 21st March, 1973.

2.5.1 Temperatures

For the year as a whole temperature averaged near normal. Day temperatures were slightly higher or near normal values while night temperatures were slightly below average. November, December, January and April were slightly cooler than normal. October, February, May, July and September were warmer than usual. In March, June and August temperatures fluctuated around their normal values.

The extreme maximum and minimum temperatures recorded during the Hydrometeorological year under consideration at various Meteorological Stations are quoted below :-

Station	Extreme maximum temperature and date	Extreme minimum temperature and date
	°C	°C
Nicosia	44.2 (20th July)	0.0 (25th Dec.&16th January)
Limassol	37.2 (24th August)	1.7 (16th January)
Larnaca	38.4 (20th July)	-0.3 (16th January)
Famagusta	39.0 (20th July)	-1.0 (16th January)
Paphos	34.1 (19th July)	3.1 (15th January)

Station	Extreme maximum temperature and date	Extreme minimum temperature and date
	°C	°C
Kyrenia	41.4 (20th July)	2.5 (14th & 15th January)
Panagia Bridge Forest Station	42.0 (20th July)	-6.7 (15th January)
Morphou	44.2 (20th July)	-2.8 (22nd, 24th & 31st Dec. and 1st January)
Halefka Forest Station	38.3 (20th July)	-2.8 (15th January)
Saittas Nursery Garden	40.0 (21st July)	-3.0 (15th January)
Amiandos	35.0 (20th July)	-7.0 (15th January)
Prodromos Forestry College	35.5 (21st July)	-8.0 (15th January)
Stavros tis Psokas Forest Station	40.5 (20th July)	-3.9 (15th January)
Kornos Forest Station	41.1 (20th July)	-1.7 (15th January)
Platania Forest Station	37.0 (21st July)	-6.5 (15th January)
Phassouri	38.5 (22nd July)	-0.1 (2nd, 15th and 16th January)

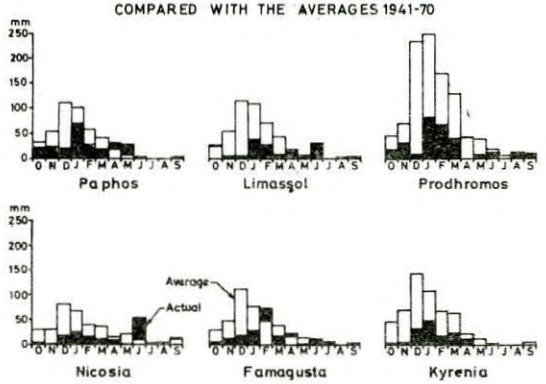
TOTAL ANNUAL PRECIPITATION (IN MM) OF CYPRUS

OCTOBER 1972 - SEPTEMBER 1973

1 : 750 000

Km 5 0 5 10 15 20 25 30 35 40 45 Km

ACTUAL MONTHLY PRECIPITATION 1972-73
COMPARED WITH THE AVERAGES 1941-70



ANNUAL PRECIPITATION AVERAGED OVER DISTRICTS AND THE ISLAND

	Area km²	1941-70 mm	1972-73 mm	Difference mm	%
1. NORTH COAST AND KYRENIA RANGE	974	493	169	-324	-65
2. RIZOKARPASO PENINSULA	476	492	150	-342	-70
3. NORTHERN TROODOS SLOPES	569	429	151	-278	-65
4. WESTERN MESAORIA	479	318	110	-208	-65
5. CENTRAL MESAORIA	565	340	127	-213	-63
6. EASTERN MESAORIA	840	343	92	-251	-73
7. EASTERN COASTAL	713	363	143	-220	-61
8. WESTERN COASTAL	414	493	243	-250	-51
9. WESTERN TROODOS SLOPES	653	599	273	-326	-54
10. WESTERN TROODOS MOUNTAINS	819	770	322	-448	-58
11. EASTERN TROODOS MOUNTAINS	790	681	243	-438	-64
12. EASTERN TROODOS SLOPES	727	425	140	-285	-67
13. SOUTHERN TROODOS SLOPES	497	548	217	-331	-60
14. SOUTHERN COASTAL	738	444	150	-294	-66
WHOLE ISLAND	9254	489	182	-307	-63

AVERAGE ANNUAL PRECIPITATION (IN MM)
1941-70

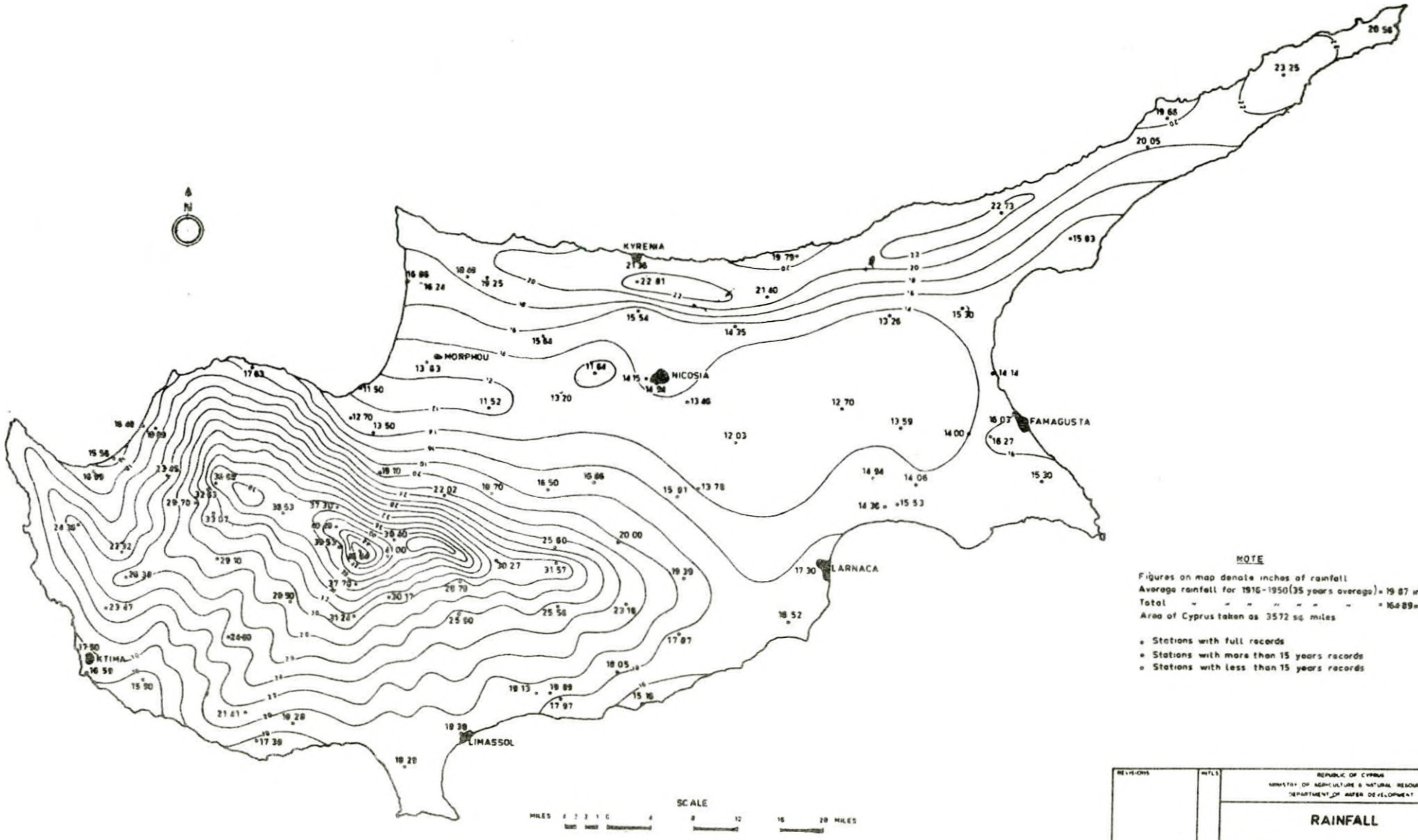
1 : 1 500 000

Km 10 0 10 20 30 40 50 Km

PREPARED BY THE METEOROLOGICAL SERVICE
MINISTRY OF AGRICULTURE AND
NATURAL RESOURCES
NOVEMBER 1973

Meteorological District Boundaries

(5) Meteorological District Number



NOTE

Figures on map denote inches of rainfall
Average rainfall for 1916-1950 (35 years average) = 19.87 inches
Total " " " " " " = 16.89 × 10^9 ft^3
Area of Cyprus taken as 3572 sq. miles

* Stations with full records
+ Stations with more than 15 years records
o Stations with less than 15 years records

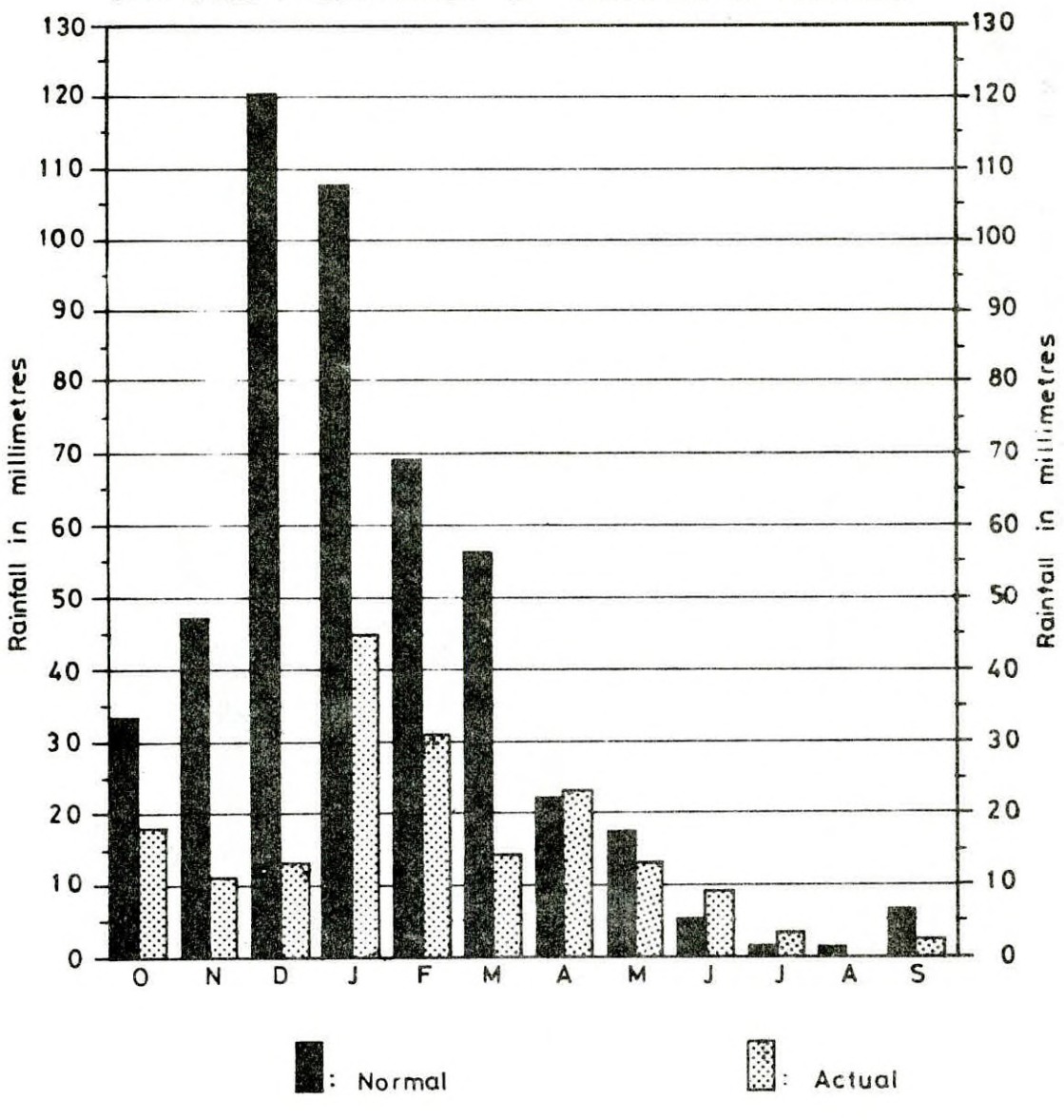
REVISIONS	INITLS	REPUBLIC OF CYPRUS MINISTRY OF AGRICULTURE & NATURAL RESOURCES DEPARTMENT OF WATER DEVELOPMENT
		RAINFALL
		ISOHYETAL MAP OF CYPRUS BASED ON RAINFALL FROM 1916 TO 1950 (35 YEARS AVERAGE)
		DC — DRG No
		SURVEYED BY — TRACED BY
		DESIGNED BY — CHECKED BY
		DRAWN BY — APPROVED BY

INCIDENCE OF RAINFALL

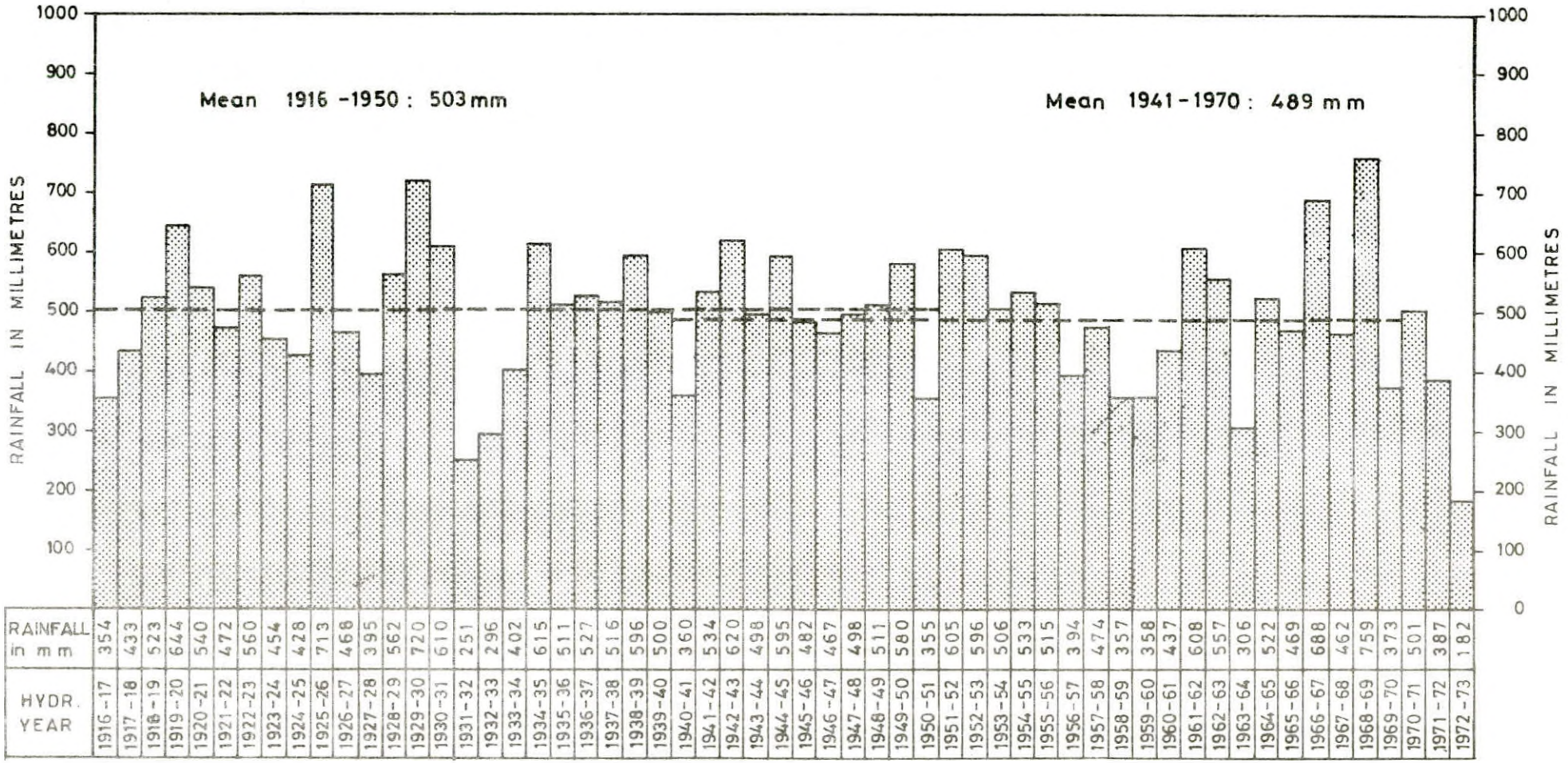
The incidence of rainfall per month as worked out from selected rainfall stations during the hydrological year 1972 - 1973 is given as under :-

Month	Rainfall in millimetres	Rainfall in inches	Percentage %
October	18	0.71	9.9
November	11	0.43	6.0
December	13	0.51	7.2
January	45	1.77	24.8
February	31	1.22	17.0
March	14	0.55	7.7
April	23	0.91	12.6
May	13	0.51	7.2
June	9	0.36	4.9
July	3	0.12	1.6
August	0	0	0
September	2	0.08	1.1
Totals	182	7.17	100.0

GRAPHICAL PRESENTATION OF INCIDENCE OF RAINFALL



ANNUAL AVERAGE RAINFALL OF CYPRUS
FROM 1916 –1973



HYDR. YEAR	RAINFALL in mm
1916-17	354
1917-18	433
1918-19	523
1919-20	644
1920-21	540
1921-22	472
1922-23	560
1923-24	454
1924-25	428
1925-26	713
1926-27	468
1927-28	395
1928-29	562
1929-30	720
1930-31	610
1931-32	251
1932-33	296
1933-34	402
1934-35	615
1935-36	511
1936-37	527
1937-38	516
1938-39	596
1939-40	500
1940-41	360
1941-42	534
1942-43	620
1943-44	498
1944-45	595
1945-46	482
1946-47	467
1947-48	498
1948-49	511
1949-50	580
1950-51	355
1951-52	605
1952-53	596
1953-54	506
1954-55	533
1955-56	515
1956-57	394
1957-58	474
1958-59	357
1959-60	358
1960-61	437
1961-62	608
1962-63	557
1963-64	306
1964-65	522
1965-66	469
1966-67	688
1967-68	462
1968-69	759
1969-70	373
1970-71	501
1971-72	387
1972-73	182

2.6 Permanent stream gauging stations

On important rivers at selected places permanent flow gauging stations have been established equipped with automatic recorders, from the records of which the volume of flowing water may be deduced.

The following stream gauging stations equipped with automatic water level recorders were in operation during the year:-

Gauging Station No.	Stream	Location	Co-ordinates
1-1-3-95	Khapotami	Kissousa	VD805513
1-1-7-95	Khapotami	Kouklia	VD627383
1-2-4-95	Dhiarizos	Philousa	VD754575
1-2-7-90	Dhiarizos	Kouklia	VD601411
1-3-5-05	Xeros	Lazaridhes	VD725652
1-3-8-60	Xeros	Phinikas	VD615470
1-4-4-50	Ezouza	Kannaviou	VD610633
1-4-9-80	Ezouza	Akhelia	VD524444
1-8-2-80	Avgas	Toxeftra (Akamas)	VD394644
2-2-3-95	Khrysokhou	Skoulli	VD497709
2-2-6-90	Stavros-tis-Psokas	Evretou	VD520705
2-3-8-95	Yialia	Kato Yialia	VD549848
2-7-2-75	Pyrgos	Phileyia	VD717857
2-8-3-15	Limnitis	Limnitis Saw Mill	VD739830
2-9-3-40	Marathos	Varisha	VD770872
2-9-4-90	Kambos	Potamos tou Kambou	VD826892
3-1-3-95	Xeros	Karavostasi	VD852889
3-2-1-85	Marathasa	U/S Kalopanayiotis Dam	VD842733
3-2-1-95	Marathasa	Kalopanayiotis Dam	VD841739
3-2-2-90	Marathasa	U/S Lefka Dam	VD852795
3-2-4-95	Marathasa	Karavostasi	VD863895
3-3-1-70	Ayios Nicolaos	Kakopetria	VD900707
3-3-2-60	Platania	Kakopetria	VD927698
3-3-3-95	Karyotis	Evrykhou	VD906773
3-3-5-95	Karyotis	Pendayia	VD883902
3-4-2-90	Atsas	Evrykhou	VD931810
3-5-4-40	Elea	Vizakia	WD018806
3-7-1-50	Peristerona	Panayia F.S.8	WD075754
3-7-3-90	Akaki	Malounda	WD163783
3-7-5-95	Merika	Avlona	WD093924
3-7-7-85	Skylloura	Ayios Vasilios	WD156969
3-7-8-60	Ovgos	Kyra	WD050964
3-7-8-65	Ovgos	Ovgos Dam	WD034973
3-7-8-90	Ovgos	Morphou	VD973974
3-7-9-50	Serakhis	Morphou Dam	WD007948
3-8-6-50	Aloupos	Aloupos Chiftlik	VE980018
4-2-3-70	Panagra	Panagra	WE077119
4-4-2-50	Boghazi	Kyrenia Road Forest	WE296077
5-2-3-50	Melini	Ayia Trias	XE125337
5-3-4-85	Laris	Rizokarpaso	XE218405
5-9-4-90	Kharangas	Boghaz (F'sta)	WE883100
6-1-1-80	Ayios Onoufrios	Kambia	WE225735
6-1-1-85	Pedhieos	Kambia	WD224741
6-1-4-20	Tengelis	Kythrea	WE415010

Gauging Station No.	Stream	Location	Co-ordinates
6-1-4-50	Pedhieos	Mia Milia	WD376958
6-1-5-50	Vathys	Athalassa	WD345867
6-5-3-15	Yialias	Nisou	WD359765
6-5-2-95	Alikos	Ayios Sozomenos	WD413808
6-5-3-95	Yialias	Pyroi	WD446824
7-1-7-50	Kalopannes	Kalopsidha	WD746842
7-2-3-50	Liopetri	U/S Liopetri Dam	WD806732
7-2-7-05	Paralimni Lake Out Flow	Paralimni	WD892801
8-2-1-90	Aradippou	Nicosia-Larnaca road	WD517683
8-2-2-90	Aradhippou	Panayia Yematousa	WD516689
8-4-3-40	Tremithos	Ayia Anna	WD442668
8-4-5-30	Tremithos	Klavdhia	WD490615
8-4-5-40	Tremithos	Kiti Dam	WD510590
8-5-1-90	Bouzis	Mazotos	WD472518
8-7-3-60	Mylou	Kornos	WD332613
8-7-4-80	Syrgates	Skarinou Station	WD343535
8-8-2-50	Maroni	Vavla	WD261558
8-8-3-30	Maroni	Khirokita Station	WD317503
8-9-7-50	Vasilikos	Kalavasos	WD275472
8-9-7-95	Vasilikos	Vasiliko	WD292425
9-2-3-85	Yermasoyia	Phinikaria	WD093475
9-2-4-95	Akrounda	U/S Yermasoyia Dam	WD078460
9-4-3-80	Garyllis	U/S Polemidhia Dam	VD977450
9-6-4-95	Kouris	Khalassa	VD920470
9-6-5-10	Zavos	Khandria	VD994672
9-6-7-75	Zyghos	Khalassa	VD941471
9-6-9-05	Kouris & Kryos	Khalassa	VD921466
9-8-1-95	Evdhimou	Evdhimou	VD780397

2.6.1 Flood Discharges

Since the year has been the driest in record for Cyprus no remarkable floods have been recorded.

2.7 Inflow of water in dams

As the hydrological year of 1972-1973 have been the driest ever recorded in Cyprus, the amount of water accumulated in the most important dams in Cyprus, 45 in number under regular observation, was very small. The maximum volume of water accumulated in all the dams under regular observation was only 3.7 mill.m3 which is about 9% of the 41 mill. m3 of their total capacity.

Only in six small dams on mountainous areas there was an overflow. In 18 of them there was no inflow and in 10 the inflow was less than the 20% of their capacity.

Analytically the situation is shown on the table on next page :

Table showing volume of water accumulated and commencing date of inflow for various dams during the year 1973.

No.	D a m	Capacity $10^3 m^3$	Inflow commencing Date(1973)	Maximum volume Accumulated $10^3 m^3$	Date of Maximum Accumulation 1973	Remarks
1	Agros	100	January	4.5	December	
2	Akrounda	22	"	9	November	Reservoir partyly silted up Overflowed
3	Akanthou Recharge Dams	-	-	-	-	No inflow
4	Arghaka	1150	January	172	May	
5	Athalassa	790	November	162	November	
6	Ayios Loukas	450	-	-	-	No inflow
7	Akhna	100	-	-	-	No inflow
8	Ayia Marina	300	February	19	March	
9	F'sta District Recharge Dams	-	-	-	-	No inflow
10	Galini	22	January	22	November	Overflowed
11	Geyneli	1000	November	45	"	
12	Gypsos	113	-	-	-	No inflow
13	Kalokhorio Klirou	81	January	81	November	Overflowed
14	Kalopanayiotis	390	"	390	March	Overflowed
15	Kandou	36	"	18	November	
16	Kanli	1100	November	90	"	
17	Kiti	1600	-	-	-	No inflow
18	Kouklia	4800	-	-	-	No inflow
19	Kyrenia Range Recharge Dams	-	-	-	-	No inflow
20	Lefka Marathassa	360	January	360	April	Overflowed
21	Lefka Kafizes	110	"	110	March	Overflowed
22	Liopetri	340	-	-	-	No inflow
23	Lythrodhondas Upper	32	-	-	-	No inflow
24	Lythrodhondas Lower	32	-	-	-	No inflow
25	Makrasyka	196	-	-	-	No inflow
26	Massari	2400	November	-	-	Open Tunnel
27	Mia Milia	330	January	225	November	
28	Mavrokolymbos	2200	"	255	March	
29	Morphou-Serrakhis	2000	-	-	-	No inflow
30	Ovgos	850	November	850	November	Overflowed
31	Palekhori Kambi	64	-	-	-	No inflow
32	Paralimni	65	-	-	-	No inflow
33	Pera Pedhi	55	January	55	February	Overflowed
34	Petra Upper	22	-	-	-	No inflow
35	Petra Lower	32	-	-	-	No inflow
36	Pomos	860	January	112	March	
37	Polemidhia	3400	February	202	November	
38	Prodhromos	110	January	27	January	
39	Pyrgos	270	November	30	December	
40	Syngrassi	1100	-	-	-	No inflow
41	Trimiklini	330	January	98	April	Gate closed on the 9th April 1973
42	Yermasoyia	14000	January	350	May	

2.8 Spring Discharges

As a result of the low precipitation during the current hydrological year all springs experienced a continuous decrease of flow. The springs on Troodos mountains have been mostly affected a good number of which completely dried up for the first time the villagers remember.

2.9 Groundwater Hydrological Work

Hydrological Surveys of the ground water bearing systems were carried out on small scale by this Department before 1960. Since then, they were rapidly amounting in scale until the most important known aquifer systems were brought in a few years time under Hydrological Observation.

Through the Hydrological Surveys all wells boreholes, springs and chain-of-wells have been registered and plotted on maps. A dense network of observation boreholes, has also been leveled. Through these observation boreholes/wells the water level is being measured twice a year, at the end of the dry season (November) when it is expected to be at lowest and at the end of the wet season (March) when it is expected to be at highest level.

Out of a large portion of the above network of wells and boreholes, water samples are obtained twice a year (November and March) for chemical analysis to evaluate the trends of any quality change of the water in each aquifer. The extent of the areas covered by hydrological surveys is 3,600km2.

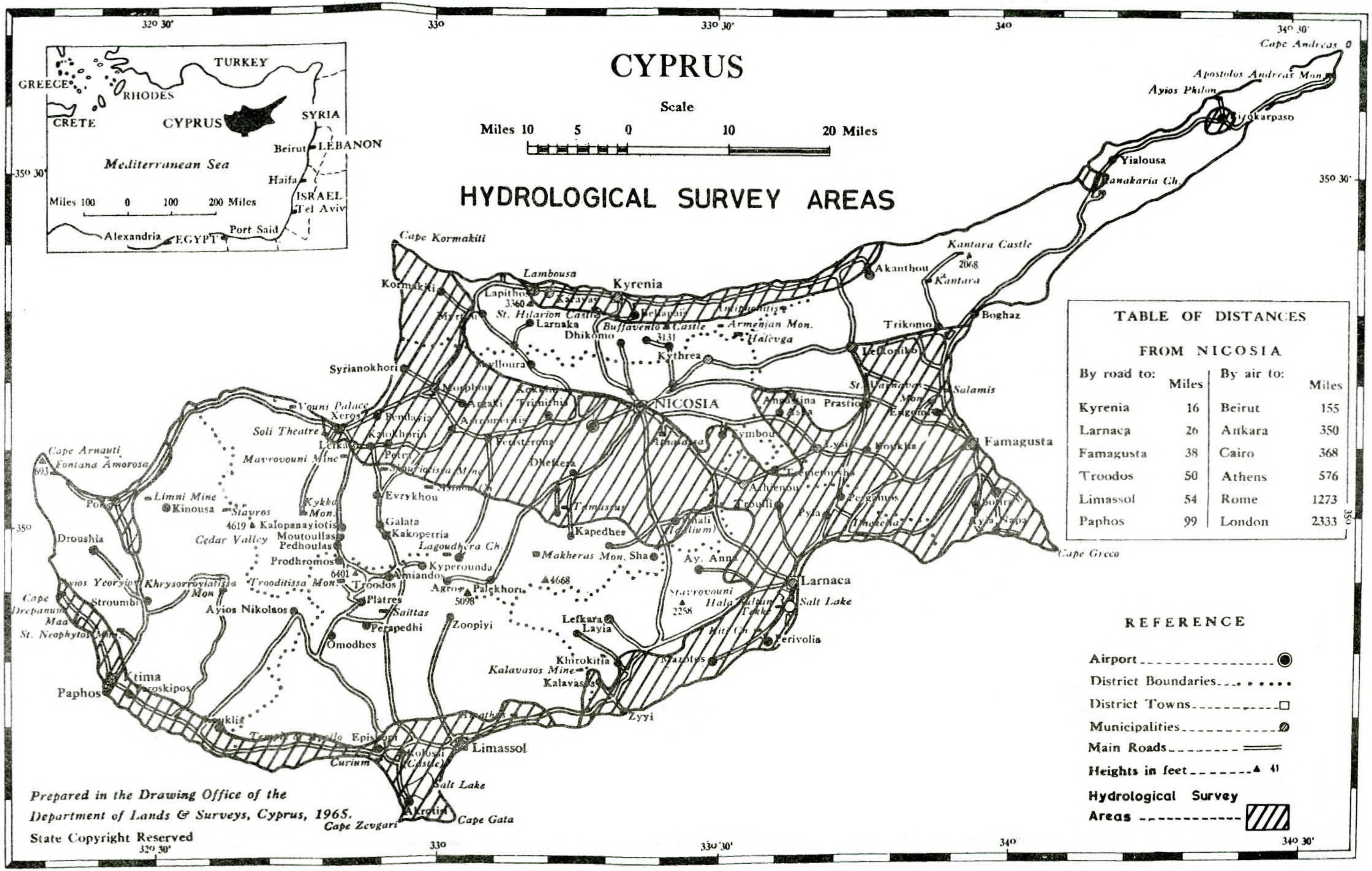
From the above observations, groundwater table contour maps and isochloride maps have been prepared for each aquifer for March 1973. For November no systematic measurements have been obtained due to the continuous pumping of the boreholes.

The annual questionnaire was also carried out for the determination of the Groundwater extraction for the year under review taking also into account the water meter readings.

The extraction of water from the aquifers, during the current year was much in excess than on average years and the groundwater recharge is estimated to be of the order of 20% due to the extremely low rainfall. As a result the groundwater table was continuously declining this year and this may also be seen through the water level measurements carried out a selection of which appears in the table.

Selected Observation Boreholes

Serial No.	Hydr. No.	Village	Water level a.m.s.l. in meters				Water level increase (+) or Decrease (-)	
			1972		1973			
			March	Novemb.	March	Novemb.	March 72-73	Novemb. 72-73
44/62	1965	Morphou	+ 5.44	- 3.00	- 0.41	- 8.16	- 5.85	- 5.16
150/54	15	Syrianokhori	—0.41	-	-	-	-	-
I/55	61	"	- 4.07	- 7.22	- 6.72	- 9.32	- 2.65	- 2.10
209/56	117	"	- 3.84	- 7.16	- 6.81	-	- 2.97	-
15/62	875	K. Varosha	- 4.19	- 5.58	- 5.75	- 6.17	- 1.56	- 0.59
18/62	228	Ay. Memnon	- 1.96	- 2.78	- 2.47	- 3.10	- 0.51	- 0.32
27/62	285	Ay. Loukas	- 3.10	- 4.14	- 3.54	- 5.68	- 0.44	- 1.54
50/53	558	Dherynia	- 0.31	- 1.11	- 0.74	- 1.23	- 0.43	- 0.12
56/56	192	Liopetri	+ 1.52	+ 1.39	+ 1.21	+ 0.87	- 0.31	- 0.52
49/54	134	Makrasyka	+35.99	+36.05	+24.80	+24.75	-11.19	-11.30
20/63	1516	Paralimni	+20.62	+19.50	+19.71	+19.38	- 0.91	- 0.12
22/63	1518	"	+ 5.80	+ 5.62	+ 5.69	+ 5.65	- 0.11	+ 0.03
51/51	774	Phrenaros	+ 7.48	+ 7.16	+ 7.08	+ 6.58	- 0.40	- 0.58
76/56	972	"	- 5.16	- 6.65	- 7.88	DRY	- 2.72	-
79/56	975	"	+ 8.04	+ 8.12	+ 8.18	+ 8.14	+ 0.14	+ 0.02
88/54	24	Kolossi	+ 2.75	+ 0.06	+ 0.45	Blocked	- 2.30	-
51/63	813	Limassol	+ 1.27	+ 0.78	+ 0.71	+ 0.48	- 0.56	- 0.30
13/63	807	Zakaki	+ 0.16	- 0.78	- 0.53	- 1.23	- 0.69	- 0.45
107/61	17	Yermasoyia	+ 8.38	+14.33	+ 3.40	- 0.17	- 4.98	-14.50


CYPRUS
Scale
Miles 10 5 0 10 20 Miles
HYDROLOGICAL SURVEY AREAS
TURKEY
GREECE
RHODES
CRETE
CYPRUS
SYRIA
Beirut
LEBANON
Mediterranean Sea
Haifa
ISRAEL
Tel Aviv
Miles 100 0 100 200 Miles
Alexandria
EGYPT
Port Said
Cape Andreas
Apostolos Andreas Mon.
Ayios Philon
Rizokarpaso
Yialousa
Kantara Castle
2068
Kantara
Akanthou
Trikomo
Boghaz
Cape Kormakiti
Lambousa
Kyrenia
Lapithos
3360
St. Hilarion Castle
Larnaka
Dhikomo
Buffavento Castle
3131
Armenian Mon.
Halevga
Kythrea
Syrianokhori
NICOSIA
Prastio
Salamis
Famagusta
Vouni Palace
Xeros
Soli Theatre
Lefka
Cape Arnauti
Fontana Amorosa
Mavrovouni Mine
Evrykhou
Limni Mine
Kinousa
Stavros
Kykko Mon.
4619
Kalopanayiotis
Moutoullas
Pedhoulas
Cedar Valley
Galata
Kakopetria
Lagoudhera Ch.
Droushia
Prodhromos
6401
Kyperounda
Amiandos
Makheras Mon.
Trooditissa Mon.
Troodos
Agros
Palekhori
5098
4668
Kapedhes
Ay. Anna
Larnaca
Salt Lake
Mavrovouni
2258
Hala Sultan Tekke
Perivolia
Stroumbi
Ayios Nikolaos
Platres
Saittas
Perapedhi
Zoopiyi
Lefkara
Layia
Omodhes
Khirokitia
Kalavasos Mine
Kalavasos
Zyyi
Ktima
Paphos
Yeroskipos
Limassol
Curium
Kolossi Castle
Salt Lake
Akrotiri
Cape Zevgari
Cape Gata
Cape Greco
TABLE OF DISTANCES
FROM NICOSIA
By road to: Miles
Kyrenia 16
Larnaca 26
Famagusta 38
Troodos 50
Limassol 54
Paphos 99
By air to: Miles
Beirut 155
Ankara 350
Cairo 368
Athens 576
Rome 1273
London 2333
REFERENCE
Airport
District Boundaries
District Towns
Municipalities
Main Roads
Heights in feet 41
Hydrological Survey Areas
Prepared in the Drawing Office of the
Department of Lands & Surveys, Cyprus, 1965.
State Copyright Reserved

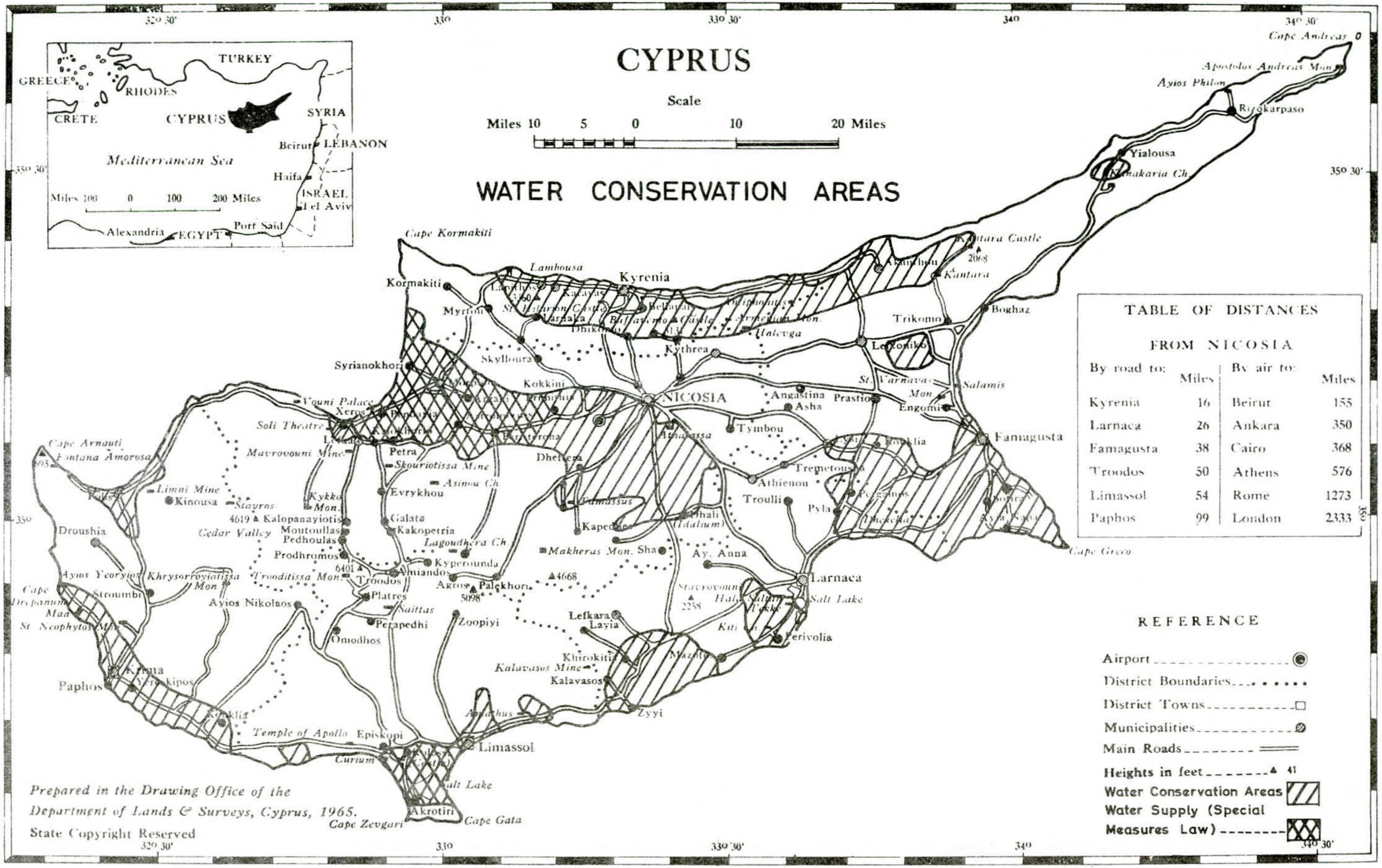


TABLE OF DISTANCES

FROM NICOSIA

By road to:	Miles	By air to:	Miles
Kyrenia	16	Beirut	155
Larnaca	26	Ankara	350
Famagusta	38	Cairo	368
Troodos	50	Athens	576
Limassol	54	Rome	1273
Paphos	99	London	2333

2.10 Control and Conservation of Groundwater

2.10.1 Water Conservation Areas (Wells Law Cap.351)

An area is declared as a Water Conservation Area when its water resources are being overexploited or the pumping trends are such, that will affect the quantity or quality of the water of that area.

On map on page 68 it is shown the areas which have been declared as "Water Conservation Areas" under the Wells Law Cap.351".

Applications for well permits falling within a Water Conservation area, are being sent by the District Officers to the Water Development Department for technical advice and recommendations. These recommendations which are based on the knowledge of the existing water situation of each aquifer, the development in the area and the existence of other wells or boreholes, chain-of-wells and springs as well as any other Government water works are mandatory to the District Officer.

2.10.2 Water Supply (Special Measures) Law 32/64

The major aquifers of Western-Messaoria and Akrotiri Peninsula, which were declared as water conservation areas in the past, have been covered by the water supply (Special Measures) Law since 1965, whose purpose is to further and more efficiently protect and control the water resources.

(i) The District Officer, with the concurrence of the Director of Water Development can withdraw any permit for any well or can apply modifications on the extraction of water as required.

(ii) On the permits which are renewed yearly, conditions are imposed regarding the quantity of water to be extracted, the method of extraction, the area to be irrigated, the measurement of water the conveyance of water and the utilization of water.

2.10.3 Well sinking permits

According to the Law as stated above, the Director of the Department of Water Development has to give his concurrence so that the District Officer may issue a well permit, when the application falls within a Water Conservation or Special Measures Law Area.

Such applications have been examined by the Division of Water Resources and our views expressed to the District Officer. A number of others applications not falling within the above referred areas have also been examined.

Since July, 1973 the Ministry of Agriculture and Natural Resources established a specially formed advisory committee for the issue of well permits, presided by the representative of the Director of the W.D.D., and having as participants representatives of the Directors of Geological and Agricultural Departments. This committee makes suggestions on the advise that the Director or the W.D.D. should give to the District Officers regarding well applications submitted.

2.11 Special Hydrological Studies

2.11.1 Morphou-Tylliria Feasibility Studies

2.11.2 Measurement of river-water diversion

The extended flow gauging network on the Serakhis river consisting of 12 hydrometric stations equipped with automatic water level recorders on the main irrigation intakes on the Serakhis river basin continued its operation during the year 1973. Similarly measurements continued in the Karyotis river intakes with four automatic flow gauging stations and

additional points of instantaneous flow measurements and on the main intake on the Elea river at Koutraphas where an automatic station has been established.

The information gathered from these stations during 1973 is of little value due to the severe draught and the absence of significant river flows. The purpose is to evaluate the amounts of diverted water and riverbed recharge, both extremely important in the water balance of the Morphou-Pendayia aquifers.

2.11.3 Surface-Water Mobilization Models

The assessment of the feasibility maximum volumes of water possible to be mobilized for both stages of the Morphou-Tylliria Project involved an examination of hundreds of storage-diversion combinations. In order to achieve this in the relatively short time available, Mr. C. Phanartzis, Hydrologist in the Department of Water Development and counterpart to the Morphou-Tylliria Project, developed four special mathematical models capable of carrying out storage-diversion-operation calculations and outputting the results of several alternatives simultaneously, in a matter of minutes. Two of the models were designed to take probabilistic hydrological inputs, while the other two, MTOPE I and MOP, operate with historic hydrological inputs. The last model, MOP, has been provided with a subroutine to compute crop irrigation requirements based on current rainfall and to output the monthly groundwater pumpage needed in a conjuctive surface-groundwater system. The results from this model form the input to the Morphou Mathematical Model in forecasting future groundwater levels. The work, results, and conclusions pertaining to the four models have been presented in three technical reports.

2.11.4 The Morphou Mathematical Model

The Morphou Mathematical Model which started being developed in 1972 was completed in September, 1973. The groundwater mathematical model which covers an aquifer area of about 240 km2 subdivided into 59 four-square-kilometer nodal areas was quite successfully calibrated over a 72 month period of historic hydrologic information (1967 to 1973).

The model was prepared by J.S. Jacovides, Hydrologist of this Department as a contribution of the Department and FAO to the Morphou-Tylliria Feasibility Study carried out by the Swiss Firm of Electrowatt.

A series of simulating runs of several alternative schemes contemplated by the Project have been made by the use of the model which are expected to assist in decision making.

The simulation runs that were made by the end of 1973 are:-

(a) Projected water balance and groundwater levels in the future, under present cultural conditions (No-project situation)

(b) Projected water balance and groundwater levels under present cultural conditions and 30% reduction of pumpage at a selected part of the aquifer

(c) Projected water balance and groundwater levels under present cultural conditions with 33% and 50% reduction of pumpage at a selected part of the aquifer.

(d) Projected water balance and groundwater levels under present cultural conditions and substitution of 18 MCM/a by imported water supplied from Prastio reservoir.

Further extensive use of the model which operates on I.B.M. system-3 computer is expected to be made in 1974 for the continuing Morphou Project.

2.11.5 The Akrotiri Mathematical Model

The Akrotiri aquifer mathematical model which was prepared during 1971-72 by Mr. J.S. Jacovides, Hydrologist of this Department in association with Dr. R.Kitching of the Institute of Geological Sciences was extensively used during 1973.

The model, which is operated on the I.B.M. System-3 computer in Nicosia, consists of 42 one-square-kilometer inside nodal areas and it has been calibrated by the use of climatologic and hydrogeologic data of a 60 month (1967-1972) period. Some 87 per cent of the computed water levels fell within ± 1.25 meters from the actual water levels of the same period which is considered as a very good calibration level.

During 1973, the model was utilised for forecasting the water levels and extent of sea-intrusion in the aquifer, that might be expected, by the end of the irrigation season of 1973 under different patterns of reduced extraction.

This study was undertaken for the purpose of evaluating the extent of reduction of pumpage that was necessary to be imposed as from May, for safeguarding the aquifer from excessive sea-intrusion, a concern that was arisen due to the extreme dry weather conditions of 1972-1973. The anticipated water-levels were subsequently checked with the actual water levels that were observed at the end of 1973. The confidence on the usage of the model as a managemental tool for the aquifer was further confirmed by the degree of coincidence of forecasted and actual water levels.

By the use of the same model, a study was also made for the optimization of the recharge of Kouris river for minimizing the subsurface losses of groundwater to the sea or the Salt Lake from the Akrotiri aquifer.

2.11.6 Environmental Isotope Survey

A research contract under the title "Environmental Isotope Survey" was renewed by the International Atomic Energy Agency for a second year (1973) with Mr. J. Jacovides, Hydrologist, as the principal Scientific Investigator.

Under this project 35 samples from boreholes of the Western Mesaoria aquifer were analysed at the Vienna I.A.E.A. Laboratories for oxygen-18 and radioactive Tritium whilst 3 samples for carbon-14.

Also, 41 samples from wells/boreholes and springs of the Kyrenia Range were analysed for oxygen-18 and Tritium whilst 3 samples were analysed for Carbon-14.

The research contract which is on an equal cost sharing basis between the I.A.E.A. and the Department was carried out at an estimated cost of £4.000.

The research programme aims to verify the applicability of radioisotope techniques in the hydrology of the island and to assist in the better understanding of the hydrologic regime in respect to the groundwater reservoirs as well as the differenctiation of the water masses from each other by the natural labelling of them by the stable isotopes and the radioisotopes. Tritium and Carbon-14.

The progress report (III) no. H/26 gives a relatively extensive account of the survey, the analyses results as well as their interpretation.

2.11.7 Sediment Surveys

During the year, four reservoirs were surveyed for determining the volume of sediment that had accumulated in the reservoir over a period of years. The depth of sediment was determined by sampling with an auger, by digging, or by driving a pipe through the fine sediment in the deeper parts of the reservoirs. The samples were taken on pre-established traverses and the sediment volume was determined by the use of sediment isopach maps. The sediment volumes were converted to sediment yield per square kilometer of catchment and can be summarized as follows:-

River & Reservoir	Catchment area	Aver. Annual Sediment Yield per km2 upto 1971/72
Polemidhia	85	250 m3
Pomos	36	140 m3
Kiti	150	125 m3
Mavrokolymbos	39	260 m3

2.12 Cost of Hydrological Studies

	Approved Estimated Cost	Actual Expenditure
Hydrological Observations and Research	£ 22,000	£17,490
Construction & Maintenance of Measuring Weirs	£ 4,500	£ 2,490
T o t a l	£ 26,500	£19,980

III. DIVISION OF PLANNING

By
C.A. Christodoulou
Senior Water Engineer

3.1 Master Plan

3.1.1 Southern Conveyor

Within the frame of the Master Plan Study a preliminary Mathematical Simulation Model has been prepared with the Assistance of the Water Research Association of Great Britain.

The said Mathematical Model covers the area of the Southern Conveyor Project with extend from Paphos to Famagusta. The model consists of two main branches.

(a) The Engineering Branch and
(b) The Economics Branch

The first deals with diversions and reservoir operation studies. The second deals with the economic analysis giving the Internal Rate of Return and the Cost Benefit Ratic of every alternative under consideration.

The Model facilitate the analysis of various alternatives, with the possibility of changing everytime any input data in a very short time.

It is hoped that in 1974 a feasibility study of the Southern Conveyor project will be undertaken under the British Overseas Development Administration financing.

3.1.2 Akrotiri Feasibility Study

The study was undertaken in October 1970, by Howard Humphreys and Sons in association with Sir M. MacDonald and Partners and Hunting Technical Services Ltd., under assignment by the Overseas Development Administration of the Foreign and Commonwealth Office, London.

The object of this study has been to evaluate land, labour and water resources of the Akrotiri region; to design a system of irrigation development which optimises those resources and to measure the economic and financial returns to the Project.

After a comprehensive study of the above which was completed by the March, 1972, the consultants submitted their findings in a seven-volume report at the end of 1973.

Possible alternative uses of the resources at different economic viabilities have been proposed and are presently being evaluated by Government.

3.1.3 Paphos Irrigation Project

The technical reports of the Feasibility Study on the Project completed by the Consultants Sir MacDonald, Howard Humphreys and Huntings were first carefully reviewed by the FAO Engineers. Their comments on

several aspects of the project were considered and some modifications or adjustments were introduced to certain recommendations made by the Consultants in their reports.

On April 1973 the Topography Branch started the survey work for the main canal extending from Asprokremmos to Yeroskipos and being 11.8 km long. This work consisted of establishing the canal line and profile levelling. Survey work was then extended to the three wellfields of Dhiarizos, Xeropotamos and Ezouza rivers and covered the whole wellfield Conveyance System which comprises of a total of 24 km of canaletti line and 8 km of pipe line.

A plan and a longitudinal section of the Main Canal were drawn while several alternatives were studied as to the type of canal operation and design to be adopted. Finally the design was based on a fully automatic operation achieved by electrically controlled gates on all regulators of the canal. A trapezoidal concrete lined canal was adopted of maximum discharge capacity varying from 4.07 m3/s at its head down to 1.78 m3/s at its tail.

Detailed design work for the Main Canal and Ezouza Syphon has been completed while the design of other structures related to the canal, such as culverts, bridges and aqueducts were still under preparation at the end of 1973. Construction of the Main Canal is expected to begin in 1974.

According to the Project Implementation Phasing the 1st stage of the project will be completed by 1978 covering 3390 ha and utilizing ground water resources while full development will be reached by 1981 when 4666 ha of land will be irrigated from the Asprokremmos dam reservoir.

The Project will be partly financed by the World Bank and its total capital expenditure is expected to reach about £12.000.000.

3.2 Site Investigations, Laboratories, Grouting

3.2.1 Site Investigation, Laboratory Sections

3.2.1.1 General

During 1973, the Site Investigations and Laboratory Sections of the Division of Planning, by being suitably equipped and staffed have served three major functions both within and outside the Department. In order of importance these functions were:

(i) in feasibility or detailed geotechnical studies of proposed dams and reservoirs (this being an essential prerequisite to the design and construction of any such project)

(ii) in construction quality control of materials by the establishment of field laboratories at a number of dam construction projects.

(iii) in assisting other Government Departments, Authorities, Corporations, Public or Private firms by making available the resources of the sections for a number of site investigations and/or laboratory work.

Both sections have been actively involved with eleven major site investigation or drilling projects, during 1973 and work was either completed or will be continued in 1974.

Site investigation and laboratory work carried out in 1973 for the proposed Phlevas, Xeros dams and Prastio reservoir formed part of the overall feasibility study referred to as the "Morphou-Tylliria Feasibility

Study" undertaken by Electro-Watt Engineering Services Ltd., acting as contracted Consultants to the Department, employed by U.N.D.P. with the participation of F.A.O. as the executing agency. All work carried out in 1973 for the above named projects was to the instructions of the Consultants.

Site investigation programmes as tentatively formulated at the beginning of investigation work almost invariably involved certain geological work such as:

(i) geological mapping of damsite and reservoir area

(ii) logging of boreholes and appraisal of subsurface geological conditions of damsite and reservoir area

(iii) interpretation of the engineering geological findings to the investigations and recommendations relating to foundation conditions for the various main and associated proposed structures at each site as well as construction procedures relating to exvavations, grouting, tunnelling, groundwater difficulties, etc.

(iv) geophysical surveys relating to the subsurface geological conditions at the damsite and reservoir area or relating to the availability of construction fill materials.

For all such work, the cooperation of the Engineering Geology and Geophysical Sections of the Geological Survey Department was requested and in all cases their assistance was given promptly and efficiently thus ensuring the best results from the collaboration of the two Departments.

3.2.1.2 Personnel

The Site Investigation and Laboratory Sections were by the end of 1973 manned as follows :

(i) Supervising

1 No. Senior Water Engineer (i/c Division of Planning)
1 No. Executive Engineer - II
2 No. Inspector of Works
2 No. Technical Assistants

(ii) Laboratory

4 No. Technical Assistants
5 No. Laboratory Technicians

(iii) Drilling

1 No. Foreman
6 No. Drillers
4 No. Assistant Drillers

3.2.1.3 Drilling Machinery, Laboratory Equipment

At the beginning of 1973 drilling machinery and laboratory equipment used in the performance of fieldwork and laboratory testing were available as described on Tables 1 and 2 respectively.

During 1973 drilling machinery and laboratory equipment as described on Table 3 and 4 were purchased by the Department.

3.2.1.4 Site Investigations during 1973

The site investigations and drilling work undertaken during 1973 for the Department, other Government Departments, the Electricity Authority of Cyprus and the Cyprus Broadcasting Corporation, are described in detail below:

3.2.1.5 Phlevas Proposed Dam

The damsite is located on the Pyrgos river, Tylliria district. The proposal is for a rockfill embankment dam and the site investigation of the damsite and reservoir area aimed at establishing.

(i) the suitability of the site from the geological point of view.

(ii) various engineering geological considerations relevant to the design and construction of the dam

(iii) the availability and suitability of fill material for the construction of the dam.

The investigations were carried out in two stages within the following time periods :

(i) February to June 1972

(ii) November 1972 to February 1973

Laboratory testing was started in January and completed by April 1973. Expenditure for the 1973 investigations amounted to £1227 and details of the work are as follows:

(i) Five boreholes to a total depth of 163 m using diamond core drilling and overburden (rotary percussion) drilling. One borehole was inclined at 30° to the vertical.

(ii) In situ permeability (water pressure) tests in three coredrilled boreholes at 3 m. stages.

(iii) Standpipes were installed in two boreholes for monitoring seasonal ground water level fluctuations.

(iv) Seven hand excavated trial pits were opened to a total depth of 16.6 m in connection with core material investigations with bulk sampling for laboratory testing.

(v) Three machine excavated trenches of a total length of 180 m. on the left and right abutments

(vi) Seven near ground surface bulk samples for laboratory testing.

(vii) Three river gravels bulk samples for laboratory testing in connection with filter material and concrete aggregate investigations.

(viii) Geophysical Survey to investigate the near ground surface weathered bedrock and recent deposits, using six seismic refraction traverses of a total length of 769 m.

(ix) Laboratory testing (see table 5)

(x) Updating of geological mapping of damsite and reservoir area in the light of information derived from the investigations.

(xi) Geological description of cores recovered from the boreholes, exposures at access roads and trenches

(xii) Geological Sections

The following drilling rigs and associated equipment were used at the site :

(i) 1 No. coredrill (W.D.D. 460)
(ii) 1 No. overburden drill (W.D.D. 477)
(iii) 1 No. air compressor
(iv) 2 No. flush pumps

3.2.1.6 Xeros Proposed Dam

The damsite is located on the Xeros river, Tylliria district. The proposal is for an earthfill embankment dam and the aim of the investigation was as described above.

Fieldwork was carried out within the period January to May 1973 and laboratory testing within the period February to July 1973. Expenditure for the investigations amounted to £4170 and details of the work are as follows:

(i) Seven boreholes to a total depth of 355 m. Two of the boreholes were inclined at 45° and one at 55° from the vertical. Four of the boreholes were put down by diamond core-drilling, two by a combination overburden/diamond drilling and one by 0.3 m. percussion boring.

(ii) In situ permeability (water pressure) tests were performed in the coredrilled parts of the boreholes at 3 m. stages.

(iii) Standpipes were installed in the boreholes.

(iv) Three hand excavated trial pits were opened of a total depth of 8.5 m., in connection with core material investigations with bulk sampling for laboratory testing.

(v) Sixteen near surface bulk samples for laboratory testing in connection with core material investigations

(vi) Two, 2.5 m. deep, machine excavated trenches within the river gravels.

(vii) Four river gravels bulk samples from within the trenches for laboratory testing in connection with shell and filter material investigations.

(viii) Five in situ density tests within the river gravels by the water displacement method.

(ix) Geophysical survey to investigate the river gravels profile within the reservoir area and thus the availability of shell material, using four resistivity traverses.

(x) Geological mapping of damsite and reservoir area.

(xi) Geological description of cores recovered from the boreholes and the pits.

(xii) Geological section along the proposed dam axis.

The following drilling rigs and associated equipment were used at the site:

(i) 2 No. Coredrills (W.D.D. 460, 555)
(ii) 1 No. Overburden Drill (W.D.D. 477)
(iii) 1 No. Percussion Rig (on loan from the G.S.D.)
(iv) 1 No. Air Compressor
(v) 3 No. Flush Pumps.

3.2.1.7 Prastio Proposed Reservoir

The reservoir site is located north-northwest of Prastio (Morphou) village near the Morphou Bay seashore.

As proposed by the Consultants, the reservoir forms the key feature of works for the Morphou-Tylliria project and will be utilised for the storage of diverted and conveyed water from the Tylliria and Pendayia rivers.

The site investigation aimed at establishing.

(i) the geotechnical difficulties relating to the design and construction of a ring dike embankment, off-channel storage reservoir.

(ii) the engineering properties of foundation strata, to be used in the design of the embankment.

(iii) the availability and suitability of construction fill material.

The non homogeneity of the near ground surface geological deposit at the site necessitated the adoption of a comprehensive investigation programme.

Fieldwork was carried out in two stages within the following time periods:

(i) November 1972 to January 1973

(ii) March to April 1973

Laboratory testing was carried out within the period November 1972 to June 1973. Expenditure for the 1973 investigations amounted to £752 and detailes of the work performed are as follows:

(i) Four boreholes of a total depth of 24.5 m. were put down using the mobile Auger Drill (W.D.D. 560)

(ii) Undisturbed (U4) sampling within the boreholes at 1 .Om. stages of depth.

(iii) All samples recovered were geologically described.

(iv) Borehole records, trial pit records and Geological Sections for the site were prepared.

(v) Laboratory testing for the engineering properties of foundation strata (see Table 5)

(vi) Laboratory testing for the engineering properties of fill materials (see Table 5).

3.2.1.8 Arminou Proposed Dam

The damsite is located on the Dhiarizos river, Paphos district. The proposal is for an earthfill or rockfill embankment dam and the site investigation aimed at providing relevant information as described for Phlevas dam above.

Field work carried out within the period June 1972 February 1973 and laboratory testing within the period January 1973. Expenditure in 1973 amounted to £1712 and details of the work are as follows:

(i) Two inclined boreholes of a total depth of 159 m. using diamond core drilling. Inclination of boreholes was 30° to the vertical.

(ii) In situ permeability (water pressure) tests within the boreholes at 3m. stages.

(iii) Bulk sampling from two proposed core material borrow areas.

(iv) Laboratory testing (see Table 5)

(v) Geological mapping of damsite and reservoir area

(vi) Geological description of cores recovered from the boreholes.

(vii) Heological section along the proposed dam axis.

The following drilling rigs and associated equipment were used at the site :

(i) 2 No. coredrills (W.D.D. 497, 557)

(ii) 2 No. Flush Pumps

3.2.1.9 Petra Proposed Dam

The damsite is located on the Ayii Saranta tributary, Atsas river, Morphou region. The proposal is for an earthfill embankment dam and the aim of the investigation was as described above.

Fieldwork was carried out, within the period May to July 1973 and laboratory testing within the period May to August 1973. Expenditure for the work amounted to £1490 and details of the work performed are as follows:

(i) Four boreholes of a total length of 114 m. by diamond core drilling. Two of the boreholes were inclined at 45°.

(ii) In situ permeability (water pressure) tests within the boreholes at 3m. stages.

(iii) Installation of standpipes within three boreholes

(iv) Twenty machine excavated trial pits of a total depth of 31m., in connection with core material investigations.

(v) Eight machine excavated trial pits of a total depth of 19.6 m. in, connection with shell and filter material investigations.

(vi) Bulk sampling from within the pits for laboratory testing.

(vii) Laboratory testing (see Table 5)

(viii) Geological mapping of damsite and reservoir area

(ix) Geological description of cores recovered from the boreholes

(x) Geological section along the proposed dam axis.

The following drilling rigs and associated equipment were used at the site :

(i) 2 No. coredrills (W.D.D. 555, 559)

(ii) 2 No. Flush Pumps

3.2.1.10 Phypotamos Proposed Dam

The damsite is located on the Pendaskinos river, Larnaca district. The proposal is for a rockfill embankment dam and the geotechnical feasibility study including fill material investigations were carried out in 1971. The additional 1973 investigations were requested by the Design Section of the Department to yield relevant detailed information to be used in the design and construction of the embankment and associated structures.

Fieldwork was started in November 1973 and continued in January 1974. Laboratory testing was carried out in September to November 1973. Expenditure for the 1973/74 investigation amounted to £650 and details of the work are as follows :

(i) Three boreholes of a total depth of 52 m. by diamond core drilling along the proposed tunnel line.

(ii) One auger drilled borehole to a depth of 4.5 m. within the river terrace deposits of the right abutment.

(iii) Eight hand excavated test pits of a total depth of 22 m. within the burried channel deposits of the right abutment.

(iv) Undisturbed (U4) samples within the Auger drilled borehole at one metre intervals of depth.

(v) In situ density testing and bulk sampling within the test pits.

(vi) Laboratory testing (see Table 5)

The following drilling rigs and associated equipment were used at the site:

(i) 1 No. Mobile Auger/Coredrill (W.D.D. 560)

(ii) 1 No. Flush Pump

(iii) U4 sampling equipment.

3.2.1.11 New Engomi Proposed Reservoir

The site is located in the Makedonitissa area of Nicosia and the proposal is for an r.c., partly burried, storage reservoir. The Design Section of the Department requested that a site investigation be carried out to establish:

(i) the subsurface geological conditions at the site

(ii) the engineering properties of foundation strata leading to relevant recommendations for the design and construction of safe and economic foundations.

Fieldwork was carried out in two stages within the following periods:

(i) July 1973
(ii) September to October 1973.

Laboratory testing was carried out within the period September to October 1973. Expenditure for the work amounted to £322 and details for the work are as follows:-

(i) Nine boreholes of a total length of 73 m. were put down using the mobile Auger Drill.

(ii) Standard Penetration Tests within the boreholes at one metre intervals of depth down to 5 m. depth.

(iii) Undisturbed (U4) sampling within three boreholes at 1.5 m. intervals of depth.

(iv) Disturbed bulk sampling at frequent intervals of depth.

(v) Borehole records and Geological Sections for the site were prepared.

(vi) Laboratory testing (see Table 5)

3.2.1.12 National Gallery and Library

The site investigation was requested by the Director, Ministry of Education.

The terms of reference were to establish the subsurface geological and foundation conditions at the site, located in the Ayii Omologitae area of Nicosia, to facilitate the design and construction of safe foundations for the proposed structures.

Fieldwork was started in February and completed in March 1973.

Laboratory testing was started in February and completed in April 1973.

Expenditure for the work amounted to £1383 and details of the work performed are as follows:-

(i) Four boreholes of a total length of 97.5 m. were put down using the mobile Auger/Coredrill (W.D.D. 560).

(ii) Disturbed bulk samples were recovered from the boreholes at 0.5 m. intervals of depth and undisturbed (U4) samples at 1.5 m. intervals of depth.

(iii) Where undisturbed sampling proved impossible to perform Standard Penetration testing was carried out in the boreholes at 1.5 m. intervals of depth.

(iv) Borehole records and Geological Sections were prepared.

(v) Laboratory testing (see Table 5).

3.2.1.13 Pedhieos River Bridge Extension

The site investigation was requested by the Director, Public Works Department, Ministry of Communication and Works, in connection with the proposed widening scheme of Loukis Akritas Avenue Nicosia.

The terms of reference were to investigate the subsurface geological and foundation conditions at the site of the proposed Pedhieos river bridge extension, to facilitate the design and construction of safe foundations.

Fieldwork was carried out in April and laboratory testing in May 1973.

Expenditure for the work amounted to £607 and details of the work performed are as follows :

(i) Three boreholes of a total depth of 40.5 m. were put down using the mobile Auger drill (W.D.D. 560).

(ii) Disturbed bulk samples were recovered from the boreholes at 0.5 m. intervals of depth and undisturbed (U4) samples at 1.5 m. intervals of depth.

(iii) Where undisturbed samples were not recovered from the boreholes Standard Penetration tests, were performed at 1.5 m. intervals of depth.

(iv) Borehole records and Geological Section were prepared.

(v) Laboratory testing (see Table 5).

3.2.1.4 Dhekelia "B" Power Station

The site investigation was requested by the Resident Engineer of Scott, Wilson, Kirkpatrick and Partners, Consultants to the Electricity Authority of Cyprus for the project.

The terms of reference were to investigate by means of boreholes the subsurface geological conditions at the site and to carry out in situ testing in the boreholes to yield design parameters for the different structures to be constructed.

Field work was carried out in two stages within the following periods.

(i) July to September 1973
(ii) October 1973

Expenditure for the work amounted to £1763 and details of the work performed are as follows:

(i) Eighteen boreholes of a total depth of 231 m. were put down by diamond coredrilling.

(ii) Within four of the boreholes to 30.0 m., Standard Penetration tests were performed at 1.5 m. intervals of depth.

(iii) Within one borehole to 10.0 m. in-situ permeability tests were performed at 2.0 m. intervals of depth using either the rising head or the water pressure method.

(iv) Relevant borehole records and Geological Sections were prepared.

The drilling rigs and associated equipment used at the site were, as follows :

(i) Mobile Auger/Coredrill (W.D.D. 560)

(ii) Coredrill W.D.D. 559

(iii) Coredrill W.D.D. 460

(iv) 2 No. Flush pumps

(v) Standard Penetration testing equipment.

3.2.1.15 Cyprus Broadcasting Corporation

Two boreholes of a total depth of 55 m. were drilled at the site of the C.B.C. in Nicosia. Expenditure for the work amounted to £185 and an overburden drill (W.D.D. 455) was used with an air compressor and a flush pump as associated equipment.

3.2.1.16 Laboratory Work during 1973

The Soils and Concrete Laboratories of the Department performed a substantial number of tests in connection with the following:

(i) Dam feasibility studies : Fill material investigations

(ii) Reservoir feasibility and foundation strata studies: Fill material investigations and foundation strata engineering properties.

(iii) Laboratory testing performed for other Government Departments, Authorities, Private or Public firms

(iv) Construction quality control of materials by field laboratory testing.

Tables 5 and 6 describe analytically the type, project and number of tests performed in the Soils and Concrete laboratories, respectively, during the year.

3.2.1.17. Field Laboratories

As a matter of policy of the Department, field laboratories were equipped and manned at the following construction sites during 1973, the aim being the quality control of construction materials:

(i) Lefkara Dam (Rockfill embankment)

(ii) Palekhori Dam (Concrete)

(iii) Arakapas Dam (Concrete)

(iv) Agros Dam (Clay blanket lining of reservoir)

On contracted construction projects such as Lefkara and Palekhori Dams, the work involved the supervision and checking of the contractors field testing work. Construction at the Arakapas site begun in September 1973 and therefore only a limited number of field tests were carried out to-date. The field laboratory at the Agros site was equipped to carry out the following types of tests:

(i) Plastic-Liquid Limits

(ii) Moisture content

(iii) Compaction "Proctor"

(iv) In situ density by the "sand replacement" method

(v) In situ density by the "core cutter" method.

The types and numbers of tests performed at the site are shown on Table 5.

3.2.1.18 Reports

The procedure adopted by the Site Investigations and Laboratory Sections was to report on the work performed and the findings of the investigations and/or laboratory testing, on completion of each project. Towards this end, the following relevant reports were prepared and published by the Department in 1973:

(i) F/27 "Arakapas Proposed Dam: Foundation and Material Investigations" March 1973

(ii) F/28 "Ayios Theodhoros (Soleas) Upper Damsite: Foundation and Material Investigations" May 1973.

(iii) F/29 "Limnitis Damsite: Foundation and Material Investigations" May 1973.

(iv) F/31 "Report on the Site Investigation for the Proposed National Gallery and Library" July 1973.

(v) F/32 "Panayia tis Agapis Dam: Foundation and Material Investigations" July 1973.

(vi) F/33 "Report on the Site Investigation for the Proposed Pedhieos River Bridge Extension" July 1973.

(vii) F/34 "Phlevas Dam: Foundation and Material Investigations" August 1973.

(viii) F/35 "Report on the Site Investigation for the Proposed New Engomi Reservoir" August 1973.

(ix) F/36 "Dhekelia "B" Power Station: Site Investigation" September 1973.

(x) F/37 "Arminou Dam: Foundation and Material Investigations" September 1973.

(xi) F/38 "Petra Dam: Site Investigation" November 1973

(xii) F/39 "New Engomi Reservoir: Additional Site Investigation" November 1973.

(xiii) "Evaluation of Soils Laboratory Test Results for the Larnaca Tourist Complex"

(xiv) "Laboratory Testing of Soil Samples for J. & P. Ltd.-Contract: Masafi-Fujeirah Road, Bridge No.1".

Table 1-W.D.D. Field Investigations Equipment

(i) Drilling Rigs

Drill rig Number	Type	Make	Year Acquired
WDD 294	Overburden	Atlas	1963
WDD 354	Coredrill	Craelius	1963
WDD 423	Wagon Drill	Atlas	1965
WDD 455	Overburden	Atlas	1966
WDD 460	Coredrill	Boyles	1966
WDD 477	Overburden	Atlas	1967
WDD 497	Coredrill	Craelius	1968
WDD 555	Coredrill	Boyles	1971
WDD 557	Coredrill	Boyles	1971
WDD 459	Coredrill	Boyles	1971
WDD 560	Auger Drill	Atlas	1971
WDD 553	Light percussion Drill	Edeco	1970
WDD 587	Mini-Wagon-Drill	Atlas	1972

(ii) Other Equipment for Use on Site

Number	Description	Year Acquired
1	Vane shear test apparatus	1970
2	Portable powerhead auger	1970
3	Plate bearing test apparatus	1970
4	Clean-out auger with sludge barrel	1970
5	Stationary piston sampler	1970
6	Thinwall samplers (Shelby tubes)	1970
7	U4 sampling tubes	1970
8	Standard Penetration Test Equipment	1970
9	Well-Permeability Test Equipment	1972
10	Portable Coring Machine	1972

Table 2 - Laboratory Equipment

(i) Soils Laboratory Equipment

Number	Description	Year Acquired
1	3 No. Liquid Limit Apparatus	2 prior to 1967 1 in 1971
2	Normal and rapid moisture content apparatus	prior to 1967
3	2 No. Shrinkage Limit apparatus	prior to 1970
4	Standard and modified proctor apparatus	prior to 1967
5	Sand replacement apparatus	prior to 1967
6	Sieve analysis, hydrometer and pipette apparatus	prior to 1967
7	Falling and constant head permeameter	prior to 1967
8	Unconfined compression apparatus	prior to 1967
9	Triaxial apparatus ($1\frac{1}{2}$"diameter specimens)	prior to 1967
10	Small shear box machine (6x6 cm specimens)	prior to 1967
11	3 No. consolidation apparatus	1 prior to 1967 2 in 1971
12	1 No. 17 inch diameter by 10 inch high constant head permeameter	1967
13	1 No. sample extruder	1967
14	1 No. High capacity triaxial machine for up to 4 inch diam. soil and rock specimens	1968
15	1 No. Norwegian type porepressure apparatus	1968
16	1 No. Torsion dial balance	1969
17	2 No. Proctor penetrometer sets	1969
18	Universal Hydraulic extruder	1970
19	Large shear box machine (12x12" samples)	1970
20	Platform beam scale	1971
21	2 No. multispeed, bench mounted 1 ton triaxial compression machines	1972
22	1 No. multispeed, 5 ton triaxial machine	1972
23	2 No. Bishop type pore pressure apparatus and 1 No. volume change indicator	1972
24	6 No. Bishop type constant pressure systems	1972
25	1 No. Infra Red drying cabinet	1972
26	1 No. Kango Vibrating Hammer	1972
27	2 No. Blader type pressure cylinders	1972
28	1 No. Constant Head permeameter for sands	1972

(ii) Concrete Laboratory Equipment

Number	Description	Year Acquired
1	Aggregate crushing test apparatus (Local)	1960
2	Balance capacity 700 lbs (local)	1961
3	Compacting factor apparatus for concrete (Local)	1961
4	Oven for drying sands and aggregates	1965
5	Concrete testing machine hand operated 100 ton capacity	1957
6	Sieve shaker	1964
7	Vicat neddle for cement test	1966
8	Concrete testing machine electrically operated 150 ton capacity	1966
9	Laboratory concrete mixer	1968
10	Distillation apparatus	1969
11	Sample splitter for aggregates	1969
12	Air Entraintment meter	1971
13	Electric concrete vibrator	1971
14	Core cutting machine	1972
15	Portable coring machine	1972

Table 3 - Drilling and Associated Equipment Purchased during 1973

Number	Description
1	3 No. Double tube core barrels: "Craelius-T76 mm", 3.0 m. each, complete
2	3 No. Core Lifters for use with above
3	3 No. Core Lifter cases for use with above
4	Auger drilling equipment to fit Auger Drill W.D.D. 560 as follows: (i) 1 No. complete, head assembly (ii) 8 No. hollow stem auger flights 5 in. i.d., 10 in. o.d., 5ft. long each (iii) 8 No. centre rods to fit 5 in. i.d. auger flights, 5 ft. long each. (iv) 1 No. Hard formation cutter head assembly, complete. (v) 1 No. Adaptor to N.W. drill rods
5	Undisturbed (U4) sampling and Standard Penetration testing equipment as follows: (i) 1 No. Driving head for U4 sampling (ii) 2 No. cutting shoes for U4 sampling (iii) 2 No. 2 in. o.d., 24 in. long open ended split spoon Raymond samplers, complete (iv) 1 No. 2 in. o.d., 24 in. long, 60° cone ended Raymond sampler, complete.

Table 4 - Laboratory Equipment Purchased during 1973

Number	Description
1	50 kg Mercury for constant pressure apparatus
2	Water deairing unit, complete
3	1 set 200 mm. diameter sieves
4	1 set 450 mm. diameter sieves
5	Automatic soil compactor, complete
6	Hydraulic - electric extruder
7	1 set plate bearing test equipment, complete
8	Soil pocket penetrometer
9	2 No. stop-clocks
10	2 No. geological hammers
11	1 set constant pressure system accessories
12	1 set triaxial machine accessories
13	3 in. dia. diamond tipped drill bit to fit portable coring machine
14	4 in. dia. diamond tipped drill bit to fit portable coring machine.

Table 5 - Soils Laboratory Tests during 1973

TYPE OF TEST \ PROJECT	Prastio Reservoir	Arminou Dam	Phlevas Dam	Xeros Dam	Petra Dam	Kalavassos Dam	Dhypotamos Dam	Agros Dam	New Ehgoni Reservoir	Arakapas Dam	Famagusta Sewage Scheme	Narional gallery and Library	Pedhieos River Bridge Extension	P.W.D. Larnaca Harbour	Larnaca Tourist Complex	J. and P. Ltd.	Miscellaneous	Total of each kind of test
Atterberg Limits	22	37	18	23	48	3	14	21	11	5		27	11	24		9		273
Moisture Content	31		11	15	48			30	18	5		15	12					185
Standard Proctor		31	18	18	18			21		5					3			115
In Situ Density							14	59										73
Bulk Density	28					3			12			15	12			9		79
Hydrometer Analysis	41	38	18	23	48			8	12	5	2	17	7	24	3	3		249
Permeability	6	16	12	15	14			8		5								76
Triaxial Undrained	1								9			15	8	8		3		44
Triaxial Cons.Und.with p.W.P	3					1	2											6
Shear Box (Large)	1		2															3
Consolidation	7								6			4	3			2		22
Silt Content																	141	141
Specific Gravity	29	38	18	23	48			8	12	5	2	27	8		3			221
Sieve Analysis	5		3	6	11						18							43
Core Crushing Tests		80	60	48	25													213
T o t al	174	241	160	171	260	7	30	155	80	30	22	120	61	56	9	26	141	1743

Table 6 – Concrete Laboratory Tests during 1973

PROJECT / TYPE OF TEST	Massari Dam	Philia Booster Station	Khirokitia Reservoir	Palekhori Dam	Tenders for concrete and aggregate	Miscellaneous	Total of each kind of test
Sieve Analysis	12	8	7	133	185	28	373
Silt Content	7	5	4	255	162	15	448
Organic Impurities	7	5	4	255	162	15	448
Specific Gravity	2	–	2	13	16	41	74
Aggregate Crushing Test	2	–	2	10	18	4	36
Cubes Crushing Test	36	28	56	1124	248	372	1864
Slump Test	9	7	14	281	14	8	333
Water Absorption	2	–	2	10	16	41	71
Rock Cores Crushing	–	–	–	–	–	41	41
Moisture Content	–	–	–	130	16	31	177
T o t a l	77	53	91	2211	837	596	3865

3.4 Grouting Section

During 1973 the grouting activities of the Department were as follows:

3.4.1 Grouting at St. Sophia Mosque

The grouting works regarding the restoration of St. Sophia Mosque which were started in 1972, were completed on 13.1.73.

These were carried out by W.D.D. staff and machinery at the request of the Department of Antiquities, Ministry of Communications and Works which undertook the total expenses.

The grouting work involved all the internal columns (10 No. off) of the structure, being a part of the executed works for restoration of the Mosque. The grouting was done through holes drilled at the joints of the columns so as to fill up the voids formed in the lime mortar in order to avoid further settlement of these.

The total quantity of dry cement injected was 1,100 kgs.

3.4.2 Lefkara Dam - Tunnel Grouting

The drilling and grouting of the Lefkara Dam Tunnel was undertaken by the Sub-Contractor Technoexportstroy of Bulgaria, using machinery hired from W.D.D. and under the supervision of the grouting section of W.D.D.

The work commenced on 9th January 1973 and completed on 30th March 1973. A total of 295 holes 37 mm. diameter, were drilled, at 4 m. centres along the length of the tunnel and perpendicular into bedrock along the tunnel perimeter. The total consumption within these holes was 66,600 kgs. of dry cement.

3.4.3 Lythrodhonda Upper Dam-Grouting

The grouting of this dam was carried out by W.D.D. staff and machinery between March and April 1973.

It consisted of 15 boreholes having a total chainages of 137 metres, drilled on the left abutment of the dam. The grout consumption in dry cement of all these boreholes was 2,625 kgs and covered an area of 80 m2.

The aim of this grouting was to minimise the detected leakages on the left abutment.

The total cost for this work was £450.-

Table 7 - W.D.D. Grouting Machinery in 1973

1.	One "Moyno" Grout pump (Pneumatic) Capacity = 50 psi/min. Pumping Pressure = 200 psi
2.	Two "Craelius" Grout pumps Reciprocating with diesel engine Capacity = 11 gal/m Pumping Pressure = 1000 psi
3.	Two Z.A.300 High Speed Mixers (Pneumatic), "Craelius" Capacity = 66 Imp.gallons
4.	Two Z.A.600 Grout Agitator (Pneumatic), "Craelius" Capacity = 132 Imp.gallons
5.	1 No. Colloidal grout mixer "Semix 175" type "Craelius"
6.	1 No. Grout Agitator "Concrete" type - Capacity = 77 Imp.gall.

IV. DIVISION OF DESIGN AND CONSTRUCTION OF MAJOR PROJECTS

By

A.P. Georghiades
Head of Division

4.1 The Design Division which is one of the Major Divisions of the Department is sub-divided into three main branches.

The Design Branch whose functions are :-

(i) the detailed design of major projects undertaken by the Department.
(ii) the preparation of specification and conditions of contract for the construction of Major Projects.
(iii) the planning and supervision of construction of Major Projects.

The Topography Branch which carries out all the surveying work of the Department.

The Drawing Office Branch which does most of the drawing work of the Department.

4.1.2 Design Branch

The Design Branch is manned with qualified Civil, Irrigation and Topography Engineers and one Senior Inspector of Works.

The Permanent and Temporary personnel of the Design Branch during 1973 consisted of :

1 No. Executive Engineer I - Head
7 No. " " II
2 No. Irrigation Engineers
2 No. Topography Engineers
1 No. Senior Inspector of works

During the year work was done on the design of dams, Irrigation Works, preparation of Estimates and Feasibility reports on Major and Minor Projects, construction planning and control of Major Projects and other minor miscellaneous works. A brief-description of the most important works, undertaken by the design branch, during the year is given below :

4.2 Report on Design of Major Projects

4.2.1 Design report on the New Engomi Reservoir

The New Engomi Reservoir forms part of the Nicosia Water Supply Scheme and during the year 1973 various alternative designs were tried out and their relative merits and costs compared. The alternative designs considered were based on a net reservoir capacity of 17,600 m3 and maximum water elevation of 627.65 ft. Also from the topography, a rectangular reservoir was suggested as most suitable for better utilization of the available ground. The various alternatives of the proposed reservoir were :

a. Beam - slab construction with mass concrete walls.
b. Beam - slab construction with reinforced concrete walls.
c. Flat slab roof with reinforced concrete walls.

The estimates for their individual costs showed that there is very little difference between the alternatives but there are distinct structural advantages in the flat-slab construction on better ventilation and easier construction, and it was finally adopted. Six final drawings showing all the structural details were prepared. The New Engomi Reservoir is a subsurface reservoir to about a third of its height with internal dimensions of 381'0"x125'0"x18'0", divided in two compartments by a reinforced concrete division wall. It is connected with the adjacent Old Engomi Reservoir with 2 No. 18" ϕ steel pipes. It has an internal fish-bone like drainage system under the floor with 6"ϕ main A.C. pipes and 4"ϕ perforated A.C. branch to collect any pipes leakages. Also it has an external 6"ϕ perforated pipe outside drainage from the floor to collect any leakages from wall joints and rainwater. Besides there are four 6"ϕ washout pipes for emptying the reservoir for cleaning purpose, and two overflows arrangements consisting of two rectangular pools with 2 No. 12¾ϕ cast-iron pipes for each reservoir compartment. Also there are 2 No. 22"ϕ inlet pipes drawing water from boreholes in Morphou area and 2 No. 24"ϕ outlet pipe for drinking water of Nicosia.

The outside pipe network works by gravity through a number of manholes spreads round the reservoir area, to the main manhole from where it runs into the nearest main drainage pipe of the Nicosia drainage system.

4.3 Palekhori-Kambi Dam

4.3.1 General

The main purpose of the dam is irrigation. It is built on the Kambi river at an elevation of about 700 m above sea level and at a distance of about 43 km S.W. from Nicosia.

The dam is a mass concrete gravity dam type. It has a max. height of 32.6 m from river bed level to the crest of the dam and 30.5m to spillway crest level. The length of the crest is about 125m.

The capacity of the dam is 620.000 cu.m. with normal irrigation outlet flow 120 l/sec.

The dam consists of 13 vertical blocks extending over the entire height of the dam.

A continuous grout curtain extending over the entire length of the dam, was provided in the dam foundations, injections being done through a concrete cap.

The fifth block from the left abutment of the dam is serving as a spillway, 10.36 m wide, discharging overflow water into a flip bucket. A drainage and inspection gallery having a cross section 1.52 m x 2.13 m will extent through the entire length of the dam. A valve chamber formed partly within the gallery is accomodating the sluice valves.

A ϕ 300 mm and ϕ 200 mm steel pipes situated in a recesses along the sluiceway - desilting outlet with cross section 1,52 m x 1,83 m - are serving as irrigation and compensation pipe respectively.

The construction of the dam which has been entrusted to "Ioannou and Paraskevaides Ltd " after an International Tender at the price of approximately £271.000.

The Contractor was instructed to commence works on the 12th October, 1971.

4.3.2 Progress of works achieved in 1973

Excavation

Construction works started in full scale early 1972 with only site organization and stripping of the site being carried out end of 1971.

The excavation of dam foundation, approach channel to sluiceway, flip bucket and stilling basin foundation started early in the 1972 and have been completed by July 1972.

The final volume of excavation has been exceeded substantially as compared to the original estimate. This excess was unavoidable as actual conditions met on site were different to those originally anticipated. The rock encountered in general was weathered to an average depth of 5 m while in some places it reached the depths of 15m.

4.3.3 Temporary Works

While carrying out the excavation of the dam foundation the Contractor proceeded in the erection of his plant and the Construction of the temporary dam for water supply. All these were completed in the first half of 1972.

4.3.4 Drilling and Grouting

Drilling and grouting works commenced on the 15th May 1972 and were entirely finished by the 2nd November, 1972.

The whole work has been carried out by the subcontractor "Energoexpostroy" of Bulgaria, a specialised firm on grouting works. All drilling and grouting equipment were supplied to the above firm by WDD through the main Contractor being a provision of the contract.

According to the drawings, two grout curtains had to be constructed, beneath the upstream part of the dam foundations. The main grout curtain of about 18 m deep, and the second of about 10.5 m deep. Grout mix was usually composed of water and ordinary Portland cement with the addition of 3% of betonite. During the formation of the main grout curtain it was observed that initial permeability at some sections was rather low, and the results obtained after grouting indicated that the permeability was reduced to the minimum required criterion. Therefore a considerable quantity of drilling and grouting for the second grout curtain was omitted, at these particular sections.

After the completion of the grouting works, number of control holes were drilling along the grouted zone in order to determine the effectiveness of grouting. Permeability water tests were performed and the results obtained were satisfactory.

The original estimated cost on Drilling and Grouting was finally reduced by nearly 50% due to the elimination of the work for the second line of grouting.

4.3.5 Concreting

The concreting started on May 1972. At the first months of concreting the progress was slow and a start was made on concrete cap for grouting. After the completion of the concrete cap the progress was faster.

The Contractor has used a Crushing Plant on Malounda Village for the supply of aggregation with an automatic batching plant for mixing the concrete. Two tower cranes were used for the transportation and placing of concrete.

The total volume of concrete done was about 29500 cu.m. The max. output of concrete was in April 1973-160 cu.m./per working day.

The installation of hydraulic operated gate started in April 1973 and completed on June 1973. The dam was entirely finished on September 1973.

4.3.6 Expenditure

The total expenditure incurred upto the end of the work was about £306.000. Out of this amount about £284.000 were paid to the contractor with the balance of £22.000 being spent for direct expenditure by WDD.

Palekhori - Kambi Dam Project- Contract 39/71/5 - Analysis of Final Cost

Commencement date : 12.10.71 Completion date : September 1973

Item No.	Description	Estimated cost May 1973	Revised estimated May 1973	Actual cost £
A.	Dam contract J & P			
	Materials on site			
1	General site works	11,925	11,100	11,042
2	Earthworks	15,693	49,600	51,232
3	Drilling & Grouting	34,287	16,700	17,067
4	Concrete	203,026	203,200	200,718
5	Pipes Valves and fittings	2,067	2,500	1,908
6	Metal works	3,642	3,700	1,976
7	Miscellaneous	337	300	143
	Total of Contract	279,977	287,100	284,086
B.	W.D.D. Expenditures for Dam			
1	Access Road (1.6.71)	8,000	8,000	7,915
2	Hydraulic Gate	4,000	6,500	5,576
3	Guard House	2,000	2,000	-
4	Supervision and transport	7,500	9,000	7,886
5	Miscellaneous	7,323	4,400	472
6	Land Acquisition	4,000	4,000	5
7	Overall contingencies for contract and WDD		9,800	
	Sub-total WDD	32,823	43,700	21,854
	Grand Total	303,800	330,800	305,940

4.4 Khirokitia Treatment Works

4.4.1 General

The work for the Khirokitia Treatment Works commenced in December 1971 and it continued right through 1972 and 1973. The work was carried out by direct labour by the Department of Water Development.

Progress during 1973

During 1973 the following progress was achieved:

a. Sedimentation Tanks

By the end of May 1973 all the structural work on the Sedimantation Tanks was completed.

b. Administration Building

By the end of April all the structural work was completed on the Administration Building and the work on the finishes of the Building commenced. By the end of the year all the finishes were completed the only outstanding work being the interior painting of the building, and the installation of the lighting protection unit.

c. Filters

All the structural concrete in the filters was completed by the end of March 1973 and the work on the finishes followed. By the end of the year only the interior painting of the Filter Gallery was outstanding.

d. Site Works

During 1973 the fencing of the three sides of the side was completed and work was in progress at the end of the year on the fencing along the main Limassol Road.

The drainage system of the Treatment Works was completed along with the sweage system and the earth works for bringing the ground levels of the site to ; the required levels.

The main outstanding work on the site works is the asphalt roads and pavements and the street lighting units, along with the fencing along the Limassol road.

e. Installation of Mechanical Plant

The erection of the mechanical plant of the Khirokitia Treatment Works started in mid April 1973 with the arrival of the U.F.E.L. erector and by the end of July the bulk of the erection work was carried out and the erector could not proceed without the Automatic panels which were not in Cyprus yet and with the finishes of the Administration Building not completed. For this reason the erector left Cyprus and he returned in mid November to continue with his work on the automatic system and the electrical part of the system.

By the end of the year it became apparent that there would not be enough water in the Lefkara Dam for the commissioning of the Works Programmed for January 1974 and the erector would have to leave during January after completing the erection and return at a later date for the commissioning.

Expenditure

The estimated cost of the Treatment works was £226.000 out of which £97,730, was the treatment plant contract. The actual cost up to the end of 1973 was as follows:-

Description	Actual costs
1. Treatment plant contract	64,106
2. Sedimentation tanks	31,788
3. Filters	16,855
4. Administration Building	46,644
5. Site works	11,719
6. Electrical installation	1,069
7. Miscellaneous and supervision	10,752
T o t a l	182,933

4.5 Massari Dam

4.5.1 General

Massari Dam is located upstream of Morphou Dam, at the junction of the three main tributaries of the Serakhis river, i.e. the Akaki, Peristerona and Merikas rivers.

The purpose of the dam is to recharge the Morphou acquifer, downstream of the dam, as well as acting as a control structure.

The dam is an earth-rock-fill dam of max height 16 m and a capacity of 2.26×10^6 cu. meters. It consists of an impervious clay core and upstream clay blanket, and upstream and downstream filter and shell zones.

A reinforced concrete uncontrolled spillway of max. width 61 m is serving as a discharge structure in case of floods. A r.c. conduit, 3.35m diameter, at the deepest section of the dam, is serving as a diversion tunnel.

The construction of Massari dam, which was undertaken by the Department, commenced in Jyly 1971 and ended in June 1973. Because of the late date of starting, the embankment was constructed in two stages, the first stage being completed in December 1971.

The second stage which constituted the major part of the embankment together with the R.C. conduit and part of the spillway were constructed during 1972.

The whole of the project was executed by direct labour and supervised by the permanent personnel of the Department. Some of the plant used was provided by the Department, whilst the remaining plant was hired.

Natural materials used for the construction of the embankment were taken from the river bed or nearby borrow areas, and only their transportation was given to contract.

The site supervisory staff for the works consisted of one Executive Engineer, an Inspector of Works, a Technical Assistant, a Chief Assistant Foreman, four Foremen and three laboratory technicians.

The work involved the overall planning and execution of the works, the preparation of progress charts and quality control of every day routine work, weekly programming and cost control. Monthly progress reports giving details of quantities of work executed with corresponding costs, were prepared and circulated amongst officers concerned.

The entire cost of the project finally reached the amount of £162,300 not including any money spent on Acquisition of land.

4.5.2 Progress achieved in 1973

General

All constructional work was completed by the end of June 1973, including the reinforced concrete foot bridge which was designed to take light traffic. Erection of the inlet hydraulically operated gate was also completed, despite the difficulties encountered.

4.5.3 Embankment

The second part of the embankment was completed by the end of January 1973 including the rip-rap placed on the upstream face. A total of 286500 cu.m. of compacted fill material was placed on the embankment. The rates achieved in all items of work were very low indeed, with the result that the final cost was very satisfactory.

The table below gives the volume of all materials placed with the corresponding rates and total expenditure.

Summary of Quantitites placed in the Dam Embankment

Description	Total quantity (m3)	Rate mils/m3	Total expenditure £
Corefill	85,470	231	19,790
Filters	26,950	300	8,090
Shell-Fill	162,470	132	21,488
Toe-Drain	4,620	343	1,588
Rip-rap	7,000	400	2,855
T o t a l	286,510		53,811

Spillway

The only part of the spillway which was still under construction during 1973 was the reinforced concrete bridge which was designed to carry light traffic.

A total of 3100 m^3 of reinforced concrete (mix:-1:2:4) and 400 m3 of mass concrete (1:2½:5) were placed. Average cube strength obtained were 4,500 and 3,500 lbs/in2 respectively. The corresponding rates obtained were 10.32 £/m3 and 8.38 £/m3 respectively.

4.5.5 R.C. Conduit

Concreting of the conduit was completed during 1972. The erection of the hydraulically operated gate, and approach steel foot bridge for the shaft, were the main jobs completed during 1973.

A total of 1000 m3 of reinforced concrete (mix:-1:1.8:3.2) and 230 m3 (1:3:6) were placed, the corresponding rates being 18 £/m3 and 8.38 £/m3 respectively. These rates include reinforcement and formwork.

4.5.6 Expenditure

The total expenditure incurred for the completion of this project for all sections of the works, is as indicated in the table, below.

Section of work	Expenditure (cleared accounts)
1. General items	£ 23,619 (1-7)
2. Dam items	53,697 (11-33)
3. Spillway items	54,346 (41-62)
4. Outlet items	31,027 (71-85)
5. Land acquisition	13,981 (8)
T o t a l	£176,670

4.6. Lefkara Dam

4.6.1 General

The design of Lefkara Dam was carried out by Messrs. Pietrangeli ed Humphreys, an associated firm of Howard Humphreys, and Sons, consulting Engineers, in 1970.

International tenders for the construction of the dam were invited on the 18th December 1970, the closing date of submission of tenders being the 27th February 1971. Ten tenders were received from eight different countries. The contract was finally awarded to "Joint Venture Leonard Fairclough (U.K.) Ltd., and Medoon Construction Ltd (Cyprus). The letter of acceptance of the tender was dated 29th April, 1974. The contract was signed on 29th May 1971, and the Engineer's order to commence was issued on the same day. The Contract price is £1,125,148.990 mils and the duration of the contract is 910 days from the Engineer's order to commence.

The dam is of the rockfill type with a central clay core. It is 74 meters high, crest elevation being at 361.0 metres above sea level with a total fill volume of about 820.000 cu.m. and storage capacity of 13.85 million cu.m. The mean annual inflow was estimated at 8.2×10^6 cu.m. from a catchment area of 36.30 km2. It is estimated that about 5.3×10^6 cu.m. of water will be made available annually from the dam for the water supply of Famagusta.

4.6.2 Expenditure

The total expenditure incurred from the commencement of the works up to the end of December 1973 was £1,155.630 of which 1,063,273 was for work done by the Contractor upto December 1973 and the balance of £92,357 represents direct expenditure by the Department. The expenditure incurred during the year 1973 is as follows:-

(i)	Payments to contractors	£672.354
(ii)	Direct Expenditure by WDD	45.625
	Total for Dam	£717.979

The value of the work carried out by the Contractor to the end of the year of £1,063.273 represents 94% of the contract price in 100% of the Contract Period.

4.6.3 Progress achieved in 1973

The satisfactory rate of progress achieved over the last five months of 1972 was maintained during the year 1973 and the general filling was completed on the 21st of November.

4.6.4 Diversion Tunnel

The concreting operations for lining the tunnel continued in 1973 and were completed by the end of March.

Placing was done by pneumatic places and ram pump. After the completion of the lining, work started for the construction of concrete corbels to support the steel joists on which the two draw off pipes are to be laid. Laying of pipework commenced in April and was completed by 4th September. Painting of pipes and joists started but due to shortage of paint remained to be completed in 1974.

4.6.5 Embankment

Placement and compaction of rockfill in 1m sluiced layers continued from level 315.80 at the beginning of the year and reached level 360.0 on the 15th of November. Placement of clay core reached level 360.0 on the 6th of November. The average rates of placing were 40.000 cu.m. for rock and 8.500 cu.m. for clay. The remaining filling with rock to elevation 361.0 which is the finished crest level and an additional filling for the crest camber was completed on the 21st of November. The certificate of substantial completion was issued on 24th November 1973 being the completion date stipulated in the contract.

The following work remained outstanding on the date of issue of the certificate of completion.

1. Various tasks in connection with clearance of the site, reinstatement of public roads to the site, removal of some spoil to tip, some landscaping and general tidying up.

2. Construction of the downstream measuring weir.

3. Minor repairs to and finishing off of Gauge houses, underdrain outlets, shaping of downstream rockfill slope etc.

4. Installation of surface movement markers on the slopes of the dam.

5. Installation of Hydraulic Instrumentation

6. Electrical sub-contract

7. Completion of the crest works, road and turning bays and

8. Various minor finishing touches

By the end of December 1973 most of the above works except for some minor items such as shaping of d/s rockfill slope, completion of the crest works and turning bays, installation of surface movement markers and various minor finishing touches had been completed. The remaining works for the completion of the crest and crest road started in December and supposed to be completed in 1974. Soil instruments at level 323.0 were installed by Dr. A.D.M. Penman of the Building Research Establishment on behalf of Soil Instruments Ltd for the Contractors. Work commenced on the 16th of March and was completed on 4th April. The last three piezometers at level 331.0 were installed by the site staff on the 22nd of May. Afterwards regular readings were taken by the site staff.

4.6.6 Spillway

The final triming and removal of loose and overhanging rocks from the northern cut slopes commenced on the 4th of January and was completed on the 10th of March. The work was done by labourers using iron bars.

Concreting after a discountinuity of about 3 months in 1972 started again on the 16th of January and was completed on the 14th of September. The main source of concrete for the work was the contractors Batching plant at Stavrovouni, sited at about 10 miles from the dam. Some concrete was also mixed on site using the small plant installed there. The only outstanding work at the end of 1973 was the installation of the steel handrailing of the foot bridge and abutments.

4.6.7 Intake Works

The first section of the inclined gallery was cast on 30th January. The innex circular formwork used was made in four quandrants lined with sheet iron which was lifted upwards and fixed in new prosition. At the beginning, the progress of concreting being slow, the contractor increased the number of carpenters with the result that two 6 m sections were cast every month. This progress was maintained and the concreting completed on 21st of September. The casting of insitu steps was done simultaneously with the progress of the whole work. The installation of pipe work followed the concreting of each section. The fixing of the handrails along the stairway begun on the 13th July together with the platforms and completed by the end of the year except for painting.

4.6.8 Drilling and grouting subcontract

Drilling and grouting in the tunnel was done by the three remaining employees of Technoexporstroy of Bulgaria. Work commenced on 9th January and was completed on 30th March.

4.6.9 Rainfall and River flows

The first flow in the river bed gravels was detected on 26th January and the first visible surface flow appeared on 12th February. Until April the situation showed no change in impounded water levels and the use of water by the contractor was balanced by the inflow. A heavy rainstorm on 17th of May increased the quantity of impounded water by 25,000 cubic metres.

The river flow over the gravels ceased on 11th of June. The flow under the gravels continued and was measured at a buried pipe upstream of the dam.

The first rainfall at the damsite fell on the 30th of October but because of the previous dry year there was no river flow upto the end of the year.

The total rainfall of the year at the damsite totalled 295 mm.

4.7 Distribution Systems of Major Projects

During the year under review, the following design and construction works were executed on Distribution Systems of major projects.

4.7.1 Design Works

1. Akrounda - Phinikaria

In both areas new design was prepared in the light of Land Consolidation in the area. All required date to purchase the necessary pumps for the scheme were calculated and pumps were ordered with the relevant equipment.

2. Mavrokolymbos

Following land consolidation in the area preliminary design was prepared for secondary lines of Khlorakas and tertiary system of the whole area covered by Mavrokolymbos dam. to assist works of Land Consolidation. Final design will follow the final land tenure of the area.

3. Lefkara

New design report was prepared for Lefkara Distribution following decisions taken by the Interdepartmental Land and Water use committee.

4.7.2 Land Consolidation

During 1973 the following irrigable areas were undergoing Land Consolidation: Kissonerga, Khlorakas, Akrounda, Phinikaria and Palekhori. Land Consolidation is closely related to Distribution Systems since irrigation schemes in these areas have to follow the new land tenure and new roads. Irrigation Engineer, Mr. E. Kambourides was representing our Department at the meetings of Land Consolidation Committees.

4.7.3 Construction Works

1. Argaka-Magounda

Construction of the scheme continued during 1973 and the total amount spent was £23,590. Work consisted of (1) connecting the Break Pressure tank to the Dam through a 22" steel pipe, (ii) construction of 5 concrete boxes, (iii) construction of protective earth wall of 85' x 15' x 6', (iv) construction of spillway of Break Pressure Tank, (v) construction of Store House 18' x 13' x 9', (vi) fencing of Store House and Break Pressure Tank, (vii) collection of all spare parts to the fenced area, (viii) construction of 12,000' of road for transportation of pipes and (ix) laying of 12725' A.C. pipes 6" diameter.

2. Yermasoyia (Akrounda - Phinikaria)

Work on Akrounda Phinikaria Scheme commenced on 5th March 1973, and and the total expenditure reached £49,200. Construction works consisted of:

1. Construction of 5000'road, 15' wide for transportation of materials
2. Construction of two concrete tanks of 30,000 gallons capacity each.
3. Excavation of 3000' trench 4' x 4'
4. Excavation of 6000' trench 3' x 4'
5. Excavation of 600' trench 7' x 5'
6. Installation of 7000' galvanized pipes, 4 diameter
7. Installation of 1060" galvanized pipes, 2" diameter
8. Installation of 1600' steel pipes with vicking Johnson couplings 14" diameter
9. Installation of 6000', victaulic pipes, 14" diameter
10. Installation of 500' steel pipes, B6" diameter

3. Palekhori

Work on pipe line to convey water from Palekhori Dam to Sklydros Intake started on October 1973. The design envisaged the laying of 2760' steel pipes, 12" diameter. Upto the end of 1973 the following work has been executed, at the total expenditure of £12,000.

1. Excavation and laying of 12" steel pipe, 2,760 ft.
2. Installation of :
   a. Two single air valves 3"
   b. Two double air valves 3"
   c. Two sluice valves 12"
   d. Water meter 12"
   e. Wash-out 4"
   f. 12" x 8" Tee
3. Construction of six concrete boxes.

4.8. Drawing Branch

The staff of this Branch numbered 25 i.e. 11 daily paid Technical Assistants, 8 draughtsmen scale 5, 1 Foreman scale 4, one Technical Assistant scale 5, 3 hourly paid assistants and the Head of the Branch.

4.8.1 Drawing Section

Throughout the year under review, in addition to normal Departmental work, the Drawing Section was engaged in the execution of all drawing work needed for the Morphou Tylliria Project as well as the Paphos Irrigation Project Preliminary Studies.

Work done can be listed as follows, giving also the time spent in each category of drawings and maps.

		Time spent in hours	Man months
a.	Existing & Proposed Dams	6853.00	42.9
b.	Irrigation Distribution Systems for Dams	1036.30	6.5
c.	Routine irrigation schemes	3200.15	20.0
d.	Domestic Water Supplies	3870.45	24.2
e.	Recharge Schemes	214.15	1.3
f.	Antiflood Schemes	Nil	Nil
g.	River Training Works	Nil	Nil
h.	Hydrological	251.30	1.5
i.	Hydraulic Tables	Nil	Nil
j.	Programmes & Organization	328.30	2.0
k.	Completion Plans	888.00	5.5
l.	Completion Reports	418.45	2.8
m.	Akrotiri Project	999.45	6.2
n.	Reports	363.45	2.2
o.	General	2425.30	15.0
p.	Odd Jobs	339.30	2.1
q.	Watershed Surveys	1046.30	6.5
r.	Paphos Project	1553.00	9.7
s.	Morphou Tylliria Project	9014.00	56.4
t.	Auxiliary Services		
	i. Library	3398.30	21.0
	ii. Plan Registry	450.15	2.8
	iii. Plan Reproduction	394.45	2.4
	iv. Drawing Materials Store	99.45	0.6
u.	Training of staff	8.00	0.1
v.	Leave etc.		
	i. Leave Paid	2165.45	13.5
	ii. Leave without pay	497.45	3.1
	iii. Sick Leave	1155.30	7.2
	iv. Maternity Leave	764.30	4.7
	v. D.C.	286.00	1.8
	Totals	42,000	262

The above time spent on various jobs does not include any time spent by the Head of the Drawing Branch, the Foreman and one daily paid employee working with the photo process lab. Also the work of the Storeman (T.A.) of drawing instruments and surveying instrements is not included.

4.8.2 Library & Technical Information Section

During 1973, 12 new books at a total cost of Approx. £67 were purchased by the Department and subscription was continued on 8 Technical Periodicals at a total cost of £45. In addition 46 reports were prepared by Officers of the Department and numerous other books and periodicals were received free of charge.

The Library continued to issue regular reports of material received and of articles from periodicals of special interest.

4.8.3 Reproduction Section

Plan reproduction continued during 1973 with the automatic continuous process dyeline paper printing machine with the old machine as stand-by. Some 3450 orders were issued to the Reproduction Section and 40,000 prints were made of various sizes and of all types.

4.8.4 Photo Process Lab.

The photo Process Lab. functioned smoothly during 1973 on reproduction, enlargement and reduction of maps and drawings.

4.8.5 Photographic Section

Record of the work, on major construction projects, water supply and irrigation schemes, was carried out throughout 1973 in black and white photos and colour slides. In addition during the construction of Lefkara and Palekhori Dams colour 16 mm cine films were taken.

BOOKS PURCHASED DURING 1973

Library Reg. No.	Title	Author	Price
5995	Design Textbooks in Civil Engineering. Vol. One. Irrigation Engineering. Canals and Barrages.	LELLAVSKY S.	£ 3.10.0
5996	Small Water Supplies	McCONNEL S.	£ 2. 0.0
5997	The Mechanics of Engineering Soils	CAPPEL P.L & CASSIE W.F.	£ 2.15.0
5998	Unified Code. CP.110:Part 1:1972. The structural Use of Concrete.Part 1. Design Materials and Workmanship.	B.S.I.	

Library Reg. No.	Title	Author	Price
5999	Unified Code. CP.110: Part 2:1972. The Structural Use of Concrete. Part 2. Design Charts for Singly Reinforced Beams, Doubly Reinforced Beams and Rectangular Columns.	B.S.I.	£16. 0.0
6000	Unified Code. CP:110:Part 3: November 1972. Code of Practice for the Structural Use of Concrete. Part 3. Design Charts for Circular Columns and Prestressed Beams.	B.S.I.	
6001	Handbook on the Unified Code for Structural Concrete.(CP.110:1972)	CEMENT AND CONCRETE ASSOCIATION	
6009	Hydro-Electric Engineering Practice. Vol.I. Civil Engineering.	BROWN J. GUTHRIE	£22. 0.0
6010	Buried Pipelines: A Mannual of Structural Design and Installation.	CLARKE N.W.B	£ 7. 0.0
6011	The Drilling of Rock	McGREGOR K.	£ 6. 0.0
6029	Pumps Selection, Systems and Applications, 1969.	WARRING R.H.	£ 7. 6.0
6008	World Register of Dams 1973	I.C.O.L.D.	Under subscription
		Total	£66.11.0

SUBSCRIPTION OF TECHNICAL PERIODICALS 1973

Ser.No.	Title	Price
1.	Journal of the American Waterworks Association	£12. 3.0
2.	Proceedings of the Society of Water Treatment and Examination.	1.16.0
3.	Concrete	3. 0.0
4.	Proceedings of the Institute of Civil Engineers	8. 0.0
5.	Geotechnique	6.10.0
6.	Journal of the Institute of Water Engineers	6. 0.0
7.	Magazine of Concrete Research	2. 0.0
8.	Transactions of the American Society of Civil Engineers.	5.15.0
	Total	£45. 4.0

4.9 Topography Branch - Design Division

This Branch, headed by Inspector of Works A. Evripidhou, has dealt with all the Survey Works of the Department. These Surveys were of the Engineering type and consisted of:
Contour Surveys for Dam sites and Reservoirs, profile-levelling and Cross-Sectioning for canals and pipelines as well as for Reservoir sedimentation studies, instrumental observations for movement detection of constructed dams and the neighbouring slopes, setting-out of projects and preparation of LRO maps for acquisition purposes.

A major assignment of the Topography Branch this year was the gathering of field data required for the design of the Paphos Irrigation Project and Morphou-Tylliria Project. Field operations for both Projects are still in progress and these are expected to be completed by April 1974. Survey operations are concentrated on the location of the canal and pipeline routes on the ground, setting-out of the curves, computing of co-ordinates for the canal summits, and profile-levelling along the ℄ of the canal and pipeline routes. Small site surveys for the design of small structures such as bridges, crossings etc, preparation of IRO maps for acquisition purposes was also another task undertaken by this branch.

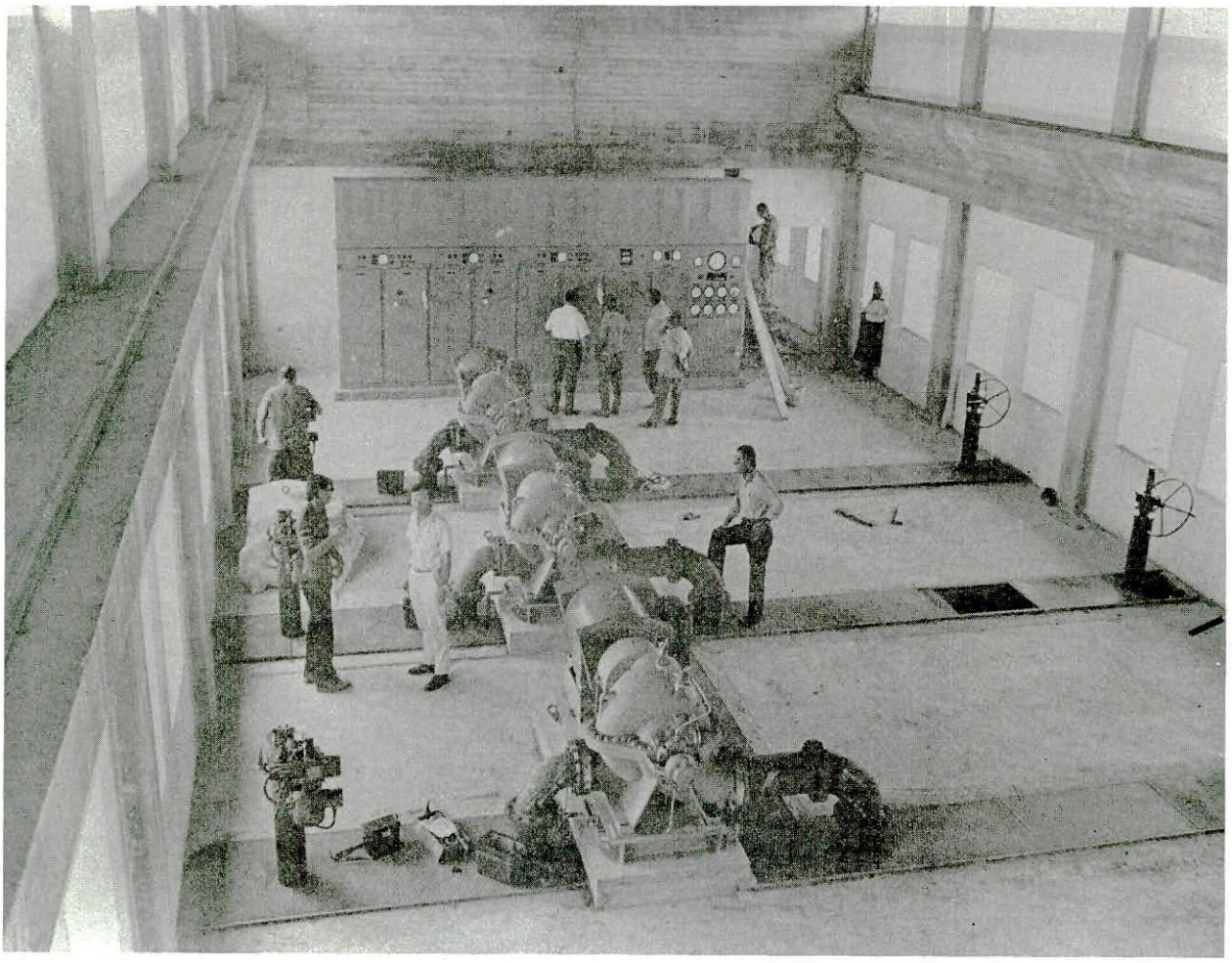
The staff of this branch during the year 1973 was as follows:

Post	No.	Class	Remarks
Inspector of works	1	Permanent	I/C of Branch
Tech. Assistants	5	Monthly paid	
T/A	2	Daily paid	
T/A	7	Hourly paid	Under training

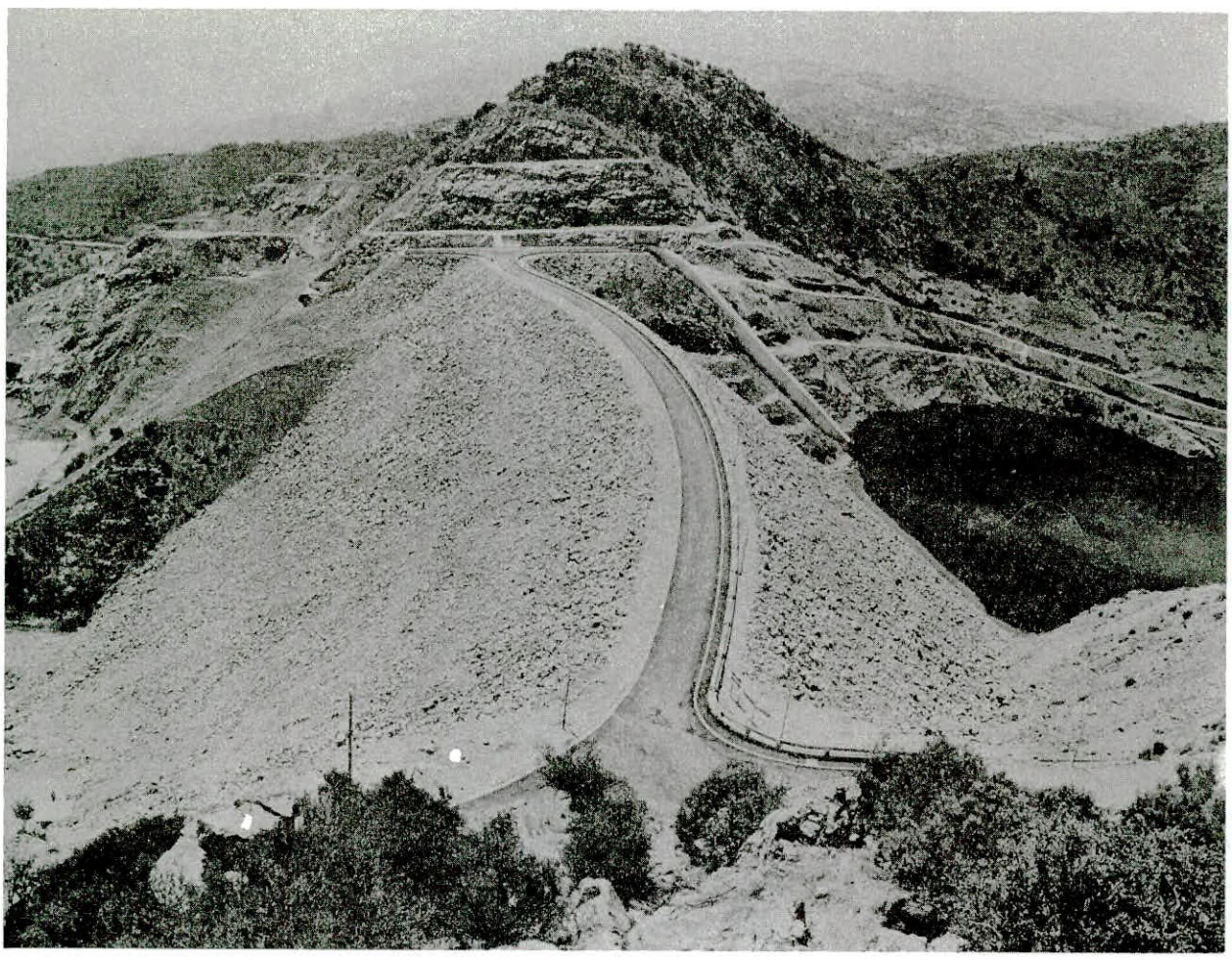
This branch has dealt with the following Projects:

Project	Type of Survey	Remarks
Argaka- Magounda Reservoir	Contour	Sedimentation studies
Arakapas Distr.System	Levelling	
Peyia Dam Site	Contour	
Athalassa Reservoir	Contour	Sedimentation studies
Xeros R.(Lefka)	Contour	Extention and raising of Existing Survey
Xeros-Phlevas River	Plotting of BH's	
Yermasoyia Distr.System	Contour	
Yermasoyia Reservoir	Cross-sectioning	Sedimentation studies
Limnitis Diversion	Contour	Diversion structure
Paleometokho	Contour	Recharge scheme
Phlassou	Contour	Reservoir design
Kiti Reservoir	cross-sectioning	Sedimentation studies
Paphos Irr.Project	Setting-out and Profile-levelling	
Kalo-Khorio Klirou	Spot levels	Distribution system
Pomos Reservoir	Contouring	Sedimentation studies
Mavrokolymbos Res.	Contouring	Sedimentation studies
Kambi Dam	Levelling	T.W.L. Location

Project	Type of Survey	Remarks
Arakapas Dam	Levelling	T.W.L. Road location
Perapedhi Damsite	Contour	Extention of contours
Petra dams site	Plotting of BH's	
Morphou-Tylliria Project	Setting-out and Profile-levelling	
Yialias R.	Contouring	Recharge
Dhipotamos site	Contour	Extention of contours
Prastio Morphou R.	Cross sectioning and setting-out	
Khirokitia pipeline	Setting out and levelling	
Massari dam	Levelling	Establishing control net
Kalopanayiotis dam	Movement observations	
Kambi Distr. system	Levelling	



Nicosia Water Supply—Boosting Station at Philia



Lefkara Dam

V. DIVISION OF CONSTRUCTION

By

H.P. Karakannas
Head of Division

5.1 The functions of the Division involve mainly the Planning, Construction, Supervision and control of all waterworks undertaken by the Department either by Direct Labour or Contract in the field of Domestic Water Supplies and Irrigation Works and in the capacity of Minor and Major Projects.

In addition the Division deals with the checking of designs and estimates of schemes prepared by the small project division, the preparation of specification for tenders of materials and machinery as well as with the utilization and administration of the constructional plant and the Department's Workshop respectively.

The numerous functions of the Division and the various skilled trades involved necessitate the staffing of the Division with wide experienced personnel.

The staff of the Division during 1973 consisted of:

1 No. Engineer Hydrologist - Head
1 No. Mechanical Engineer
3 Nos Senior Inspectors of Works
6 Nos Inspectors of Works
3 Nos Chief Foremen
9 Nos Assistant Chief Foremen
1 No. Technical Assistant
90 Nos Monthly and weekly paid Foremen
368 Nos weekly paid regular Artisans

482 Nos in total

Although the supervising staff of the Division was rather short in number and while only one Technical Assistant was available, still the staff worked efficiently without in the least relaxing their vigilance, and carried out the programme of works, responding simultaneously to the great demand for the execution of emergency schemes to cover the essential needs of Towns and villages, as a result of the greatest ever recorded drought in the island's history. Such emergency water supply schemes were executed for most of the Towns and a number of villages. It may be worth mentioning that in order to meet the great demand, plans were introduced to supply a number of villages with their urgent water supply needs by means of tankers.

The originally approved programme for 1973 included 188 schemes of a total estimated cost of £2,585,191. This programme of works was later altered by the Council of Ministers as a result of the unprecedented drought. A number of major and minor irrigation schemes considered of not first necessity were frozen, so as to secure additional funds for the implementation of emergency water supply and irrigation schemes, as well as to use funds for the relief of the so hardly striken farmers of the island.

The Construction programme for 1973 included 188 schemes of a total estimated cost of £2,585,191. Out of these 188 schemes 93 schemes were Rural Domestic Water Supply estimated at £813,607, 63 schemes were Minor Irrigation estimated at £408,039, 29 schemes were Major Irrigation estimated at £1,256,597 and 3 schemes were town Water Supply estimated at £106,948. In detail the 188 schemes included in the 1973 Development Estimates for construction during the year are shown hereunder:-

Ser. No.	No. of schemes	Nature of Scheme	Amount allocated for 1972 £
1	93	Rural Domestic Water Supply Schemes	813,607
2	63	Minor Irrigation Schemes	408,039
3	29	Major Irrigation Schemes	1,256,597
4	3	Town Water Supply Schemes	106,948
	188	T o t a l	£2,585,191

Over and above these 188 schemes that were included in the 1973 construction programme of works, the Construction Division has carried out considerable works on a number of Town and Village Water Supply Schemes, as well as on Irrigation Schemes from funds deposited by the appropriate authorities. Considerable efforts were also made to meet the demand for the execution of works on behalf of other Departments and private Developers. On such schemes the expenditure during 1973 reached the amount of £126,377.

The overall expenditure incurred on the construction of all the works referred to above during 1973 reached the amount of £1,935,701. This amount was spent on carry over and new schemes included in the 1973 Development Budget of the Department, as well as on schemes executed on behalf of other Government Departments or Authorities, or from funds deposited by Water Boards Municipalities, Village Water Commissions, or Irrigation Committees. Out of this amount £480,347 were spent on 81 Nos Rural Domestic Water Supply Schemes, £159,167 were spent on 41 Nos Minor Irrigation Schemes, £1,080,046 were spent on 19 Nos Major Irrigation Schemes, £89,764 were spent on the three independent schemes for supplementing the Water Supply of Nicosia Towns, and £126,377 were spent on 257 Water Supply and Irrigation Schemes executed on bahalf of other Government Departments, Water Boards, Municipalities, Village Water Commissions or Irrigation Committees and private developers. In detail the expenditure incurred on the construction of all the schemes mentioned above is shown on the list below:-

Serial No.	Nature of Scheme	No. of schemes	Expenditure incurred during 1973 £
1	Rural Domestic Water Supply Scheme	81	480,347
2	Minor Irrigation Schemes	41	159,167
3	Major Irrigation Schemes	19	1,080,046
4	Town Water Supply Schemes	3	89,764
5	Town Water Supply Schemes for Water Boards or Municipalities	10	19,013
6	Water Supply & Irrigation Schemes for other Government Departments	36	25,747
7	Rural Water Supply Schemes from Deposits	156	49,441
8	Minor Irrigation Schemes from Deposits	5	10,167
9	Water Supply & Irrigation Schemes for Private Developers	50	22,009
	T o t a l s	401	1,935,701

5.2 Labour Force

For the execution of all the 401 schemes mentioned above, the Construction Division has made use of its 368 regular employees, and a number of casual artisans and employees that were recruited from the areas where the works were executed. During 1973 in addition to the 368 regular employees of the Department a daily average of 568 casual employees were engaged for the construction of the works. In total during 1973 an average of 936 regular and casual employees were engaged daily by the Construction Division of the Department, and the overall expenditure on wages for the year reached the amount of £544,252.

It is worth mentioning that for the execution of works and the implementation for the Construction programme of 1973 enormous difficulties were faced in some areas for the securing of adequate skilled and unskilled labour force.

Such difficulties were mostly encountered near the urban areas and especially in the Kyrenia and Nicosia areas where the rapid development in the private sector absorbes all the local labour force. In most cases casual labour had to be recruited from other isolated areas and be transported to the site of the works under construction. In spite of the great efforts made by the staff of the Division for the securing of sufficient labour force for the completion of the Construction programme within the specified timetable, some schemes had to be suspended due to shortage of labour force.

5.3 Constructional Plant

For the execution of the works included in the Construction Programme of 1973, the Departmental and Government machinery was used primarily. In cases however where the Departmental machinery could not meet the demand, and especially in the field of Heavy Machinery, the Division had to hire such machinery from private owners through open tenders. In total during 1973 machinery was hired for 15,420 working hours at an expenditure of £20,915. Also during the year machinery was hired for the excavation of 88,000 running meters of trenches for the laying of pipes at a cost of £12,066. Land Rovers and other vehicles had also to be hired for 7,220 working days at a cost of £14,669, from private owners to be used for the transportation of employees and materials to the site of the works.

5.4 Materials

Most of the materials used for the construction of the projects were purchased from the Government Central Stores. Such materials are pipes, pipe fittings, steel, pumping units, water meters, timber, etc. Building materials, however, such as gravel, sand, aggregate etc, were purchased through tenders. During 1973 the Construction Division awarded 69 such tenders for the purchase of 19,532 cubic meters of such materials at a cost of £30,304. The needs of the Division in cement were purchased through a Government general contract from the Vassiliko Cement Factory. During 1973 2,970 tons of cement valued at £20,025 were purchased for the works executed by the Division.

During 1973 a total length of 352,335 meters of pipes of all types, i.e. steel victaulic galvanized iron and asbestos cement, were laid by the Division for Domestic Water Supply and Irrigation Schemes. In addition for all the Rural Water Supply Schemes 5,967 water meters of $\frac{1}{2}$ inch in diameter were purchased and installed by the Division.

Tables showing in detail the pipes and other materials used by the Division for the works executed during 1973, are given below :

(i) List showing all types of pipes laid during 1973

Nominal diameter in inches	Galvanized Steel Class B	Galvanized Steel Class D	Asbestos cement Class B	Asbestos cement Class D	Total length of pipes
	Running meters	Running meters	Running meters	Running meters	Running meters
½"	28,650	-	-	-	28,650
¾"	300	-	-	-	300
1"	15,804	-	-	-	15,804
1¼"	32,352	-	-	-	32,352
1½"	23,490	-	-	-	23,490
2"	43,200	-	-	-	43,200
2½"	12,696	-	-	-	12,696
3"	27,414	-	39,172	1,533	68,119
4"	54,960	-	27,928	1,950	84,838
6"	-	4,530	25,296	2,764	32,590
8"	-	1,350	5,280	-	6,630
10"	-	60	2,172	1,434	3,666
Grand Totals	238,866	5,940	99,848	7,681	352,335

(ii) List showing other materials and hired machinery used during 1973

Ser. No.	Description	Quantity	Expenditure incurred in £
1	Cement	2,970 tons	20,015
2.	Water meters ½"ϕ	5,967 Nos.	20,884
3	Heavy machinery	15,420 working hours	20,915
4	Land Rovers, etc.	7,220 working hours	14,669
5.	Excavation of trenches	88,000 running meters	12,066
6	Sand	11,493 m3	17,239
7	Shingle	4,575 m3	5,718
8	Aggregate	3,464 m3	3,464
9	Soil	45,209 m3	3,883
	T o t a l		£118,853

5.5 Rural Domestic Water Supply Schemes

The construction programme for 1973 included 93 Rural Domestic Water Supply Schemes of an estimated cost of £813,607. Out of these schemes 47 were completed during 1973, 34 were put in hand but could not be completed by the end of the year and were carried over for completion in 1974, and 12 schemes could not be put in hand for various difficulties and those that were not rejected were carried over for execution in 1974.

The expenditure incurred on all the Rural Domestic Water Supply Schemes reached the amount of £480,347, thus exceeding the 1972 expenditure by approximately £180,000. The 93 schemes that were included in the 1973 construction programme are shown in detail on the three lists that follow.

5.6 Rural Domestic Water Supply Schemes completed during 1973

As stated above out of the 93 schemes included in the 1973 Development Budget, 47 schemes of an estimated cost of £175,378 were completed during the year. The expenditure on these 47 schemes reached the amount of £133,588.

It should be noted that the originally estimated cost of these 47 schemes was much higher but as most of these schemes were put in hand in 1972 or even before the lists below indicated the amount allocated for expenditure in 1973 only.

A list giving in detail these 47 Rural Domestic Water Supply Schemes that were completed during 1973 is shown below:

Rural Domestic Water Supply Schemes completed during 1973

Serial No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £	Nature of work and remarks
	Nicosia District			
1	Alona Platanistassa Laghoudhera Sarandi Polystipos	17,443	11,886	New schemes. Supplementary supply from Troodos area. New distribution systems and house to house service.
2	Nikitari	1,986	1,710	Supplementary supply
3	Ayios Theodhoros (Soleas)	5,862	3,338	New Schemes, and house to house service.
4	Kakopetria	8,514	7,207	Supplementary supply.
5	Kapouti	4,132	984	New scheme, house to house service.
6	Pharmakas	4,580	4,523	New scheme and house to house service.
7	Alithinou	2,700	1,976	-do-
8	Kannavia	3,800	3,362	-do-
9	Apliki	2,440	2,144	-do-
10	Peristeronari	2,140	1,437	House to house service
11	Gourri	4,600	4,076	-do-
	C/F	58,197	42,638	

Serial No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £	Nature of work and remarks
	B/F	58,197	42,638	
12	Petra	1,408	115	Supplementary supply improvements.
13	Morphou	3,420	991	Completion of new distribution system
14	Makheras Monastery	5,000	4,971	Construction of reservoir
15	Varishia	500	500	Improvements
16	Pakhyammos	5,300	4,900	New Scheme with house to house service
	Limassol District			
17	Mathikoloni	243	238	New scheme. Resiting of village. Work started 1972
18	Potamos-tis-Yermasoyias	848	813	New scheme. Work started in 1971.
19	Pissouri	240	150	Construction of st.tank. Work started in 1972
20	Polemidhia Kato) Polemidhia Pano) Ypsonas) Kolossi) Erimi)	3,702	3,588	
21	Ayios Dhometios	6,360	6,334	Supplementary supply.New scheme. House to house service.
22	Ayios Constantinos	2,820	2,737	New scheme. House to house service.
23	Trimiklini Regional Scheme	300	300	Work executed in 1972. Government share refunded.
	Famagusta District			
24	Akheritou	5,266	4,330	New scheme. Supplementary supply. House to house.
25	Ayios Elias	7,540	6,776	House to house service.
	C/F	101,144	79,381	

Serial No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £	Nature of work and remarks
	B/F	101, 144	79,381	
26	Dherinia	4,500	2,250	Supplementary supply. Scheme executed in 1972. Government share refunded.
27	Prastio-Gaidhouras	4,300	4,286	Supplementary supply
28	Boghaz	3,600	1,616	-do-
	Larnaca District			
29	Athienou	3,605	2,981	Improvements to existing system
30	Tokhni	3,312	1,385	Supplementary supply house to house service
31	Lefkara Regional Scheme (Lefkara Pano, Lefkara Kato, Kato Dhrys, Vavla & Layia).	5,522	1,369	New pumping scheme from Khirokitia Reservoir
32	Lefkara Pano	985	57	Add st. tank
33	Lefkara Kato	1,023	852	New scheme
34	Kato Dhrys	2,762	220	Main conveyor and house to house service.
35	Vavla	1,314	149	Main conveyor and house to house service.
36	Layia	1,000	992	New st. tank and house to house service.
	Paphos District			
37	Goudhi	3,633	3,396	New distribution system and house to house service
38	Pretori	5,580	4,649	New distribution system and house to house service
39	Trakhypedhoula	3,409	2,983	New distribution system and house to house service.
40	Skoulli	2,440	2,159	New distribution system and house to house serive.
41	Lemona	3,360	2,839	New distribution system and house to house service.
	C/F	151,489	111,564	

Serial No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £	Nature of work and remarks 666
	B/F	151,489	111,564	
42	Mesakhorio	3,710	3,286	New distribution system and house to house service.
43	Dhinia	2,200	2,016	d-do-
44	Polis-Prodhromi	3,000	2,430	Extension of existing distribution system.
	Kyrenia District			
45	Kondemenos	1,123	733	New storage tanks and conveyor improvements to existing system.
46	Ayios Amvrosios	10,856	10,629	New st. tanks and improvements to existing distribution system
47	Bella-Paise	3,000	2,925	Extension of sit distribution system.
	T o t a l s	175,378	133,588	

5.7 Rural Domestic Water Supply Schemes put in hand during 1973, but completed by the end of the year and carried over for completion in 1974

Out of the 93 schemes that were approved for execution in 1973, 34 schemes of an estimated cost of £579,857 were put in hand during the year but could not be completed by the end of the year and were carried over for completion in 1974. The expenditure incurred on these 34 schemes for 1973 reached the amount of £346,759. The reasons for not completing these schemes during 1973 are :

(i) Some schemes are major ones involving a great expenditure and split into phases for construction in two or even three years.

(ii) Some schemes are combined and involve also a great expenditure, and they have been programmed for constuction for a longer period than one year.

(iii) Some schemes were approved very late in the year, either as a result of the delay in the completion of the Administrative formalities and the issue and loan funds, or they were approved for construction very late in the year as a result of the prevailing drought.

These 34 schemes include the regional schemes for Lymbia-Shia-Kornos etc., Klirou-Mitsero-Kalokhorio, Trikomo-Boghaz-Gastria-Arnadhi-Spathariko etc., and the major schemes for Karavas, Lapithos which involved a great expenditure.

A list showing these 34 schemes as well as the amount allocated and spent on each one separately during 1973 is shown below :

Rural Domestic Water Supply Schemes put in hand during 1973, but not completed by the end of the year and carried over for completion in 1974.

Serial No.	Name of scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £
	Nicosia District		
1	Piyenia	17,838	7,499
2	Pano Pyrgos	5,536	3,579
3	Lymbia Shia (L'ca District) Kornos (L'ca District) Mosphiloti (L'ca) Psevdhas (L'ca) Pyrga (L'ca) — Regional Scheme	67,500	37,352
4	Potami Vyzakia	14,209	6,939
5	Kambos Tsakistra	18,900	15,236
6	Kaliana	4,920	3,242
7	Pyroi	3,350	2,707
8	Klirou Mitsero Kalokhorio	47,300	38,545
9	Korakou	14,440	5,326
10	Katydhata	5,340	3,622
	Limassol District		
11	Ayios Pavlos	400	58
12	Kolossi	10,000	9,062
13	Yerasa	3,490	2,657
14	Phini	12,620	6,639
15	Ayios Amvrosios	5,100	4,150
16	Eptagonia	7,300	3,271
	C/F	234,243	149,884

Serial No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £
	B/F	234,243	149,884
	Famagusta District		
17	Vatyli, Strongylos, Arsos, Tremethoushia, Meloushia (Larnaca District)	12,353	1,622
18	Trikomo Regional Scheme		
	Trikomo-Boghaz-Castria Arnadhi-Spathariko-Ayios Yeorghios-Limnia-Ayios Serghios-Styllos-Engomi-Lefkoniko	72,000	21,889
19	Kondea	22,600	19,470
20	Lyssi	8,400	7,623
21	Ayios Yeorghios-Lefkoniko	300	259
	Larnaca District		
22	Skarinou, Ayios Theodhoros, Alaminos (combined scheme)	20,090	13,393
	Paphos District		
23	Kouklia	2,455	1,640
24	Panayia	18,400	14,821
25	Ayia Marina, Nea Dhimmata	4,900	3,569
26	Timi	5,300	4,136
27	Amargeti	7,500	6,594
28	Armou	12,375	8,353
29	Tsadha	17,000	6,549
30	Dhrymou	6,190	3,770
31	Kili	6,860	4,194
	Kyrenia District		
32	Elia, Phterykha	8,626	251
33	Karavas	52,717	39,208
34	Lapithos	67,548	39,534
	T o t a l s	579,857	346,759

5.8 Rural Domestic Water Supply Schemes included in the 1973 construction programme but not put in hand for various reasons and those not rejected carried over for execution in 1974

Out of the 93 schemes that were approved in the 1973 Development Budget, 12 schemes of an estimated cost of £58,372, could not be put in hand for various administrative, or legal difficulties, or even some were rejected by the beneficiaries.

A list showing these 12 schemes in detail is given below:

Rural Domestic Water Supply Schemes included in the 1973 Development Budget but not put in hand for various reasons and those not rejected and carried over for execution in 1974

Serial No.	Name of Scheme	Amount approved for 1973 £	Remarks
	Nicosia District		
1	Kambi (Pharmaka)	1,720	Pending acquisition of spring
2	Linou	2,500	Delay in the issue of loan funds
3	Skylloura	1,100	Administrative difficulties, scheme cannot be proceeded with. Not revoted.
	Limassol District		
4	Prodhromos	1,700	Scheme to be revised
5	Platres Kato	600	Delay in the arrival of the pumping unit.
6	Mallia	800	Source of supply dried up
7	Pakhna	3,400	Delay in the provision of village contribution.
	Larnaca District		
8	Vavla-Layia	4,002	Scheme rejected by Layia
9	Aradhippou	30,000	Delay due to Administrative difficulties.
	Paphos District		
10	Akoursos	6,100	Scheme rejected by householder
11	Kannaviou	2,650	Administrative difficulties and delay in the issue of loan funds.
	Kyrenia District		
12	Kalogrea	3,800	Delay in the issue of loan funds due to arrears.
	Totals	58,372	

5.9 Minor Irrigation Schemes

The construction programme for 1973 included 63 Minor Irrigation Schemes of an estimated cost of £408,039. Out of these 63 schemes 76 were completed during the year, 15 schemes were put in hand during 1973 but could not be completed by the end of the year and were carried over for completion in 1974, and 22 schemes could bot be put in hand for various reasons and those not rejected were carried over for execution in 1974. The expenditure incurred during 1973 on all these schemes was £159,167 and so it exceeded the 1972 expenditure by £50,000.

These 63 schemes include pumping schemes, recharge schemes, lining of canals, etc. All of them are shown on the lists that follow, and for easier reference they have been separated into three categories as under :

(i) Schemes completed during 1973.

(ii) Schemes put in hand during 1973 but not completed by the end of the year and carried over for completion in 1974, and

(iii) Schemes not put in hand during 1973, for various reasons and those not rejected carried over for execution in 1974.

5.9.1 Minor Irrigation Schemes completed during 1973

As already stated 26 out of the 63 Minor Irrigation Schemes that were included in the 1973 Development Budget were completed. The amount allocated for these 26 schemes was £52,180 and the expenditure incurred was £46,889. A list showing these 26 schemes in detail, and the expenditure incurred on each one separately, as well as the nature of the work executed, is given hereunder :

Minor Irrigation Schemes completed during 1973

Ser. No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £	Nature of work
	Nicosia District			
1	Ayios Yeorghios Petra	3,126	3,054	Construction of R.C. canals
2	Moutoullas	1,554	1,365	Pipe distribution system
3	Pyrgos (Tyllirias)	2,489	2,449	Pipe distribution system
4	Laghoudhera	950	683	Construction of st. tank
5	Palekhori (Halkomatas)	3,000	2,937	-do-
6	Pharmakas	2,000	1,953	Main conveyor
7	Morphou (M'ce of Dams)	100	82	M'ce of dam
8	Aredhiou	600	597	Construction of R.C. canals
	C/F	13,819	13,120	

Ser. No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £	Nature of work
	B/F	13,819	13,120	
9.	Lythrodonta(M'ce of Dam)	435	435	M'ce of dam
	Limassol District			
10	Yerasa	1,143	510	Pipe. distribution system
11	Perapedhi (M'ce of Dam)	135	68	Maintenance of Dam
12	Kilani (Asomatos Skotini)	6,500	6,414	Pipe distribution system
13	Agros (Panotaliou)	1,250	1,012	Pipe distribution system
	Famagusta District			
14	Aloa	630	595	Repairs to existing earth Dam
15	Akhna	2,937	2,358	Construction of one Recharge Earth Dam
	Larnaca District			
16	Maroni (Safto)	179	177	Pumping scheme and pipe distribution system
17	Zygi Tokhni	822	713	Pumping scheme and pipe distribution system
18	Psematismenos	5,305	4,959	Pumping scheme and pipe distribution system
19	Idalias River (Dhali-Potamia-Ayios Sozomenos)	4,665	4,614	Recharge scheme
	Paphos District			
20	Nata	2,106	1,655	Pumping scheme and pumping
21	Nea Dhimmata (Symvoulas)	5,138	4,874	Laying of new G.I. conveyor pipeline
22	Amargeti	4,200	2,850	Pumping scheme and replacement of old channels by A.C. pipes.
	C/F	49,364	44,354	

Ser. No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £	Nature of work
	B/F	49,364	44,354	
23	Argaka (Ayia Varvara)	700	658	New G.I. conveyor pipeline
24	Nata (Dhiala)	1,600	1,491	Storage tank and pipe distribution system
	Kyrenia District			
25	Elia	333	221	Compensations
26	Karakoumi	283	165	Compensations
	T o t a l s	52,280	46,889	

5.9.2 Minor Irrigation Schemes put in hand during 1973, but not completed by the end of the year and carried over for completion in 1974.

Out of the 63 Minor Irrigation Schemes that were approved for execution in 1973, 15 schemes of an estimated cost of £222,899 were put in hand during the year but could not be completed by the end of the year, and were carried over for completion in 1974. On these 15 schemes the expenditure was £112,278. Some of these schemes were nearing completion at the end of 1973 and were expected to be completed very early in 1974. A list showing in detail these 15 schemes, with the amount allocated and spent on each one separately is given below:

Minor Irrigation Schemesput in hand during 1973, but not completed by the by the end of the year and carried over for completion in 1974

Ser. No.	Name of Scheme	Amount approved for 1974 £	Expenditure incurred during 1973 £	Remarks
	Nicosia District			
1	Mosphili (Tyllirias)	7,000	5,982	Pumping scheme and pipe distr. system
2	Pedhoulas	14,450	13,160	Pipe distr. system.
	Limassol District			
3	Saittas-Moniatis	12,850	7,971	Pipe distr. system
4	Pissouri	70,000	8,462	Pumping unit and pipe distr. system
5	Moniatis	13,100	9,737	Pipe distr. system
6	Kyperounda(Earth Reservoir)	16,903	13,644	Pipe distr. system. Earth reservoir and pipe distr. system.
	C/F	134,303	58,956	

Serial No.	Name of Scheme	Amount approved for 1974 £	Expenditure incurred during 1973 £	Remarks
	B/F	134,303	58,956	
	Famagusta District			
7	Famagusta Dherynia	4,045	134	Compensations
8	Akanthou	16,650	8,228	Construction of three Recharge earth dams
9	Makrasyka	4,800	3,353	Construction of one recharge earth dam
10	Vitsadha	17,000	10,777	Pumping unit and pipe distribution system
	Larnaca District			
11	Maroni	9,551	6,039	Pumping scheme and pipe distribution system
12	Skarinou	8,300	6,829	-do-
	Paphos District			
13	Chrysochou Valley Goudhi-Skoulli-Kholi	20,000	11,416	Pumping scheme, st.tanks and distribution system
14	Ayia Marinoudha	850	710	Pipe distribution system
	Kyrenia District			
15	Kazaphani	7,400	5,836	Construction of earth recharge dams.
	T o t a l s	222,899	11,878	

5.9.3 Minor Irrigation Schemes approved for execution in 1973, but not put in hand for various reasons and those not rejected carried over for execution in 1974

Twenty two such schemes estimated at £132,960 out of the total number of 63 included in the 1973 Development Budget could not put in hand during the year for various reasons. For 1 6 schemes the funds were frozen by the Council of Ministers as a result of the prevailing drought and the utilization of the funds for more urgent projects. Three of these schemes were rejected by the beneficiaries and have not been been carried over.

All these 22 schemes are shown in detail on the list hereunder :-

Serial No.	Name of Scheme	Amount approved for 1973 £	R e m a r k s
	Nicosia District		
1	Pakhyammos (Tyllirias)	4,000	Funds Frozen
2	Peristerona) Astromeritis)	10,000	-do-
3	Galata (Esso)	6,000	-do-
	Limassol District		
4	Phini	5,400	Scheme rejected by beneficiaries
5	Prodhromos	7,200	Funds Frozen
6	Sylikou	3,460	Delay in the provision of village contribution
	Famagusta District		
7	Ayios Andronikos	2,200	Scheme rejected
8	Liopetri	6,000	Funds Frozen-sscheme rejected
	Larnaca District		
9	Kalavassos	13,250	Funds Frozen
10	Athienou(Athanassis)	5,500	-do-
11	Kalavassos	3,750	-do-
12	Psematismenos	2,500	-do-
13	Mari	11,100	Funds Frozen - Scheme rejected
14	Alaminos	7,000	Funds Frozen
	Paphos District		
15	Pano and Kato Akourdalia	1,600	Funds Frozen
16	Peyia	17,500	-do-
17	Polis Khrysochou	3,000	-do-
	Kyrenia District		
18	Karavas	3,000	Land acquisition not completed
19	Vassilia(Recharge)	2,600	Funds Frozen
20	Vasilia (Paleokastro)	1,400	-do-
21	Lapithos (Kephalovryso)	12,500	-do-
22	Ayia Irini	4,000	-do-
	T o t a l s	132,960	

5.10 Major Irrigation Schemes

The 1973 Development Budget included 29 Major Irrigation schemes of an estimated cost of £1,256,597. The actual expenditure on 19 of these schemes was £1,080,046. Out of these 29 schemes 15 involved dam works, 9 distribution systems and 5 recharge works. The greatest expenditure incurred on a single project was on Lefkara Dam where it reached the amount of £568,930. More details on the most important schemes as regards their construction and operation are given separately elsewhere in this report. A list showing all the Major Irrigation Schemes included in the 1973 Development Budget, as well as the expenditure incurred on each one separately is given hereunder:-

Major Irrigation Schemes
Expenditure incurred on Major Irrigation Schemes during 1973

Serial No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £	Remarks
	A. Dams (Government funds only)			
1	Lefkara Dam	590,003	568,930	
2	Lefkara-Khirokia Pipeline	58,621	52,775	
3	Khirokitia Treatment Plant	140, 000	129,192	
4	Massari Dam	26,352	22,640	
5	Yermasoyia Dam	16,988	11,170	
6	Mavrokolymbos Dam	7,728	-	
7	Kalopanayiotis Dam	4,334	71	
8	Pomos Dam	581	-	
9	Polemidhia Dam	400	-	
	B. Dams (Contributory)			
10	Palekhori-Kambi Dam	189,940	177,913	
11	Arakapas Dam	50,000	10,683	
12	Agros-Blanket	7,500	3,468	
13	Agros-Pumping	13,680	8,704	
14	Morphou-Serakhis	10,000	6,517	
15	Ovgos	5,464	22	
	C. Distribution Systems (Government funds only)			
16	Argaka-Makounda	26,127	23,591	A.C.pipe distribution system.
17	Mavrokolymbos	4,901	924	
18	Polemidhia	6,813	2,703	Extension of distribution system
19	Ayia Marina	6,099	-	
20	Yermasoyia	51,672	49,070	
21	Kiti	1,306	1,295	R.C canals
22	Kalopanalyiotis	792	-	
23	Pomos	150	-	
	C/F	1,219,451	1,069,668	

Serial No.	Name of Scheme	Amount approved for 1973 £	Expenditure incurred during 1973 £	Remarks
	B/F	1,219,451	1,069,668	
	D. Distribution Systems (contributory)			
24	Palekhori	12,000	9,642	
	E. Recharge Works (contributory)			
25	Famagusta) Dherynia)	2,411	736	Compensations
26	Morphou Spreading Grounds	20,300	-	
27	Morphou Recharge (Protopapas)	1,669	-	
28	Syrianokhori (Pumping scheme)	283	-	
29	Syrianokhori (Kokkinoyi)	483	-	
	T o t a l s	1,256,597	1,080,046	

5.11 Town Water Supply Schemes

a) Schemes executed during 1973 from Government Funds

The 1973 Development Budget included three Town Water Supply, schemes, for Nicosia Town, namely :

a) Pendayia scheme
b) Dhikomo scheme, and
c) Tseri scheme

On these three schemes the expenditure during 1973 reached the amount of £89,764. It may be worth mentioning that it was by the implementation of the Dhikomo Emergency Scheme that the population of the Town and suburbs of Nicosia was relieved during the hot and dry summer of 1973. This scheme involved the conveyable of the water of two existing boreholes at Dhikomo area to Nicosia. The expenditure on each of the three schemes separately during 1973 was as under :

a)	Pendayia scheme	£ 75,729
b)	Dhikomo Emergency scheme	£ 13,960
c)	Tseri scheme	£ 75
	Total	£ 89,764

5.11.1 Town Water Supply Schemes

b) Schemes executed during 1973 from funds deposited by Water Boards and Municipalities

During 1973 the Construction Division of the Department executed 10 such schemes on behalf of the six main towns either for the Water Boards or for the Municipalities. The overall expenditure incurred on these 10 schemes during 1973 reached the amount of £19,013. A list showing in detail these ten schemes and the expenditure on each one separately is given below:

Serial No.	Name of Water Board or Municipality	Expenditure incurred during 1973 £
1	Nicosia Water Board (Kokkinotrimithia Scheme)	1,914
2	Nicosia Water Board (Tseri Scheme)	127
3	Nicosia Water Commission	525
4	Nicosia Municipality (slaughter house)	797
5	Limassol Water Board	242
6	Famagusta Water Board (Consult. Service)	2,830
7	Famagusta Water Board	551
8	Larnaca Water Board	5,635
9	Paphos Minicipality	214
10	Kyrenia Municipality	6,178
	T o t a l	19,013

5.12 Water Supply and Irrigation Schemes executed during 1973 from funds deposited by other Government Departments

During 1973, 36 such schemes at an expenditure of £25,747 were executed by the Construction Division in addition to the Departmental Development Budget, for other Government Departments. These 36 schemes included major water supply schemes such as the Water Supply Scheme for the Tourist Development area at Pakhyammos, near Ayios Epiktitos Village, at an estimated cost of £42,000, executed on behalf of the Ministry of Commerce and Industry, the Water Supply Scheme for the National Guard at "Profitis Elias" at Pendadaktylos estimated at £6,300, etc. These 36 Water Supply or Irrigation schemes could not be executed by the concerned Departmemts as a result of lack of experience and, or, means and the Department was asked to undertake the execution of these schemes.

5.12.1 Rural Water Supply Schemes executed during 1973 from funds deposited by the villages

The overall expenditure incurred on these schemes during 1973, reaching the amount of £49,441 may seem at first instance negligible, yet the truth is that the construction Division made great efforts to meet the demand of 156 villages for either urgent repairs or emergency supplementary supply, or extensions. In fact the expenditure of £49,441 covered 156 village water supply schemes, and the staff of the Division was always eager to assist village authorities seeking the Department's assistance. It is worth mentioning that all these works were undertaken by the division of construction at the request of the District Officers, who provide the Village Authorities, and this in order to retain the good standard of the work and for control purposes.

5.12.2 Minor Irrigation Schemes executed from funds deposited by the Villages

During 1973, 5 irrigation schemes of an expenditure of £10,167 were carried out by the Construction Division, at the request of the relevant Irrigation Committees and District Officers.

5.12.3 Water Supply and Irrigation Schemes executed during 1973 for Private Developers

In spite of the heavy programme of works included in the Development Budget of 1973, still the Division undertook 50 schemes for private developers, on which an expenditure of £22,009 was incurred during the year. Most of these schemes are Water Supply Schemes for new divisions of building sites within communal areas. Such works are undertaken by the construction division at the request of Rural Authorities or District Officers, so that the standard of the work is maintained to the same standard as the existing schemes into which the division is attached.

5.2 Workshop

The workshop of the Department is part of the Division of Construction but provides services to the other divisions of the Department. It is equipped with all facilities required for construction work as earth moving equipment, motor transport, carpenting, plumbing and fittings, the slotting and perforation of drilling casing, electrowelding of drilling bits and grouting.

Installation and maintenance of pumping stations and pumping units and also maintenance of the electromechanical equipment on dams is carried out by the workshop.

The despatching of materials and stones to all sites of work all over the island is also done by the workshop.

The labour force of the workshop during 1973 consisted of an average of 57 regular and 17 casual artisans specialised in all activities of this branch of the construction division nine regular labourers were employed by the despatching section of the workshop.

The maintenance of the heavy earth moving equipment and other minor machinery including the Land Rovers and drilling rig was carried out at the cost of £52,650,000 and includes replacement of fittings and other accessories. (The above sum includes the cost of petrol and oil for vehicles).

The total operational hours of the equipment and the mileage covered by the land rovers are as shown below :

Heavy earth moving equipment

Motor vehicles

The activity of the Workshop was extended to

	Amount spent £
35 new installation for domestic supplies	12,859
11 new installation for irrigation	4,630
74 repairs to pumping installation for domestic supplies	3,921
12 repairs to pumping installation for irrigation	1,141
various casting and fittings	27,585
various carpentry works	4,285
various masonry works	928
despatching of material and stores	4,350
	£ 59,699

Mechanical Equipment	No.
Ruston Bucyrus Drilling Rig 22W	1
Catterpillar D8	3
Catterpillar Traxcavator 955	2
Allis Chalmers traxcavator	1
Ruston Bucyrus Excavator RB10	1
Ruston Bucyrus Excavator RB19	1
Excavator "Smith"	2

Mobile Plant	
Mobile Drill	1
Mini Core Drill	1
Small Core Drill	2
Core Drill	6
Overburden	3
Wagon Drill	1
Grouting Pumps	3
Concrete Pump	1
Air Compressors	12
Diesel Alternators	8
Electrosubmersible Pump	12
Turbine Pump	4
Centrifugal Pump	11
Portable Pump	5
Sheep foot roller	18
Vibrating Soil Compactor	3
Vibrating Roller	2
Concrete Vibrator	7
Concrete Mixer	56
Mobile Cranes	2
Hoists	3
Thornycroft tractive unit low loader	1
Dumpers	4
5 ton diesel lorry (Austin)	1
Bedford R.L.Lorry	3
Land Rover	28
Toyota Land Cruiser	6
Toyota Station Wagon	8
Pumps for testing pipes	18
Rubber tyred compaction rollers "ALBARET"	2
Unipower	2
Utility Hoist Crane on AC623	1
Air Pumps	2
Flush Pump	15
Cutting machine for pipes	15
Air concrete vibrator	5
Small Drilling Rig	1

Workshop Plant	No.
Bench Drilling Machine	1
Upright drilling machine	4
Planner timber machine	1
Bandsaw timber	1
Bar bender	1
Bar cutter	2
Mechanical Equipment	
Electric Welders	9
Forge	1
Air Compressors Stationary	2
Grinding Machines	4
Power Hack-Saw	2
Wood cutting machine	1
Plate bending machine	1
Spark plug testing machine	1
Battery charging unit	1
Hydraulic press 100 tons capacity	1
Band saw grinding machine	1
Hydraulic pipe bending machine	1
Soldering iron heater	2
Foundry	1
Tube valcanizing machine	1
Tyre extracting equipment	1
Paint spraying equipment	1
Letter printing machine	1
Lathes	2
Bench shaper	1
Electric metal shear	1

VI. MAINTENANCE AND OPERATION DIVISION

By

K.C. Hassabis
Assistant Director

This Division includes the branches dealing with:

(i) The Operation and Maintenance of Major Irrigation Projects
(ii) The Operation and Maintenance of Domestic (Town) Water Supplies.

6.1 Maintenance and Operation of Major Irrigation Projects

This branch participates in the management and operation of the Government major irrigation projects and is responsible for the maintenance of Major Projects whether Government or contributory.

6.1.1 Maintenance of Projects

The work of maintenance includes:

(i) The regular inspection of the works

(ii) The taking of regular observations and records on the behaviour and condition of the various structures.

(iii) The actual maintenance work.

During 1973 maintenance work involved mainly routine maintenance of the various works as listed below.

6.1.2 Summary of Expenditure on Maintenance Works

(i) Government Projects

Dams	£3675
Distribution Systems	£ 603
Sub-Total (i)	£4278

(ii) Contributory Projects

Government Share	£ 384
Village Contribution	£ 242
Sub-Total (ii)	£ 626
Total (i) + (ii)	£4904

6.1.3 Details of Maintenance Works - Dam Projects

6.1.3.1 Government Dams

Argaka

Cleaning of stilling basin, repairing of access road, blasting of rock above access road and removing of vegetation from embankment.

Cleaning of irrigation channels.

Expenditure:	Dam:-	£1367
	Distribution:-	£ 31
	Total	£1398

6.1.3.2 Athalassa

Removing of silt around the outlet pipe.

Expenditure: Dam:- £ 48

6.1.3.3 Ayia Marina(Special Case)

Removing of vegetation from embankment and painting of all metal structures and manholes.

Expenditure:	Dam:-	£ 17
	Distribution:-	£ 20
	Total	£ 37

6.1.3.4 Kalopanayiotis

Repairing of staircase of embankment. Painting of all metal structures, removing of vegetation from embankment, repairing of bathroom boiler of guard house.

Repairing of distribution main at Orkondas.

Expenditure:	Dam:-	£ 149
	Distribution:-	£ 17
	Total	£ 166

6.1.3.5 Kiti

Construction of an R.C.C. staircase of the Embankment. Emergency repairs to gate. Emergency repairs to 21" main.

Expenditure:	Dam:-	£ 459
	Distribution:-	£ 119
	Total	£ 578

6.1.3.6 Mavrokolymbos

Painting of all metal structures and shaft and Regrading of land slide area.

Installation of strainers on water meters and painting of metal structures of distribution system.

Expenditure:	Dam:-	£ 414
	Distribution:-	£ 12
	Total	£ 426

6.1.3.7 Polemidhia

Painting of all metal structures. Treating of bridge timber with solignum, cleaning of spillway, removing of vegetation from embankment and desilting of area in front of tunnel.

Painting of all manhole covers, painting of interior of break pressure tanks with epoxy paints. Emergency repairing of break pressure valve.

Expenditure:	Dam:-	£ 130
	Distribution:-	£ 284
	Total	£ 414

6.1.3.8 Pomos (Special Case)

Painting of all metal structures, treating of bridge timber with solignum, cleaning of access road and cleaning of drain canals.

Painting of all manhole covers and grilles, painting of all S.Vs and repairing of pipe fittings.

Expenditure: Dam:- £ 34
Distribution:- £ 120
Total £ 154

6.1.3.9 Syngrasis

Painting of bridge and all other metal structures - treating of bridge timber with solignum -

Expenditure: Dam:- £ 73

6.1.3.10 Yermasoyia

Constructing of a protective wall outside tunnel (22 m x 2.6 m x 0.3 m), painting of radial gates and all other metal structures.

Expenditure: Dam:- £ 984

No.	Project	Expenditure Dam £	Distr. £	Total	Remarks
1.	Argaka	1367	31	1398	
2.	Athalassa	48	-	48	
3.	Ayia Marina	17	20	37	
4.	Kalopanayiotis	149	17	166	
5.	Kiti	459	119	578	
6.	Mavrokolymbos	414	12	426	
7.	Polemidhia	130	284	414	
8.	Pomos	34	120	154	
9.	Syngrasis	73	-	73	
10.	Yermasoyia	984	-	984	
	Total	3675	603	4278	

Maintenance of Dams
Contributory Dams

No.	Project	Expenditure			Remarks
		Govt. £	Contr. £	Total £	
1.	Agros	-	-	-	
2.	Akrounda	16	8	24	Modifications to gear box and replacing of two main outlet S.Vs.
3.	Ayios Pappos	-	-	-	
4.	F/sta recharge dams	-	-	-	
5.	Galini	-	-	-	
6.	Geunyeli	-	-	-	
7.	Gypsos	-	-	-	
8.	Kandou	-	-	-	
9.	Kanli	-	-	-	
10.	Kalo Khorio(Klirou)	-	-	-	
11.	Kyrenia Range Dams	-	-	-	
12.	Lefka	-	-	-	
13.	Lefka Marathasa	-	-	-	
14.	Lythrodhondas (2 dams)	290	145	435	Grouting of Upper dam - Maintaining of gates
15.	Mia Milia (Special Case)	-	-	-	
16.	Morphou - Serrakhis	27	55	82	Painting of Bridge, treating of timber with solignum-Painting of outlet(perforated pipe)
17.	Ovgos	-	8	8	Emergency repairs to main outlet valve
18.	Pera Pedhi	45	23	68	Emergency repairs to gate and axle.

No.	Project	Expenditure			Remarks
		Govt. £	Contr. £	Total £	
19.	Petra (2 dams)	-	-	-	
20.	Prodromos	-	-	-	
21.	Pyrgos	6	3	9	Emergency repairs to main irrigation outlet.
22.	River Training (General)	-	-	-	
23.	Trimiklini	-	-	-	
	Total	384	242	626	

6.2 Management and Operation of Major Irrigation Projects

The quantity of water collected in most of the major dams was much below normal due to the continuing low rainfall and run-off during the year under review.

Thus, although there was an increasing demand of water for irrigation, the water available was very limited in quantity.

The amount of water available for irrigation in the dams (excluding Yermasoyia Dam where Distribution System is under construction) was 1.858×10^6 m^3, as compared to 3.777×10^6 m^3 for 1972.

The amount of water sold for irrigation was 971243 m^3 i.e. 52% of the water available. The corresponding water utilised in 1972 was 2,757,251 m^3 i.e. there was a decrease in utilization accounting to about 65%.

Gross income from the sale of water was £11,137 compared with £29,391 for 1972 while the net income was £409 compared with £17,260 for 1972.

The following table gives comperative figures for income and expenditure for the last 6 years.

Data on Water Usage for 1968 - 1973

Year	1968	1969	1970	1971	1972	1973
Water storage in 1000 m^3	-	-	6160	5352	3777	1858
Water sold in 1000 m^3	1185	1038	1961	2467	2757	971
Gross Income £	15363	21241	22594	26891	29391	11137
Operation £	3507	5911	5849	7688	7282	6450
Maintenance £	858	7582	5328	3342	4849	4278
Total Expenses £	4365	13493	11177	11030	12131	10728
Net Income £	10998	7748	11417	15861	17260	409

Data on the Operation of Government Dam Projects for 1973

Ser. No.	Project	Capacity $m^3 \times 10^6$	Water stored $m^3 \times 10^6$	Water sold $m^3 \times 10^6$	Gross Income £	Expenditure			Net Income £	Remarks
						Operation £	Maintenance £	Total £		
	1	2	3	4	5	6	7	8	9	10
1.	Argaka – Magounda	1.150	0.190.000	0.121.748	1,218	399	1,398	1,797	- 579	Distribution system under Construction
2.	Ayia Marina	0.300	0.066.925	0.066.925	669	311	37	348	+ 321	
3.	Kalopanayiotis	0.358	0.358.000	0.099.313	1,291	1,381	166	1,547	- 256	
4.	Kiti	1.610	-	-	-	-	578	578	- 578	
5.	Mavrokolymbos	2.180	0.314.000	0.352.096	4,180	2,003	426	2,429	+1,751	
6.	Polemidhia	3.430	0.202.000	0.116.240	1,630	1,440	414	1,854	- 224	
7.	Pomos	0.860	0.214.921	0.214.921	2,149	916	154	1,070	+1,079	
8.	Yermasoyia	13.500	0.350.000	-	-	-	984	984	- 984	No Distribution System
9.	Syngrasi	1.110	-	-	-	-	73	73	- 73	
10.	Athalassa	0.790	0.162.000	-	-	-	48	48	- 48	
	TOTALS		1.857.846	0.971.243	11,137	6,450	4,278	10,728	+ 409	

6.3 Management of Water Supplies under the provisions of Law Cap.350

The activities of this Branch, mainly concerned with Town Water Supplies and regional rural water supplies administered by Government, were hindered to a large extent due to the dry weather which prevailed during the year under review.

The year 1973, was the driest year recorded in the period of the last fifty years and, the more so as it was the continuation of previous years which followed a drought pattern. The resultant effect on water resources was so severe that many communities experienced shortage of water both for domestic and irrigation purposes. Many springs and wells dried up and underground water levels depressed to a dangerous degree. Emergency schemes for the supplementation of water supplies, where it was feasible, were under execution and tankers were employed for the transport of water to remote places, for the whole summer period.

6.3.1 Administration of Greater Nicosia Scheme

The proposal for the amalgamation of this Scheme with that of the Nicosia Water Board is still under consideration and the administration of this scheme is still in the hands of Government, being implemented by this Branch.

6.3.1.1 Operation of Greater Nicosia Scheme

The Greater Nicosia scheme provides water to the suburban area of Nicosia, having its separate defined "area of supply". In addition, "bulk" supplies are made available to Nicosia Water Board whose sources are inadequate to meet the consumption during summer.

The highest daily consumption for 1973 for the Greater Nicosia "area of supply" was 11,850 c. meters on 27.6.1973 (under restrictions).

During the year under review, the distribution system of Greater Nicosia Scheme was extended by 26,750 ft. of 6" ϕ and 4" ϕ asbestos cement pipes, laid wholly in new parcellations and 748 house connections were made. By 31.12.73 the number of consummer reached the figure of 10,911.

A statement showing expenditure and revenue of Greater Nicosia Scheme for the year 1973 is given on page 147.

6.3.1.2 Nicosia Town and Suburbs Water Supply

Though the water supply for Nicosia and suburbs is administered by three separate Authorities, it is in fact, faced commonly and restrictions are imposed on the whole area as long as water available from all sources is not adequate to suffice requirements. Such shortage was experienced from the early months of the year under review and restrictions were imposed on 3.4.1973. The total amount of water conveyed from all sources amounts to 7,692,671 cu. meters and was distributed as follows:-

(i)	G.N.S. "area of supply"	2,783,850	cm
(ii)	N.W.B. -do-	4,008,030	cm
(iii)	N.W.C. "Town within walls"	668,406	cm
	Total	7,460,286	cm

G.N.S. 27.6.73 - 11,850 cm

The highest consumption for the "areas of supply" mentioned above was 28,030 cu.m. (under restrictions) which equals to 42 gls per capita on an estimated population of 150,000 people. N.W.B. (including N.W.S.) 16.180 cm on 15.4.73(with restrictions).

Having regard the adverse effect on underground Water, resulting to the partial utilization of Pendayia sources, and with a view to supplementing Nicosia and suburbs water supply to the highest possible level, emergency schemes were carried out by making use of two boreholes near Dhikhomo village area and the purchase of water from privately owned wells. This, however, would not be a solution to the problem. All factors tend to prove that Urban Water Supplies cannot rely on emergency schemes, once existing sources cannot suffice water requirements. More reliable schemes for this sort of service should be planned on a long - term basis -.

6.3.1.3 Water Supply to Government Residences and Institutions

Other than water supplied for domestic use, separate sources are used for irrigation and the latter supply could be maintained undisturbed to all Government Residences and Institutions including the Presidential Palace.

6.3.1.4 Famagusta Water Supply Project

The construction of Lefkara Dam was completed within contract's scheduled completion period, i.e. end of November 1973. Similarly, the treatment plant at Khirokhitia and the installation of the main conveyor from the dam to this plant have been substantially completed. It is expected that these installations may be put into commission by June 1974, depended, of course, on the quantity of water to be stored in the dam during winter months.

Pumping, therefore, could only be made from existing boreholes at Khirokhitia, Psematismenos and Skarinou areas, excluding "Vassilikos" which was completely dry. Considering, however, that Larnaca Town's sources could not suffice its requirements, a number of Boreholes were drilled and/or developed in the Alethrico area which were pumped, delivering water in combination with existing ones to Famagusta, Larnaca, village regional schemes and local irrigators. From all above sources a total quantity of 1,775,722 c. meters was extracted.

A statement showing expenditure and revenue of the Famagusta Water Supply Project for the year 1973 is given on page 148.

6.3.1.5 Technical advice to Water Boards

All meetings of the existing four Water Boards were attended and technical advice was offered where necessary in our capacity as an official member of these Boards.

Facts about each Water Board and brief description of their water supplies are outlined below:-

6.3.1.6 Nicosia Water Board

It has already been mentioned that supplementation of its water supply has become a necessity. A study for required improvements on its distribution system in conjuction with Greater Nicosia Scheme and Nicosia Water Commission (Town within walls), has been prepared by Messrs. McLaren International Ltd and it is being adopted where feasible. Pipe laying

in the Town within walls is in progress. Other activities of this Board are:-

A) The total quantity of water supplied from all W.B. Sources was 2,581,890.

B) The total quantity of water consumed as registered area meters was 4,676,436 c.m. (including Nicosia Water Commission).

C) The total maximum consumption per day (including Nicosia Water Commission) was 16,180 c.m. on 15/4/73, (with restrictions).

D) The total number of consumers on 31.12.73 was 13.347.

E) (i) Extension of distribution system

a) 7,816 ft. of 4" ϕ A.C. Pipes

b) 433 ft. of 6" ϕ A.C. Pipes

(ii) Total length of distribution system in feet run including extensions for 1973

a) 12" ϕ 12100 ft
10" ϕ 25000 ft
8" ϕ 12930 ft
6" ϕ 82581 ft
4" ϕ 628239 ft (statement 5)

F) The total number of hydrants installed in 1973 was 18.

The total number of hydrants installed up to 31.12.73 was 865.

6.3.1.7 Limassol Water Board

The use of boreholes situated in the "Amathos" river and which will form the source of supply of a supplementary Scheme to this town is still negotiated with Government. Nevertheless, the main conveyor of this scheme has already been laid for the delivery of water of Mesa-Yitonia Reservoir. Water requirements, however, could be met satisfactorily and a regular supply could be maintained throughout the year. The maximum consumption reached the figure of 17,721 cm from records, it is further collected:-

a)	Total quantity of water supplied from sources	5,083,762 c.m.
b)	Total quantity of water consumed, as registered by Area Meters and by water meters at bhs 2, 7 and at Viagrex	4,999,405 c.m.
c)	Maximum daily consumption in summer on 21.7.73	17,721 c.m.
d)	Total number of consumers as at 31.12.73	19,015

e) (i) Extension of distribution system:

pipelines laid during 1973 25.956'/4"
130'/6"
6.643'/8"
32.729'

(ii) Total length of distribution system . . . . . 749.678'/4"
98.601'/6"
36.111'/8"
27.000'/10"
911.390'

f) Number of hydrants:

(i) installed in 1973 38

(ii) total installed 998

6.3.1.8 Famagusta Water Board

Emergency schemes carried out and brought into commission could not suffice this Town's requirements and restrictions to the supply of rather acute nature were imposed. Messrs. McLaren International Ltd. completed their study for the improvement of this Town's distribution system and their recommendations are being implemented. Additional information is given below:-

a) Total quantity of water supplied

(i) From Water Board sources 1,006,054

(ii) Delivered through Government Progect 1,111,015

Total = 2,117,069 cm

b) Total quantity of water consumed as registered by area meters 2,063,673 cm

c) Maximum daily consumption (under restrictions) 6,653 cm

d) Total number of consumers as at 31.12.1973 11,758

e) Extension of distribution system during 1973 . . . . . .

(i) 3,165 meters x 3" ϕ (10,381' x 8")
3,515 " x 6" ϕ (11,529' x 6")
7,735 " x 4" ϕ (25,370' x 4")
14,415 47,280'

(ii) Total Length of distribution system

(iii) 9,363 meters x 8" ϕ
29,430 " x 6" ϕ
170,278 " x 4" ϕ
290,071

f) Number of hydrants: installed during 1973 = 63

g) Total number of hydrants by 31.12.73 = 896 No.

6.3.1.9 Larnaca Water Board

Although additional supplies were made available from the Government administered water supply project, yet, restrictions were imposed on the water supply of this Town, due to the fact that the yield of its own sources had diminished to a large extent. Other than supplementation of water, apparently, the storage capacity of its service reservoirs need to be increased. Other data are:-

a) Total quantity of water supplied from all sources 1,454,420 c.m.

b) Total quantity of water consumed as registered by area meters 1,313,750 c.m.

c) Maximum Summer consumption (under restrictions) 4,200 c.m.

d) Total number of consumers at 31.12.73

4850, excluding Turkish consumers which are estimated to be 1100.

e) I. Extension of distribution system during the year 1973 in f.r.

7,600 f.r. of 6" ϕ
16,500 f.r. " 4" ϕ

II. The total length of distribution system is not available.

f) I. Hydrants installed during the year 1973: 34

II. Total number of hydrants installed within water supply area: 264

GREATER NICOSIA SCHEME (including Morphou Bay Scheme)

Revenue and Expenditure account for 1973

	Expenditure		Revenue		
(i)	Pumping Charges	£ 24,447.045	(i)	Sale of water	
(ii)	Maintenance charges	5,797.569		(a) in / bulk	£ 101,801.500
(iii)	Collection fees	21,451.350		(b) to consumers	£ 122,351.824
(iv)	Morphou running expenses	55,291.689	(ii)	Connection fees	£ 3,390.000
(v)	Tseri running expenses	6,387,324	(iii)	Usage of pipelines	£ 2,950.200
		£ 113,374.977	(iv)	Other Revenue	£ 41,494.570
(vi)	Administration	5,000.000		Total =	£ 269,988.094
	Grand Total =	£ 118,374.977			

Note:- (i) Revenue figure for 1973 includes the amount of £72.544.900 representing value of water delivered to Nicosia during 1972 but not paid in time.

(ii) It is estimated that water to the value of £20,000 was supplied to the Turks but collection of this amount was not possible due to abnormal situation. The total amount due by the Turks (calculated at minimum) since 1964 has by now reached the figure of £220,000.-.

FAMAGUSTA WATER SUPPLY (GOVT. SCHEME)

Expenditure and revenue account for 1973

Expenditure			Revenue	
Pumping charges			Sale of water	£ 57,275.000
(a) Attendants	(£ 14,520.340)			
(b) Electricity and fuel	(£ 14,314.871)			
(c) Rent of Land Rover etc.	(£ 1,131.646)			
		£ 29,972.857		
Maintenance Charges		£ 3,292.360		
Purchase of water		£ 320.200		
	Total	£ 33,595.417		

VII. DIVISION OF SMALL PROJECTS PLANNING

By

P. Pantelides
Head of Division

7.1 Introduction

This Division is dealing with design and planning of village water supply schemes throughout the island and smaller irrigation schemes which are usually limited within village boundaries and managed by local Irrigation Divisions or Associations.

The activities of the Division are confined to Projects which can be dealt with quickly and effectively without resorting to highly sophisticated methods of engineering design and overall techno-economic planning. Practical considerations are more advantageously applied in the design methods and the human rather than economic element is the more important factor in assessing project viability.

Recommendations for budgeting is an inherent function of the Division and because practically all projects are financed on a contributory basis, village communities are actively participating in all stages of project development; this is perhaps another reason which added to a traditional inter-communal jealousy and scarcity of water, makes planning in this particular field of development a technique in itself, that can hardly be exercised in accordance with vigorous techno-economic standards.

The continued drought over the year has overburdened the schedule of the Division with an influx of new applications from village communities suffering from water shortage. Most of these cases have taken the form of persistant and direct representations through the Minister of Agriculture and/or the Director-General with an additional increase of bureaucratic documentation and report writing by the Division Head.

A memorandum describing the difficulties encountered by this Section in task performance with clearly defined recommendations for improvement measures has been submitted to the Minister of Agriculture in the course of the year.

7.1.2 Staff

There has been no change in the staff employed: One Superintendent of Works is in charge, two Senior Inspectors are supervising the activities for Village Water Supplies and Irrigation respectively, and there are four technical teams consisting of one Inspector and one Technical Assistant for four combined districts in the island. Two Irrigation Enginners dealing with specific assignment were detached from the Section throughout the year.

The situation with task performance is expected to improve by the decision taken to forward a number of applications for local examination by the District Engineers, and a certain number of engineering designs to a separate team of Engineers working directly under the guidance of the Assistant Director at Headquarters.

7.1.3 Budgeting

Budgeting (always a tricky business in this office) in the year under review, for implementation in 1974, was considerably curtailed because of financial implications resulting from drought conditions.

The total provision for new water supply improvement schemes amounted to £296,118 and for minor irrigation schemes to £179,856, total = £475,974.

Because of fund shortage, a strict and rather arbitrary method of selective priorities was applied, with the result that some important new water supply schemes from boreholes in the drought - stricken villages of Paphos District were budgeted at 50% of their estimated cost. This method of construction by annual instalments has later proved to be inadequate, even wasteful, and steps were being taken to warrant supplementary expenditure.

7.2 Village Water Supplies

Definitions

We call "villages" all communities with "individual service systems" except the towns of Nicosia, Famagusta and Larnaca whose water supplies are managed by statutory Water Boards.

Total Number of Villages = 628 (including suburbs)
Supply Rate : Optimum 130 lt/head/day
Minimum 100 lt/head/day for house-to-house systems

Total Population : Approximately 404,000

For systems with public fountains the consumption rate is considerably lower, at the rate of 60 lt/head/day in the hot months of the year.

7.2.1 Because of the continued drought conditions, culminating to an exceptionally dry year in 1972-73, the rate of supply in several villages throughout the country had dropped below 4 gallons per head per day (17 lt/head/day) and measures were taken through the District Officers to supply these villages with water tankers.

A total of 61 villages were treated like that as follows :

Nicosia District	19 villages
Limassol District	11 villages
Famagusta District	7 villages
Paphos District	17 villages
Total	61 villages

Apart from the supply with Tankers, in 10 other villages in the Limassol and Paphos District emergency schemes were prepared for supplementary water supply either by interconnection with neighbouring villages or by pumping from new boreholes which were drilled for this purpose.

The general supply situation at the end of the year is depicted in Tables A,B and C.

Notable features delineated from these tables are the following:

(a) With the completion of 67 house-to-house systems in 1973 nearly 82% of all villages are now enjoying house supply. There are still 115 villages (including turkish) throughout the country with village fountains.

(b) A total of 245 villages with a population of near 131,000 are getting water below the optimum rate of 130 lt/head/day. The worst stricken villages are those getting practically no water through their systems in 1973 as set down on Table C.

7.2.2 Problems and Planning

Generally, the problems of inefficient water supply in Cyprus can be classified in three main categories as follows:

(a) Inadequacy or short-comings in the hydraulic components of the system (Service reservoirs, main conveyors or distribution mains, hydraulic pressure etc.) due to village expansion and the need for enlargement.

(b) Lack of house-to-house water distribution facilities and the need to modernize the obsolete system in conformity with the rising living standards in the countryside.

The first case can be readily resolved by construction of hydraulic components of the requisite capacity and by extending the system. Schemes like these can usually be financed from village resources without Government assistance.

The second case can be resolved by re-modelling the whole system in accordance with present-day standards and practice in order to provide water supply at house gate. The problem here is to have the necessary water supply which is required daily for the system to operate satisfactorily, on the one hand, and to plan project implementation in compliance with a restrictive budget on the other hand.

The shortage of water at the source of supply is an insidious problem which cannot be readily resolved without careful planning - the problem arises out of a constantly rising demand for more water and a rapid depletion of water resources available.

Efforts are being made to cope with water shortages like that, in individual villages by the construction of new boreholes in the immediate neighbourhood and it water were found to instal a pump and convey the water for supplementary supply to nearest villages where the need is greatest; but in most cases, particularly in the dry regions of the island, water will have to be conveyed from distant permanent supply sources which have already been established or will have to be preservatively organized sooner or later; such sources are now taking or will take the form of pumping wells from river basin reserves or other permanent aquifers, surface reservoirs with ancillary treatment works, or tunnel collectors on suitable locations on the central mountain range.

In this direction plans are currently being studied for connecting dry villages in the Famagusta and Larnaca south - eastern area to the present Lefkara - Famagusta conveyor.

Another plan is being worked out with a master pumping source on the Xeropotamos gravel basin and a regional conveyor to supplement all the lower Paphos villages as far as the coral Bay.

A similar project is being worked out by pumping from the upper sources of Xeropotamos (Lazarides Springs) and supplementing the old-established regional networks of Ayia-Appidhes -Papaloucas in upper Paphos District.

A regional pumping project from the upper riverine gravels of DIARIZOS has been prepared for collective distribution to : Arminou, Messana, Salamiou, Kelokedhara, Trakhypedhoula, Philousa, Pretori and Kedhares.

Upper villages in Limassol District could be supplemented through their respective regional networks from the Arkolahania spring by building a compensation surface reservoir for the local farmers in the Saittas-Moniatis area.

The Moutayiaka scheme of lower Limassol will be enlarged with booster pumps to embrace the dry villages of Paramitha, Spitali, Palodhia, Phinikaria and provide additional supply to the present interconnected system of: Ayia Phyla, Ay.Athanasios, Moutayiaka, Ayios Tykhonas, Pareklisha, Armenokhori, Moni, Monagroulli, Ay. Georghios.

In Nicosia District a scheme is currently being prepared to augment the Pitsilia regional supply by tapping water from the chrome mine galleries and provide supplementary supply to the Marathassa and Troodos area. Compensation works in the form of storage reservoirs and ancillary distribution works are being designed for the Solea Valley.

The dry villages in Eastern Messaoria will be supplemented by increasing pumping from the Mouzomenos borehole and enlarging the conveyor pipes.

The supply situation in all villages flanking the Idalian and upper Pedhieos basin has reached a critical stage with the depletion of the Idalia gravels and deterioration of borehole water in the Pera Orini area. A long term solution to this problem could be sought by establishing one or two surface reservoirs and treatment works in the upper reaches of the Idalias and Pedhieos rivers, of a total capacity of at least two million cubic meters. All farming communities in the upper and lower Messaoria plain capable of being served from a project like that will be glad to forego a little bit of spate irrigation in view of their glaring need for drinking water.

7.3 Schemes prepared in 1973

These are given on list D at a total cost estimated at £282,434.

(i) The more notable are described herebelow:
Extension of the Tripimeni Regional project to include Boghazi and Gastria at a cost of £33,000. This is part of a peripheral project which is currently under construction at full Government cost estimated at £72,000. Water will be pumped from a borehole on the Tripimeni limestone which will be supplemented with a second auxiliary boreholes earmarked for construction in 1975.

A conveyor pipeline will traverse the lower foothills from Tripimeni via Lefkonico - Gouphes to the Lapathos - Trikomo - Engomi village complex for supplementary supply to :
Trikomo, Ay. Georghios, Arkadi, Spatharico, Styllos, Limnia, Engomi.
From Trikomo, an extension pipe line will join the present Boghaz system and further along the Karpassia road to Gastria village. The overall cost of the project counting recent and anticipated cost revision will reach the figure of £125,000.

(ii) Pumping Supplies in the Paphos District

Schemes for supplementary supplies in drought stricken villages in Paphos from new boreholes drilled as a matter of urgency during the year include the following :

Stroumbi - Polemi	at	£ 22,300
Kallepia - Letymbou	at	£ 14,700
Kathikas	at	£ 3,000
Polis - Prodromi	at	£ 8,600

The latter scheme at Prodromi postulates additional supply in view interference with the present supply at the storage reservoir which is situated in the Turkish quarter of the village. If conditions will not improve the resiting of the storage reservoir will become necessary.

(iii) A complete re-modelling of the Kato-Zodhia water distribution in accordance with up-to-date design requirements has been prepared at a cost of £26,500. This is a typical case of obsolence in back-dated supply systems which require updating to cope with the increased demand and village expansion.

(iv) Nikitas in the Morphou area is a case of aquifer depletion due to over-development, necessitating the drilling of a new borehole. A new water distribution system has been included in a project estimated at £13,300.

(v) In Limassol District a combined project for Kivides Pano and Kato recently re-sited and including Souni-Sanaja has been drawn up at a cost of £17,400. It will provide supplementary water supply from the permanent "Ayiasma" spring.

(vi) Nessaoria - Dry Villages

This scheme provided for the installation of a larger pumping unit on the borehole at Nouzomenos which is situated on the limestones of the Northern Range to pump at the rate of 60 c.m/hr. combined with a larger conveyor in the Asha area; the scheme is reckoned to cover the current needs at the rate of 130 lit/head/day in all the dry villages namely : Petra-tou-Digheni, Kourou, Monastir, Mora, Aphania, Angastina, Marathovounos, Vitsada, Chatos, Knodhara, Pyrga, Genegra, Mousoulita, Asha.
Estimated cost £ 27,500

(vii) Kyrenia Town

A scheme to provide additional service capacity has been prepared during the year for execution by this Department at full cost by the local Municipal Council estimated cost £33,750.

(viii) Packyammos Tourist Compound Kyrenia

A scheme for water supply to the projected touristic development at Packyammos has been prepared for execution at full Government cost estimated at £42,000.

It includes a new borehole on the Kyrenia limestones near Klepini, pumping installation, service reservoir and a long conveyor steel pipeline.

7.4 Irrigation

7.4.1 The vital problem in hand at present in this particular field of agricultural development is to safeguard against imminent destruction, permanent plantations irrigated collectively from village sources and managed by statutory Divisions or Associations.

Apart from emergency measures taken during the year to assist farmers in maintaining their trees in life with such improved and highly expensive methods like water-tankers, carrying water from remote sources to the farms, the shortage of irrigation water has always been a pertinent problem in our farming community. In recent years, conditions have been aggravated because of an inherent drive by the farmers to expand, (in spite of restrictive measures and without regard to the availability and permanency of irrigation water).

The main objectives for minor irrigation projects as prepared by this Section is water conservation.

Individual schemes can be distinguished into three main categories of irrigation works as follows :

(a) Improvement Works, comprising the development of the source of supply, the provision of watertight intake structures, the installation of watertight distribution pipes or concrete channels from the source to farm gates, the construction of night storage reservoirs. The more predominant feature in this particular type of works is the replacement of the obsolete and wasteful earth canals with pipes, resulting to a considerable saving of irrigation water in the summer months when the need is greatest.

(b) The construction of boreholes in places where small underground reserves could be tapped without detriment to existing supplies, and to convey the water with pumps and pipes to existing or new farming systems, where the need is greatest. We have recently concentrated on such works in the Larnaca-Khirokitia area as a measure of compensation to local farmers affected by the extraction of water for domestic supplies mainly for Famagusta and Larnaca; also in the Paphos District where agricultural development has not advanced so fast like in other districts.

(c) The construction of recharge works in places where local underground aquifers are being depleted through overpumping.

(d) The construction of storage reservoirs, such as could preferably be located off-stream and made of suitable earth material at reduced cost, to store waste water in the early months for balancing the overdraft which is invariably experienced during the hot summer months of the year. This is a very attractive and effective method of tackling problems on the hill areas where a very profitable deciduous industry has already been established. An earth reservoir like that, lined with polythene sheeting has been commissioned during the year in Kyperounda and found to perate satisfactorily. In our considered opinion this type of structure will soon become a regular and attractive feature of the Cyprus countryside.

A similar reservoir has been designed for Pedhoulas to store local runoff and waste spring waters, and we are currently engaged in drawing up one such reservoir for Packyammos village in Tylliria.

7.4.2 Schemes Ready at the end of 1973

A list of Schemes ready for construction at the end of 1973 appears on list E.

The more notable schemes prepared and submitted in 1973 are briefly described as follows :

(i) Mamonia Pumping Scheme from Borehole (combined Water Supply and Irrigation). Estimated at £17,716 for irrigation only to provide for 140 don. permanent and 66 don. seasonal crops.

(ii) Peristerona (P) Pumping Scheme from borehole at an estimated cost of £15,000 for the irrigation of a new area of 170 don. permanent and 50 don. seasonal crops.

(iii) Yerakies Scheme involves two stage pumping from upper Xeros river to Yerakies for the irrigation of 216 don. of new land with deciduous plantations, estimated to cost £42,000.

(iv) Potami Pumping Scheme - The Third borehole in the area to be put into use at a cost of £10,000 bringing an additional area of 200 don. of seasonal crops.

(v) Dhali Pumping Scheme involves pumping from 2 boreholes in the area at a total cost of £15,550 for the irrigation of 200 don. of alfalfa. This scheme is the first step in utilizing the brackish water for the irrigation of fodder crops.

7.4.3 Inter Departmental Committee

Schemes examined by the Committee and approved or not during the year are given on List "F" 1 and "F" 2.

Schemes pending with the District Agricultural Officers at the end of the year are given in List "G".

7.4.4 Western Messaoria Control Pumping Scheme

4 No. final plans for pumping irrigation divisions in the Morphou plain were prepared in 1973 for a total area of 619 dons of existing citrus plantations and 127 dons seasonal crops.

34 No. preliminary plans were sent to the District Officer for the establishment of new irrigation divisions of a total area of 8245 dons as per lists "H" and "I".

7.4.5 Solea Valley Upstream Project

The need for this project originated from legal action taken against Government by certain Irrigation Divisions in the Solea Valley, claiming water use rights on some quantity of drinking water, piped by the Department to Kalopanayiotis since 1965.

These proceedings, have been dragging on for years and although the applicants have not yet proved legal ownership of the "Pikromiloudi" spring on the Troodos mountains where the disputed water was taken from, it has been tacitly agreed that the action will be withdrawn if and when Government will draw up and undertake to implement irrigation works acceptable to all the Divisions concerned.

Matters have been brought to a head because of the need to draw much more water from the upper reached of the Karkotis watershed for domestic supplies required in the whole area of Pitsilia, and to supplement supplies In Marathassa and Troodos where no other sources are readily available.

Other factors tending to precipitate action for this particular project is the need to divert waste flows from the mouth of "Karkotis" river to regional storage reservoirs as postulated in the Morphou Tylliria Irrigation Project.

Apart from the magnitude of the works proposed or rather pre-conceived by the people concerned, the question of planning for any conceivable project, is tied up with a host of complicated private and collective water-rights which will have to be reasonably compromised before anything could be done in the way of profitable exploitation of the "Karkotis", which is one of the most important water sources in the island.

A scheme providing for the abolition of all private waterrights and intercommunical development works has been prepared in a preliminary and rather tentative form; this has been discussed with the Divisions concerned at separate meetings called by the District Officer of Nicosia. Some Divisions, particularly those whose water-rights are not clearly defined have not been satisfied with the proposed scheme.

The tentative scheme is currently subjected to a drastic revision to incorporate all the reasonable and justifiable claims expressed at the preliminary group meetings by the people concerned. The second step will be to present the revised scheme to the Divisions at a plenary session and if acceptable then to seek Government approval for financing a staged implementation of the Project.

Village Water Supplies

"A"

Year	Villages with House-to-house distribution				Villages with Public Fountains			Villages without a pipe supply		Population %	Total of villages
	Schemes Completed	Total No. of villages	Villages %	Population %	Total No. of villages	Villages %	Population %	Total No. of villages	Villages %		
1960		90	14.33		441	70.23		97	15.44		628
1961	41	131	20.86		428	68.19		69	10.95		628
1962	59	190	30.25		380	60.55		58	9.20		628
1963	67	257	40.90		324	51.60		47	7.50		628
1964	39	296	47.13	66.71	323	51.43	32.29	9	7.44	1.00	628
1965	5	301	47.93	68.86	321	51.11	30.44	6	0.96	0.70	628
1966	7	308	49.05	69.81	316	50.31	29.95	4	0.64	0.24	628
1967	11	319	50.80	71.40	307	48.88	28.46	2	0.32	0.14	628
1968	27	346	55.10	75.72	282	44.90	24.28				628
1969	14	360	57.32	78.60	268	42.68	21.40				628
1970	32	392	62.42	83.23	236	37.58	16.77				628
1971	16	408	64.95	85.42	220	35.05	14.58				628
1972	29	437	69.60	88.70	191	30.40	11.30				628
1973	67	504	81.40	95.10	115	18.60	4.90				619

Water Supply Situation at the end of 1973 "B"

District	Satisfactory piped supply (Supply rate 130 lit/head/day)								Unsatisfactory piped suplly (Supply rate 130 lit /head/day								Total number of villages	Total population 1969
	Villages with house - to - house				Villages with fountains				Villages with house - to - house				Villages with fountains					
	No.	%	Popul.	%	No.	%	Popul.	%	No.	%	Popul.	%	No.	%	Popul.	%		
Nicosia	104	61.5	94,127	75.7	9	5.3	1,809	1.5	37	21.9	25,470	20.5	19	11.3	2890	2.3	169	124,296
Kyrenia	40	85.1	31,882	96.8	1	2.1	70	0.2	1	2.1	55	0.2	5	10.7	920	2.8	48	32,927
Famagusta	40	40.8	34,135	38.0	1	1.0	0	0	48	49.0	54,369	60,6	9	9.2	1,213	1.4	98	89,717
Limassol	71	62.3	62,969	85.0	11	9.6	2,264	3.0	23	20.2	7,552	10.2	9	7.9	1,323	1.8	114	74,108
Paphos	42	31.8	23,322	45.1	19	14.4	3,796	7.3	47	35.6	20,323	39.3	24	18.2	4,254	8.3	132	51,695
Larnaca	35	59.3	27,223	67.1	1	1.7	150	0.4	16	27.1	11,837	29.2	7	11.9	1,324	3.3	59	40,534
Total	332	53.6	273,658	66.2	42	6.8	8,089	2.0	172	27.8	119,606	28.9	73	11.8	11,924	2.9	619	413,277

"C"

List of Villages Supplied with Water Tankers in 1973

Ser. No.	Village
	Nicosia District
1	Aredhiou
2	Askas
3	Dhali
4	Gourri
5	Kambi Pharmaka
6	Klirou
7	Lythrodhondas
8	Mitsero
9	Pedhoulas
10	Nissou
11	Perakhorio
12	Potami
13	Tymbou
14	Pyroi
15	Shia
16	Vizakia
17	Kyliatos
18	Ay.Marina (X)
19	Yerakies
	Larnaca District
1	Ay. Theodhoros
2	Alaminos
3	Mosphiloti
4	Kornos
5	Pyrga
6	Pseudhas
7	Kalavasos
	Limassol District
1	Agros
2	Asgada
3	Ay. Amvrosios.
4	Ay. Constantinos
5	Ay.Pavlos
6	Ay.Theodhoros
7	Eptagonia
8	Phinikaria
9	Prastio (Kellaki)
10	Sanidha
11	Pendakomo

Ser. No.	Village
	Famagusta District
1	Ardhana
2	Kantara
3	Patriki
4	Koni Kepir
5	Kridhia
6	Ovgoros
7	Vatili
	Paphos District
1	Arminou
2	Polemi
3	Stroumbi
4	Ay.Varvara
5	Ay. Marina (Kel.)
6	Eledhio
7	Episkopi
8	Inia
9	Kallepia
10	Letymbou
11	Pitarkou
12	Milia
13	Phalia
14	Tsadha
15	Trakhypedhoula
16	Ay. Marina (Khrys.)
17	Lasa

Water Supply-Scheme prepared in 1973 and submitted to D.O.s

Summary of list "D"

District	No. of Schemes	Estimated Cost £
Nicosia	5	58,285
Famagusta	4	67,150
Limassol	7	39,150
Paphos	9	74,454
Larnaca	8	43,395
Total	33	282,434

List "D"

Water Supply - Schemes prepared in 1973 and submitted to District Officers

Nicosia District

Ser. No.	Village	Nature of Scheme	Estimated cost £
1	Nikitas	Supplementary supply from new B/H and house to house	13,300
2	Zodhia Kato	Additional storage and improvements to the distribution system	26,500
3	Philia	Additional storage and improvements to the distribution system	7,600
4	Phterigoudhi	House to house	2,985
5	Lythrodhondas	Additional supply from new well	7,900
	Total		58,285

Famagusta District

1	Petra tou Dhigeni Kourou Monastir Mora Aphania Angastina Marathovounos Vitsadha Tsiattos Knodhara Pyrga Genagra Housoulita Asha	Regional scheme New bigger pumping unit on the existing B/H and new bigger size main	27,500
2	Prastio Gaidhouras	Emergency supplemetary supply from Mersinikki B/H	2,250
3	Boghaz Gastria	Supplementary supply and improvement to the Distribution system	33,000
4	Dhavlos	Supplementary supply and additional storage	4,400
	Total		67,150

Limassol District

Ser. No.	Village	Nature of Scheme	Estimated cost £
1	Eptagonia	Supplementary supply	3,200
2	Kividhes Pano Kividhes Kato Souni-Zanadjia	Supplementary supply	17,400
3	Prastion (Kellaki)	Supplementary supply	4,200
4	Tserkez	House to house	1,200
5	Phinikaria	Supplementary supply	850
6	Potamos-Yermasoyias	Supplementary supply	3,500
7	Pyrgos	and additional storage	8,300
	Total		39,150

Paphos District

1	Kathikas	Supplementary supply	3,000
2	Stroumbi Polemi	Supplementary supply	22,300
3	Akhelia	House to house	970
4	Inia	House to house	11,080
5	Dhrousia	House to house	6,350
6	Neon Khorion	Supplementary supply	4,900
7	Kallepia Letymbou	Supplementary supply	14,200
8	Mamonia	Supplemenatary supply	2,554
9	Polis Prodhromi	Supplementary supply	8,600
	Total		74,454

Larnaca District

1	Oroklini Livadhia	Supplementary	10,700
2	Ormidhia	Supplementary supply	3,500
3	Xylotymbou	Supplementary supply	5,100
4	Ay. Vavatsinias	Supplementary supply	6,800
5	Kiti	Supplementary supply	3,500
6	Athienou	New conveyor	7,200
7	Avdhellero	Supplementary supply and house to house	4,590
8	Skarinou	Extension to the Distribution system	2,005
	Total		43,395

LIST OF SMALL IRRIGATION SCHEMES (Ready for Construction at the end of 1973) "E"
Nicosia District

‡ Included in 1974 Estimates

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. %	Irrigation perm. don.	Irrigation Seas. don.	Remarks
1‡	123/40/42	Exometokhi	Division	Rothesia (Elioudhi)	Pump-house & Distribution pipeline - B/H 28/68	3,500	1/3	25	-	Scheme rejected
2	127/40/92/F	Milikouri	"	Platys	Pump-line & Distribution pipeline	24,000	1/3	80	120	Scheme rejected
3‡	127/40/10	Nisou	Associat.	Frangos	Pump-line & Pipeline B.H. 27/64	6,000	-	-	-	Compensation to Irrig. Association Included in 1974 Estimates-Daggered.
4 ‡	57/41/II	Dhali	Division	Ftelia	Pump-house & Distribution pipeline - B.H. 67/69	8,900	1/3	100-120	-	) Irrigation of fodder crops
5 ‡	"	"	"	Katevas	Pump-house & Distribution pipeline - B.H. 56/69	6,650	1/3	70-80	-	)
6	36/42	Ergates	Associat.	Kourtoudjis	Pumping scheme-Pipeline and R.C. channels	9,000	48%	93	266	190 winter
7	28/41/II	Pakhyammos	Division		Irrig. Tank and Distrib. Pipeline	15,000	1/3	-	150	Early vegetables (Scheme to be revised)
8 ‡	51/54/V	Peristerona Astromeritis	"	Kaftousa	Construction of R.C. Channels	17,500	1/4			Included in 1974 Estimates (£7,500 daggered)
9	96/70	Peristerona	"	"	R.C. Channels	10,000	1/2			
10	74/68	Astromeritis	"	"	R.C. Channels	10,000	1/2			
11	123/40/A1	Exometokhi	"	within village	Flood Protection works	2,300				
12	24/42/II	Neokhorio	Associat.	Alakatia	Flood Protection works	620				

Nicosia District (Cont')

≠ Included in 1974 Estimates

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. %	Irrigation perm. don.	Irrigation Seas. don.	Remarks
13	35/54	Palekhori	Associat.	Maroullena	Construction of Irrigation Tank and Intake Channel	1,600	44%	10	15	
14	42/48	Apliki	"	Kaloyiros Tourkou assera	Irrigation Tank and Distrib.System	3,400	½	31	9	
15	42/42	Pera	Division		Construction of R.C. Channels	6,000	1/36	219	300	
16	117/51/II	Nikitari	"		"	4,100	1/3	-	150	230 winter
17	105/63	Pera-Politiko	"	Pedhieos	Construction of Diversion weir and R.C.Channels	5,500	1/3	-	450	
18	33/43/9	Klirou	Associat.	Laoura	Construction of R.C. Channels	4,700	40%	30	185	
19	63/52/III	Akaki-Meniko	Division	Afxenti Riatikon	"	33,550	1/4	-	500	400 winter Phase A. £20,200
20	101/40	Akaki	"	No.2	"	1,500	1/3	-	-	Phase B.£13,350
21	127/40/97/IV	Moutoullas	"		Distribution system	3,600	1/3			
22	127/40/98/IV	Kalopanayiotis	"		"	10,530	1/3			
23	39/44	Vyzakia	"		Construction of R.C. channels	11,200	1/3	-	140	
24	127/40/174	Linou	"	Linopsas	"	16,000	1/3	-	200	120 early vegetables
25	30/46/II	Phlasou	"	Ay.Epiphanitis	"	17,000	1/3	120	200	
26	43/50	Evrykhou	"		"	12,500	1/3	470	33	
27	30/46	Phlasou) Evrykhou) Korakou)	"	Kousouliotis	"	10,000	1/3	130	700	
28	86/53	Tembria) Korakou)	"	Esso Dhimma	"	8,000	1/3	160	300	
29	62/67	Korakou	"	"	"	17,000	1/3	300	100	

Nicosia District (Cont')

≡ Included in 1974 Estimates

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. %	Irrigation Perm. don.	Irrigation Seas. don.	Remarks
30	62/27	Korakou) Phlasou) Linou)	Division	Selloshis	Construction of R.C. channels	13,000	1/3	53	250	
31	127/40/118	Kaliana	"	Neron tis Tsappas	"	5,000	1/3	150	-	
32	61/66	Katydhata	"	Mylos-Djami	"	11,000	1/3	470	230	
33	127/40/25/ III	Kakopetria	"	Pano & Kato Apotheri	Distribution of pipeline	15,000	1/3	125	-	
34	127/40/25/ II	Kakopetria	"	) Dandidhes) Frangiko) Kouphelies	"	11,830	1/3	260	-	
35	127/40/107	Askas	"	Pano Ambelia	Improvement of Irrig. Works	320	42%	30	-	
36	127/40/ 92/F	Milikouri	"	Potamos tou Katsoura	Construction of Irrig. Tank	750	1/3	7	5	Scheme rejected
37	127/40/19/ II	Kambos Tsakistras	"	Ynafkion	"	800	1/3	18	-	
38	70/73	Idalias Potamos	-	-	Recharge Weirs (Gabions)	3,575	-	-	-	
39	44/39	) Ay. Trimithias) Paleometokho) Kokkinotrimithia	Division	Merikas river	"	4,640	1/3	-	-	
40	55/61	Yeralkies	"	Xeros Potamos	Pumping Scheme	42,000	1/3	216	-	
41	88/52/II	Pharmakas	Associat.	Koskinas (Piyallis)	Irrig. Tank	4,600	1/3	55	45	Scheme to be revised
42	83/52/IV	Orounda-Peristerona	Division	Maoutsos) Kakodisha) Matsiari)	Liming of channels	40,820	1/3	-	2000	
43	127/40/89/ III	Potami	"	Kambos	Pumping Scheme B/H 187/63	10,000	1/3	-	200	

Nicosia District (Cont')

≠ Included in 1974 Estimates

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. %	Irrigation Perm. don.	Irrigation Seas. don.	Remarks
44	162/62/III	Latsia Agr. Research Institude	-	-	Pumping scheme from B/H 54/72	1,650	-	-	-	Additional W.Supply
45	60/39/VI	Nicosia Central Prisons		Ayiasma water	Pumping scheme and pipeline	5,050	-	-	-	
46	61/64	Ayia Erini	Division		Boreholes, Pump house and Distrib. pipeline	21,070	1/3	61	-	
47	19/38/II	Karavas	Associat.	Palea Vrysi	Conveyor Pipeline from spring	2,800	1/2	-	-	

Famagusta District

≠ Included in 1974 Estimates

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. %	Irrigation Perm. don.	Irrigation Seas. don.	Remarks
1≠	78/39/A/II	Lysi	Division	Paleoprastio Vyzakia	Boreholes, Pump-house and distrib. pipeline	1,600	-	-	-	Daggered
2	115/39/III	Stylli-Limnia	"	Kopris Madrajes	Construction of culvert	200	1/3			
3	75/51	Syngrasis-Lapathos		Ay.Pappos	Recharge	10,000	-	-	-	£4,000 Phase "A"
4	83/62	Akhyritou	"	Ay.Kendeas	Recharge Reservoir & Pumping to wells	26,000	1/3			

LIST OF SMALL IRRIGATION SCHEMES (Ready for Construction at the end of 1973)

Larnaca District

* Included in 1974 Estimates

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. %	Irrigation perm. don.	Irrigation Seas. don.	Remarks
1 *	38/44	Alaminos	Division	Mennoyiatika	Borehole, pump-house and distrib. pipeline	6,000	1/3	100	-	
2 *	76/63	Skarinou	"		"	4,000	1/3	-	58	
3 *	57/44	Voroklini	"	Loures	"	6,500	1/3	-	58	
4 *	127/40/ 36/II	Anglisidhes	"		Extension of Distrib. system	2,400	1/3	-	-	14 don. additional
5 *	58/42	Ay. Vavatsinias	"	Pavlias	Weir and Distribut. pipeline	16,200	1/3	-	80	

LIST OF SMALL IRRIGATION SCHEMES (Ready for Construction at the end of 1973)

Limassol District

* Included in 1974 Estimates

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. %	Irrigation perm. don.	Irrigation Seas. don.	Remarks
1*	41/44/ 127/40/47/ III	Malia Khandria	Division Associat.	Trozena Avlakou	Distribution system "	3,500 1,400	1/3 1/2	25 13	10 6	
2*	31/45/G	Prodhromos	Division	Khardji	Construction of Irrig. Tank	7,200	1/3			
3*	95/61	Erimi-Kolossi	"	Kourris	Construction of Groyne Intakes	10,000	1/3	-	-	Intake works consolidation
4*	127/40/ 171/II	Limnatis	"	Alakati	Improvements on chain of wells	850	1/3			
5*	127/40/133	Paleomylos	"	Khardji	Improvements on Distribution system	580	1/3			
6	111/69	Erimi-Potamos Kourris			Construction of Protecting Embankment and River Training	2,000	-			
7	127/40/ 95/VII	Potamitissa	"	Arsoullou	Distribution Pipelines	1,200	1/3	13	-	
8	127/40/ 49/36	Kyperounda	Associat.	Frakti Postani	"					
9	127/40 49/55	Kyperounda	"	Livadhi tis mesis	Irrig. Tank and Distribution pipelines	2,250	44%	20	-	
10	127/40 49/48	"	"	Appis	"	1,600	1/2	4	-	
11	127/40 49/II	"	"	Dhiala	Irrig. Tank and Distribution pipelines	900	1/3	12		
12	127/40/ 49/47	"	"	Khalospidhia	"	2,500	1/2			
13	127/40/ 49/II	"	"	Vasiliko	"		40%	10	4	

Limassol District (Cont')

= Included in 1974 Estimates

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. £	Irrigation Perm. don.	Irrigation Seas. don.	Remarks
14	127/40/134/III	Pelendria	Division	Sarakinos	Distribution pipelines	-				
15	127/40/52/III	Ay.Ioannis (Agrou)	"	Teratsia	"	2,400	1/3	35	-	
16	"	"	Associat.	Kephalovry-sos	Distribution works	1,700	42%	16	9	
17	42/43/III	Phini	Division	Dhimma tou Mylou	"	19,500	1/3	371	-	
18	127/40/165/II	Tris Elies	"	Drakondas	Distribution pipeline	12,500	1/3	180	0	
19	127/40/59/II	Louvaras		Tsoukalas	Irrig.Tank and Distrib.pipeline	800		6	4	
20	45/44/2	Pyrgos	"	Alanovrysi	Distrib.works	5,700	1/4	-	80	
21	"	"	"	Dhimma tis Rigenas	"	4,600	1/4	-	300	
22	127/40/20/G	Ay.Theodhoros Agrou	"	Louis	Distrib.pipeline	960	1/3	8	-	
23	127/40/95/III	Potamitissa	"	Pano Potami	Protection works	986	-	-	-	

LIST OF SMALL IRRIGATION SCHEMES (Ready for Construction at the end of 1973)
Paphos District

* Included in 1974 Estimate

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. %	Irrigation Perm. don.	Irrigation Seas. don.	Remarks
1 *	69/64	Khrysokhou Goudhi-Skoulli Kholi valley (Phase A)	Division		3 boreholes, pump-houses and distri-bution pipeline	20,000	1/3	450	214	Phase A.£20,000 Phase B£20,000
2	90/68	Mamonia	Division		borehole and distribution pipe-line	17,716	1/3	140	66	
3	127/40/142	Episkopi	Division		Borehole and pipeline	3,300	1/3	20	44	
4	96/62	Peristerona	Division		Borehole and distrib. system	15,000	1/3	170	50	

List "F" 1

List of Small Schemesapproved by the Inter-Departmental Committee in 1973

1. Milikouri (Platys)
2. Mamonia (Pumping Scheme)
3. Katydhata
4. Kambos (Tsakistras)
5. Yerakies
6. Palekhori (Maroulena)
7. Pakhyammos
8. Erimi - Kolossi
9. Mallia (Trozena)
10. Voroklini
11. Alaminos
12. Milikouri (Potamos Katsoura)
13. Khandria (Avlakou)
14. Kakopetria (Kouphoelies Daontides)
15. Prodhromos (Hardji)
16. Pharmakas (Koskinas)
17. Potamitissa (Arsoullou)
18. Orounda (Ornitharis - Matsari)
19. Exometokhi (Pumping Scheme)
20. Potami (Pumping Scheme)
21. Mandria (Limassol)
22. Agros (Kato Ehetikos)
23. Ayii Vavatsinias "Pavlias"
24. Kalo Khorio (Klirou) Dam
25. Dhymes "Sykameri"
26. Lemythou "Tsangaroudha"
27. Phini (Dhyma Mylou & Vines)
28. Peristerona (P) (Pumping Scheme)
29. Ayios Theodhoros (Agrou) "Koufes"
30. Ayios Theodhoros (Agrou) "Lois"
31. Ayios Ioannis (Agrou) "Teratsia"
32. Yiolou (Pumping Scheme) B.H. 59/71
33. Kyperounda (Vasiliko)
34. Kyperounda (Appis)
35. Khandria (Kolymbos)
36. Agridhia

List "F" 1 (Con't)

37. Trimiklini (Zenonos)

38. Kato Amiandos Peledria
(Yeropotamos and Dhyma)

39. Peledria

40. Tris Elies (Drakondas).

List "F" 2

List of Small Schemes not approved by the Inter-Departmental Committee in 1973

1. Mesoyi
2. Episkopi
3. Kalokhorio - Kapouti "Demadora"
4. Kritou Marottou
5. Kato Amiandos
6. Statos (Kato Pighadhi)
7. Kythrea (Khrysidha - Voni)
8. Inia (mega Pighadhi)

List "G"

List of Small Irrigation Scheme submitted to the District Agricultural Officers for study in 1973

Nicosia and Kyrenia Districts

1. Potami (Pumping Scheme)
2. Pharmakas (Koskinas)
3. Ayii Trimithias
4. Akaki (Neron tou Hodja)
5. Anayia
6. Palekythro (Pedhieos)
7. Exometoxkhi (Pumping Scheme)
8. Dhali (Phtelia Katevas - Pumping Scheme)
9. Kalopanayiotis
10. Kalokhorio (Klirou) Dam
11. Moutoullas

Limassol District

1. Lemythou (Tsangaroudha)
2. Potamitissa (Arsollou)
3. Dhierona (Kamaroudhia)
4. Khandria (Kolymbos)
5. Ayios Ioannis (Agros) "Teratsia"
6. Ayios Pavlos "Dhima Stiraka"
7. Ayios Theodhoros (Agrou) "Koufes"
8. Agros "Vouni"
9. Pera Pedhi
10. Erimi - Kolossi
11. Agridhia (Limni)
12. Kyperounda (Appis)
13. Kyperounda (Frakti-Postani)
14. Tris Elies (Drakonda)
15. Kyperounda (Vasiliko)
16. Kyperounda (Livadhi tis Mesis)
17. Kyperounda (Khalospities)
18. Phini (Dhimma tou Mylou) and Vines
19. Pelendri (Phylagra)

List "G" (Cont')

Paphos District

1. Ayia Marina - Yialia
2. Peristerona (Pumping Scheme)
3. Tala (Milari)
4. Pano and Kato Yialia (Ayia Marina) Yefirin
5. Statos "Kato Pighadi"
6. Ayia Varvara
7. Amargetti (Glyfoudhi)
8. Yiolou (Pumping Scheme)

Larnaca District

1. Ayii Vavatsinias "Pavlias"
2. Anglissides

List "H"

Irrigation Division in Morphou area, for which final plans have been prepared by W.D.D. and sent to D.O. in 1973

Ser. No.	File No.	Village	Name of Irrigat. Division	Area commanded in don.		Drg. No.	Remarks
				citrus	Seasonal		
1	WM 42/69	Kato Zodhia	Stephania No.1	144	5	PS/IR/41	
2	WM 68/69	Katokopia	Dhromos tis Avlonas	146	54	PS/IR/42	
3	WM 36/71	Peristerona	Aspropetra	165	68	PS/IR/43	
4	WM106/72	Morphou	Toumazos	164	-	PS/IR/44	
			T o t a l	619	127		

List "I"

Irrigation Divisions in Morphou area for which preliminary plans have been prepared by W.D.D. and sent to D.O. in 1973

Ser. No.	File No.	Village	Name of Irrigat. Division	Area commanded in don. Citrus	Area commanded in don. Seasonal	Remarks
1.	WM104/72	Katokopia	Pallouderi	484	179	
2.	WM 48/72) WM 87/68)	Nikitas	Kokkini	1000	120	
3.	WM 70/72	Argaki	Koutsoumelides	245	27	
4.	WM 5/73	Massari	Massari	481	187	
5.	WM 21/72	Kapouti	Dhendroulia	235	10	
6.	WM 59/70	Kapouti	Toumba tou Skourou	165	2	
7.	WM 84/69	Prastio	Pallouderi	190	8	
8.	WM 48/71	Morphou	Ammidhes	715	-	
9.	WM 25/73	Pano Zodhia	Geraki	90	44	
10.	WM 10/73	Argaki	Gouskounos	144	10	
11.	WM 9/73	Kyra	Katarraktis	128	18	
12.	WM 6/73	Peristerona	Platis	103	-	
13.	DOM 2/64/ 143/A	Kato Koutrafas	Kapparkies	122	31	
14.	WM 16/73	Morphou	Mosphilia	149	2	
15.	WM 66/72	Katokopia	Rodamia No.2	180	32	
16.	WM 75/72	P.Zodhia	Dromos tou Angolemi	105	69	
17.	WM 19/71	K.Zodhia	Dromos tou Spiliou	186	177	
18.	WM100/72	Morphou	Vavatsinia	107	18	
19.	WM 14/73	Morphou	Stefania No.3	114	8	
20.	WM 74/72	P.Zodhia	Stavros	147	26	
21.	WM 86/72	Morphou	Ag.Georghios No.2	132	15	
22.	WM 55/72	Kyra	Katakros	156	11	
23.	WM 24/73	Astromeritis	Dromos tis Zodhias	99	74	
24.	WM 49/73	Astromeritis	Mazeri	78	88	
25.	WM 34/73	Astromeritis	Karidhia	90	78	
26.	WM 46/73	Morphou	Katoklidhis	132	8	
27.	WM 56/73	Morphou	Ambelia	112	-	
28.	WM 80/73	Argaki	Vounaroulia	120	18	
29.	WM 32/73	Katokopia	Rothesia	90	76	
30.	WM 38/72	Argaki	Exintara	163	17	
31.	WM 61/72	K.Zodhia	Dhimma	138	7	
32.	WM 62/73	P. Zodhia	Rotsarka No.2	37	79	
33.	WM 104/73	Avlona	Palialona	129	76	
	Total			6724	1521	

VIII. REGIONAL OFFICES

By N. Chr. Toufexis,
Superintendent of Works

8.1 Limassol Regional Office

8.1.1 General

At the end of the year the staff of the Limassol Regional Office was composed of the District Engineer Mr. Andreas Protopapas - Head of the Limassol Regional Office, 2 monthly paid Technical Assistants, 5 daily paid Technical Assistants, 1 hourly paid Technical Assistant, 1 Foreman Class I and 1 daily paid female typist.

The above personnel was engaged on the collection of Hydrological and Hydrogeological data, as well as for maintenance and operation of the dams, design of Small Projects and supervision of minor and major projects under construction.

8.1.2 Stream Gauging and Rainfall observing stations in operation

The following number of permanent stream gauging and rainfall observing stations were in operation during the year under weekly or monthly visits for observations, measurements and maintenance:

(i) 16 stream gauging stations equipped with automatic water level recorders. Also 4 automatic water level recorders were installed on an equal number of B/Hs in Akrotiri Fassouri area, for temporary observations. (one of them has been removed during the year).

(ii) 1 rainfall observing station.

8.1.3 Surface Water Hydrology

Weekly visits were made during the year to the stream gauging stations equipped with automatic water level recorders for observation and for calibration purposes by the use of current meters. Also samples of stream water for chemical and suspended sediment analyses were taken regularly.

Data taken from rainfall observing stations at the end of every month were sent to the Meteorological Office.

8.1.4 Ground Water Hydrology

Ground water condition in the whole hydrological area of Limassol District including Kalavasos, Zygi and Tokhni areas were observed, with the help of 550 observation wells and boreholes. The distance from established Bench Mark on top of the observations wells and boreholes to the ground water level was measured twice a year:

In March before the irrigation period and in Nobember after the irrigation period.

In addition, monthly and weekly measurements of the ground water level as well as sampling of water for chemical analysis, were taken in 140 observing boreholes.

Also 684 spring discharges were gauged volumetrically or by current meter.

8.1.5 Chemical Analyses

A total number of 522 water samples were taken from springs, wells/boreholes and streams and sent to the Government Laboratory for chemical analysis.

In addition to the above 520 samples of ground water were taken in March and November and were analysed by the Limassol Regional Office for chloride content.

8.1.6 Bacteriological Analysis

138 samples of ground water were taken from springs and boreholes used for the Limassol water supply and sent to the Pathological Laboratory for analysis.

8.1.7 Questioning

The annual questionnaire was carried out on 1317 wells and boreholes during the summer for determination of the ground water extracted, the area irrigated and kind of crops planted.

8.1.8 Well sinking permits

91 applications for drilling of wells or boreholes in the Special Measures Law and conservation areas and 16 applications in the non conservation area were investigated and submitted to the District Officer Limassol, while 40 applications for new citrus plantations permits were examined and submitted to the sub-committee, for citrus plantation Limassol.

13 applications for quarries permits were investigated and submitted to Nicosia Head Office.

9 applications into encroachment on hali land were investigated and submitted to Nicosia Head Office.

In addition to the above 123 several cases in the Special Measures Law, were examined and submitted to the District Officer Limassol.

8.1.9 Plotting of new wells and boreholes

A total number of 39 new legal and illegal wells and boreholes were plotted on map and necessary details entered into the appropriate register.

8.1.10 Water Meters

During the year, 11 water meters were installed on an equal number of boreholes in Akrotiri-Phassouri area, raising the total number to 394, mean-while 6 of them have been removed.

8.1.11 Maintenance of Dams

Inspection and Maintenance of dams and distribution systems in Limassol Region, were carried out by the Limassol Regional Office.

8.2 Paphos Regional Office

8.2.1 General

At the end of the year the staff of Paphos Regional Office was composed of the District Engineer, Mr. Charalambos Kridiotis, Head of the Paphos Regional Office, 3 monthly paid Technical Assistants, 2 daily paid Technical Assistants, 2 hourly paid employees, one daily female typist, and one hourly female draughtsman.

The above personnel was engaged on the collection of hydrological and hydrogeological data as well as for maintenance and operation of the dams in the region. Several other cases such as emergency Water Supply and irrigation problems, quarry licences and encroachments on Government lands were examined by the staff.

8.2.2 Stream gauging and rainfall observing stations in operation

The following number of permanent stream gauging and rainfall observing stations were in operation during the year under weekly or monthly visits for observations, measurements, and maintenance.

(i) 11 stream gauging stations equipped with automatic water level recorders.

(ii) 1 rainfall observing station.

8.2.3 Surface water hydrology

Weekly and monthly visits were made during the year to the stream gauging stations equipped with automatic water level recorders for observation and for calibration purposes by the use of current meters. Also samples of stream water for chemical and suspended sediment analysis were taken regularly.

8.2.4 Ground water hydrology

Ground water conditions in South Western Paphos and Polis Khrysokhou areas, were observed with the help of 266 wells/boreholes. The distance from established Bench Marks on top of every observation well/borehole to the ground water level was measured twice a year.

In March before the irrigation period and in November after the irrigation period.

In addition monthly or more frequent measurements of the ground water were taken in certain observation boreholes during the year for special studies.

Also 614 spring discharges were gauged volumetrically or by current meter.

8.2.5 Chemical Analyses

A total number of 586 samples of stream and ground water were taken and sent to the Government Laboratory for Chemical Analysis.

133 samples of ground water taken from observation wells/boreholes during March and November were analysed by the Paphos Regional Office for chloride content.

8.2.6 Suspended Sediment Analyses

A total number of 32 samples of stream water, was taken at the Permanent Gauging Stations and analysed by the Soil Laboratory for suspended sediment.

8.2.7 Questioning

The annual questioning was carried out on 3600 wells/boreholes and springs in South Western Paphos and Polis Khrysokhou areas during summer for the determination of the ground water extracted, the area irrigated and kind of crops planted.

8.2.8 Well Sinking and Citrus Plantations Permits

A total number of 492 applications for well sinking permits were investigated and reports submitted to the District Officer Paphos, while 19 applications for quarries, were examined by the Regional Office Paphos.

8.3 Morphou Regional Office

8.3.1 General

By the end of the year the staff of the Regional Office was composed of one Inspector of Works (Mr. A.K.Nicolaides) as the Head of the office, one monthly paid Technical Assistant, six daily paid Technical Assistants, two regular employees and one daily female typist. The above personnel was engaged on the collection of Hydrological and Hydrogeological data in the Morphou Region.

8.3.2 Stream Gauging and Rainfall Observing Stations in Operation

The following number of permanent stream gauging and rainfall observing stations were in operation during the year under weekly or monthly visits for observations, measurements and maintenance.

(i) 23 stream gauging stations equipped with automatic water level recorders.

(ii) 3 rainfall observing stations.

8.3.3 Surface Water Hydrology

Weekly and monthly visits were made during the year to the stream gauging stations equipped with automatic water level recorders for observations and for calibration purpose by the use of current meters. Also samples of stream water for chemical and suspended sediment analyses were taken regularly.

Data taken from rainfall observing stations at the end of every month were sent to the Meteorological Office.

8.3.4 Ground Water Hydrology

Ground water conditions in the Western Mesaoria were observed with the help of 300 wells/boreholes. The distance from established Bench Marks on top of the observation wells/boreholes to the ground water level was measured twice-a-year: In March before the irrigation period and in November after the irrigation period.

In addition to above observations, monthly measurements of the ground water level as well as sampling of water for chemical analysis were taken from 250 wells/boreholes for special studies.

Most of the springs in the area were measured on a routine basis, a small number was gauged for a short period after the request of another Departmental Division; during the year, 690 spring discharges were gauged. 30 springs were gauged once-a-month, 82 springs twice-a-year.

8.3.5 Questioning

The routine questionaire was carried out during the summer months on 909 wells/boreholes in use for the determination of the ground water extracted, the area irrigated and kind of crops planted.

8.3.6 Chemical Analysis

Samples of water were taken at various frequencies in Morphou Regional Area. Throughout the year, 1344 samples of water were taken from wells/boreholes, springs rivers and streams at weekly, monthly and annual intervals and submitted to the Government Analyst for Ionic and Boron Analysis.

In addition, 469 samples of ground water taken from observation wells/boreholes during March and November were analysed by the Morphou Regional Office for chloride content.

8.3.7 Bacteriological Analysis

65 samples of water were taken from wells or boreholes used for the water supply of Nicosia and sent to the Pathological Laboratory for analysis.

8.3.8 Suspended Sediment Analysis

10 samples of stream water were taken at the permanent gauging stations and analysed by the Soil Laboratory for suspended sediments.

8.3.9 Well sinking and citrus plantation permits

A total number of 1080 applications for well sinking were investigated and reports were submitted to the District Officer Nicosia.

8.3.10 Plotting and Levelling of new Boreholes

A total number of 32 new legal and illegal boreholes were plotted on map and necessary details entered into the appropriate register. Bench marks were established on top of 12 boreholes.

8.3.11 Water Meters

During the year, 19 water meters were installed on an equal number of boreholes in Morphou area raising the total number to 622.

8.4 Famagusta Regional Office

8.4.1 General

By the end of the year the staff of the Famagusta Regional Office was composed as follows: One Executive Engineer Mr. Costas Andreou, Head of the Regional Office, one Inspector of Works, Mr. G.Frangopoulos, five Technical Assistants, one daily paid Technical Assistant, two Regular Employees and one female typist.

All the above personnel was engaged on the collection of hydrological and hydrogeological data as well as on investigation for water supplies, minor projects and maintenance of Dams.

8.4.2 Stream Gauging and Rainfall Observing Station in Operation

The following number of permanent stream gauging and rainfall observing stations were in operation during the year under weekly or monthly visits for observation measurements and maintenances:

(i) Five stream gauging stations equipped with automatic water level recorders (Paralimni:Outfall of Lake. Liopetri-Kalopannes, Kharangas and Melini).

(ii) Two rainfall observing stations (Phrenaros and Rizokarpaso-Eleousa).

Data taken from rainfall observing stations at the end of every month were sent to the Meteorological Office.

8.4.3 Surface Water Hydrology

Monthly visits were made during the year to the stream gauging stations equipped with automatic water level recorders for observations and for calibration purposes by the use of current meter. Also samples of stream-water, for chemical analysis were taken regularly.

8.4.4 Ground Water Hydrology

Ground water conditions in the Eastern Mesaoria were observed with the help of 488 observations wells/boreholes.

The distance from established Bench Marks on top of the observation wells/boreholes to the ground water level was measured twice-a-year: In March before the irrigation period and in December after the irrigation period.

In addition, monthly measurements of the ground water level as well as sampling of water for chemical analysis were taken in the Government Observation Boreholes.

Also the yield of ten springs was measured once per month.

8.4.5 Chemical Analysis

A total number of 625 samples of water, were taken monthly from boreholes, wells, springs and streams, and sent to the Government Laboratory for chemical analysis.

340 samples of ground water taken from observation wells/boreholes during March and December were analysed by the Famagusta Regional Office for chloride content.

8.4.6 Bacteriological Analysis

226 samples of ground water were taken from wells/boreholes used for the water supply of Famagusta and Lapathos area were sent to the Pathological Laboratory for analysis.

8.4.7 Questioning

The annual questionaire was carried out on 19741 wells and boreholes during the summer for the determination of the ground water extracted, the area irrigated and list of crops planted.

Also visited 100 wells/boreholes every fortnight for collecting data to estimate the quantity of water extracted per donum by the use of water meter.

8.4.8 Well Sinking Permits

A total number of 1712 applications for sinking and covering permits of wells/boreholes in the conservation area as well as 129 applications in the non conservation areas were examined and submitted to the District Officers Famagusta and Larnaca.

8.4.9 Plotting of new boreholes

A total number of 390 new legal and illegal boreholes were plotted on map and all necessary details entered into the appropriate register.

8.4.10 Water Meters

During the year, 8 water meters were installed by an equal number of owners of wells/boreholes, raising the total number of water meters installed in the region to 491.

8.4.11 Miscellaneous

Minor repairs and maintenance of certain village water supply systems were carried out during the year by the Regional Office, especially for Ayios Sergios etc. village water supply system.