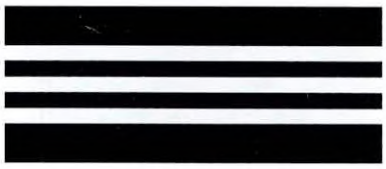

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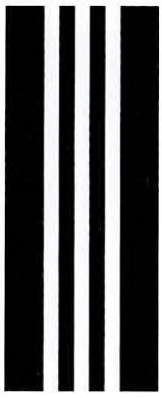

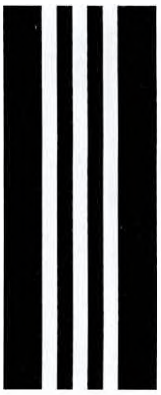

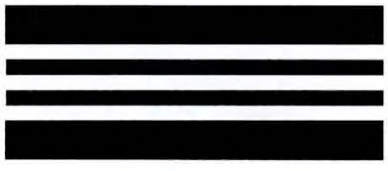

REPUBLIC OF CYPRUS

MINISTRY OF AGRICULTURE AND NATURAL RESOURCES

DEPARTMENT OF WATER DEVELOPMENT

ANNUAL REPORT
OF THE
DEPARTMENT
OF
WATER DEVELOPMENT
FOR THE YEAR
1972

By

C. A. C. KONTEATIS

Director of the Department of Water Development

NICOSIA — CYPRUS

October, 1973

REPUBLIC OF CYPRUS

MINISTRY OF AGRICULTURE AND NATURAL RESOURCES

A N N U A L R E P O R T

OF THE

DEPARTMENT OF WATER DEVELOPMENT

FOR THE YEAR

1972

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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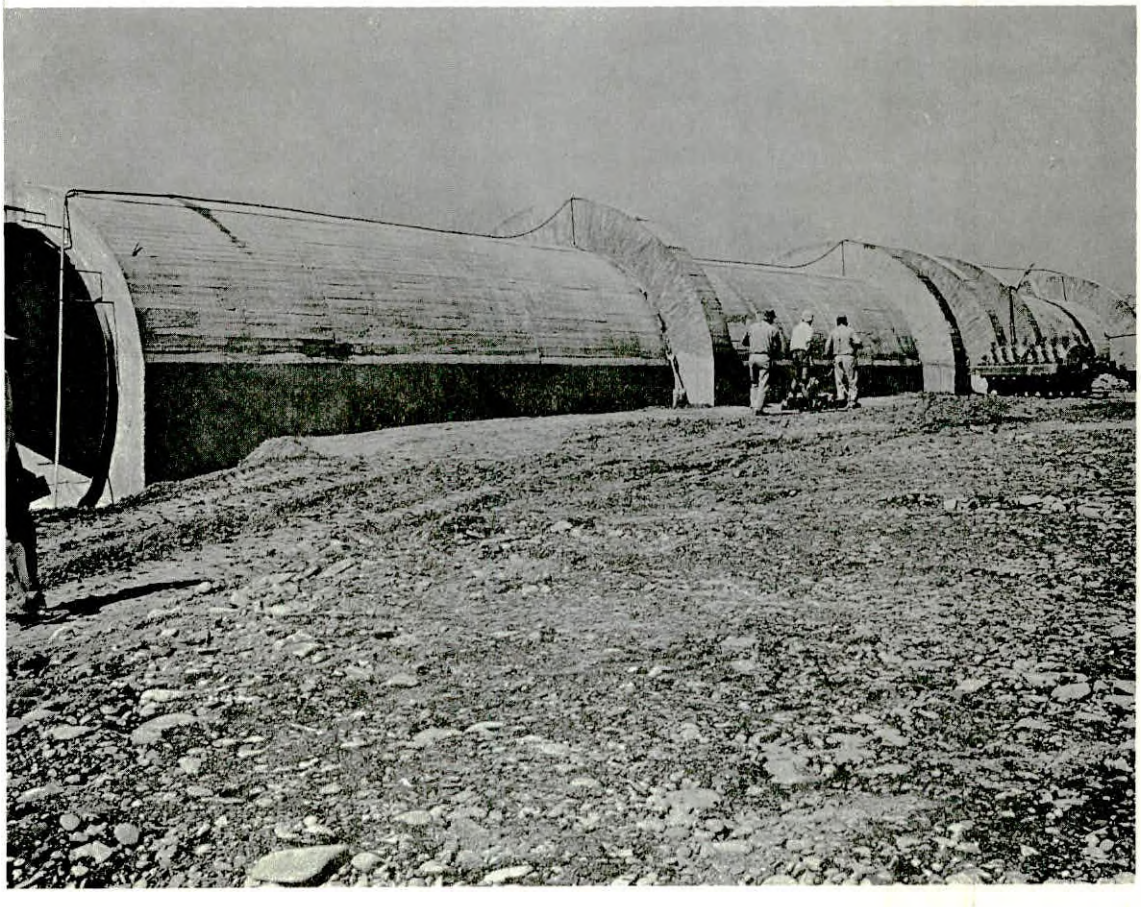
VIII. REGIONAL OFFICES

Volumetric measurement of Spring flow
(Katouris Spring, Lapithos)



Outlet Tunnel of Massari 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

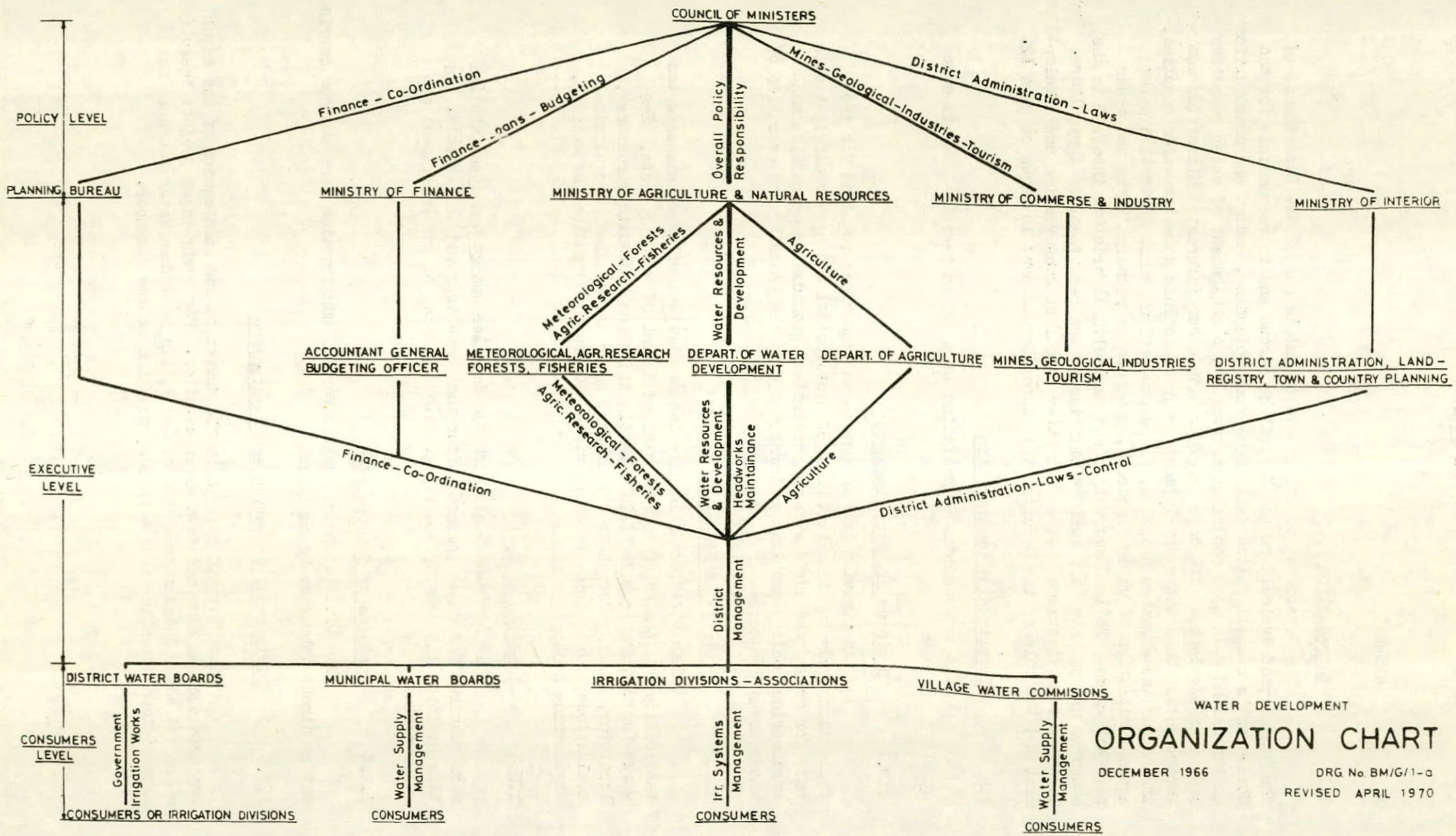
This Division deals with the detailed design and specification work required for major projects after they have approved as feasible. In this Division the drawing and topographic functions of the Department are incorporated.

1.2.4 Division of Construction

This Division is resposible 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.



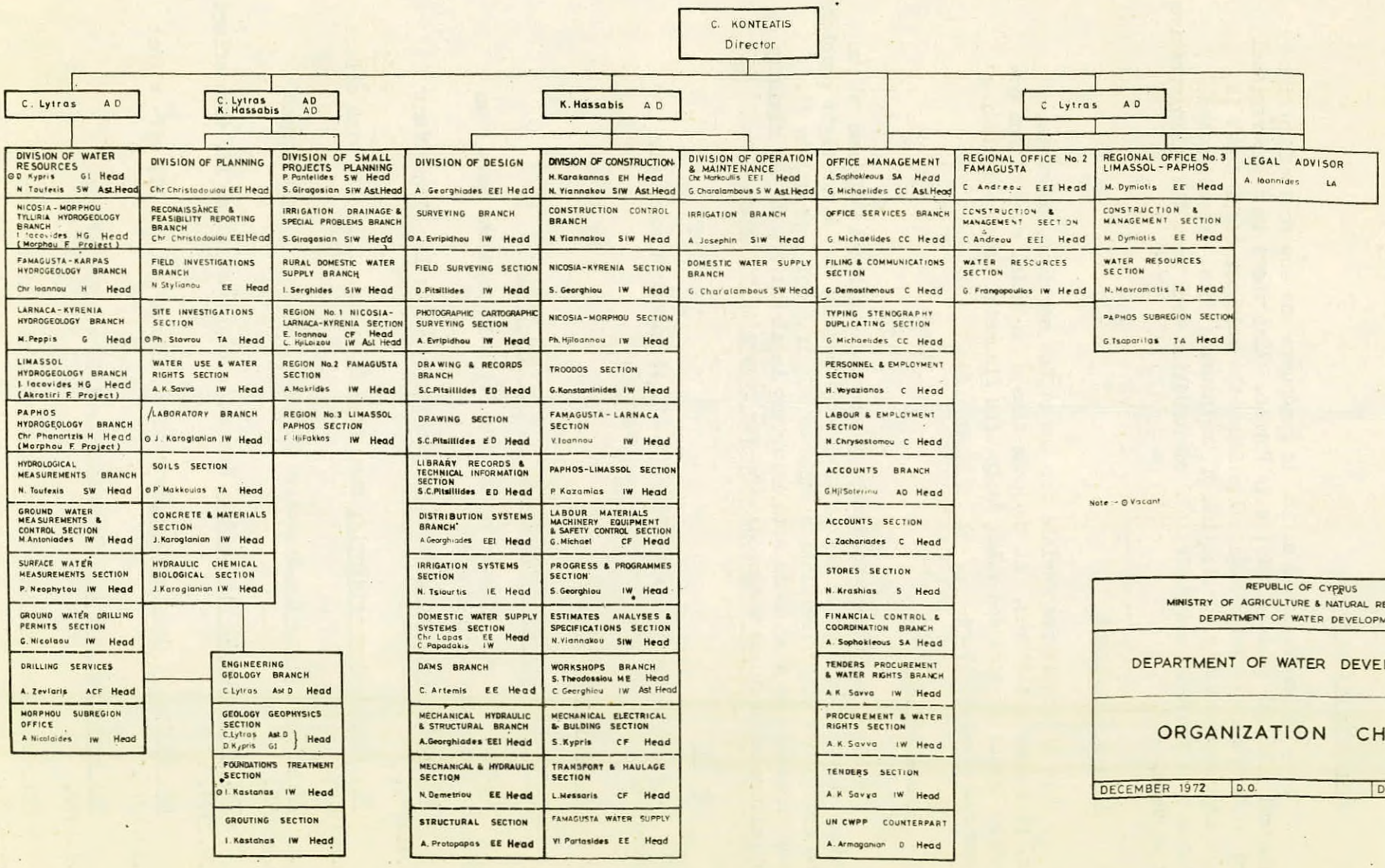
WATER DEVELOPMENT

ORGANIZATION CHART

DECEMBER 1966

DRG. No. BM/G/1-a

REVISED APRIL 1970



Note :- ⊙ Vacant

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

DEPARTMENT OF WATER DEVELOPMENT

ORGANIZATION CHART

DECEMBER 1972	D.O.	DRG. No. BM/G/1/18

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

There is one regional office in Famagusta and one regional office in Limassol with sub-regional office in Paphos. Also there is a sub-regional office in Morphou. In these regional offices the mainwork carried out is hydrological measurements, collection of engineering data, operation and maintenance of 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, contractors, 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 41. The numbers of staff by post are given on page 43.

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. Andreas Lambrou, Executive Engineer, Class II, with effect from 3.1.1972.

Mr. Charalambos Kridiotis, Executive Engineer, Class II, with effect from 3.1.1972.

Miss Maria Zachariou, Executive Engineer, Class II, with effect from 3.8.1972.

Mr. Theodoros V. Nicolaides, Executive Engineer, Class II, with effect from 1.8.1972.

Mr. Costas S. Constantinou, Executive Engineer, Class II, with effect from 1.12.1972.

Mr. Georghios Andreou, Technical Assistant, with effect from 1.1.1972.

Mr. Athanasios Klitou, Technical Assistant with effect from 1.1.1972.

Mr. Anthoullis Kokkinides, Technical Assistant, with effect from 1.11.1972.

Mr. Antonakis Hjiloannou, Technical Assistant, with effect from 1.11.1972.

Mr. Andreas Aniftos, Technical Assistant, with effect from 1.11.1972.

Mr. Panayiotis Scordis, Technical Assistant, with effect from 1.11.1972

Mr. Xenophon Antoniades, Technical Assistant, with effect from 1.11.1972.

Mr. Antonios M.Korellis, Technical Assistant, with effect from 1.11.1972.

Mr. Stavros Socratous, Technical Assistant, with effect from 1.11.1972.

Mr. Chrysanthos E. Metaxas, Foreman 2nd Grade with effect from 1.11.1972.

Mr. Sofoclis Kyriacou, Foreman 2nd Grade, with effect from 1.1.1972.

Mr. Meletios Michael, Foreman 2nd Grade, with effect from 1.11.1972.

Mr. Ioannis Athinodorou, Foreman 2nd Grade, with effect from 1.11.1972.

Mr. Kyriacos G. Nicolaides, Foreman 2nd Grade, with effect from 1.11.1972.

Mr. Cosmas Karayiannis, Foreman 2nd Grade, with effect from 1.11.1972.

Mr. Georghios Kostrikki, Foreman 2nd Grade, with effect from 1.11.1972.

Mr. Costas Constantinides, Foreman, 2nd Grade, with effect from 1.11.1972.

Mr. Elias Neophytou, Foreman 2nd Grade, with effect from 1.11.1972.

Mr. Andreas Panayiotou, Foreman 2nd Grade, with effect from 1.11.1972.

Mrs Maroulla Savvidou, Draughtsman, with effect from 1.12.1972.

Mrs. Emilia Roditou, Draughtsman, with effect from 1.12.1972.

Miss Ourania Adamidou, Draughtsman, with effect from 1.12.1972.

Mrs. Maroulla Petridou, Clerical Assistant, with effect from 1.5.1972.

1.3.1.2 On a Permanent Basis

Mr. Andreas Ph. Protopapas, Executive Engineer, Class II, with effect from 1.1.1972.

Mr. Vlassis Partassides, Executive Engineer, Class II, with effect from 1.1.1972.

Mr. Pantelis Nicolaou, Technical Assistant with effect from 1.1.1972.

Mr. George Saparillas, Technical Assistant, with effect from 1.1.1972.

Mr. George Pashiardis, Technical Assistant, with effect from 1.1.1972.

Mr. Chrysostomos Kambanellas, Technical Assistant, with effect from 1.1.1972.

Mr. Eleftherios Phinikarides, Technical Assistant, with effect from 1.1.1972.

Mr. Ioannis Mouskoundis, Technical Assistant, with effect from 1.1.1972.

Mr. Anastassis Nicola, Foreman, 1st Grade, with effect from 1.1.1972.

Mr. Modestos Themistocleous, Foreman, 1st Grade, with effect from 1.1.1972.

Mr. Lambros Nicolaou, Foreman 1st Grade, with effect from 1.1.1972.

Mr. Neoclis Ioannou, Foreman 1st Grade, with effect from 1.11.1972.

Mr. Costas Mavropetrou, Foreman, 1st Grade, with effect from 1.11.1972.

Mr. Efstathios Panayi, Foreman 1st Grade, with effect from 1.11.1972.

Mr. Savvas Shekkeris, Clerical Assistant, with effect from 1.5.1972.

Miss Anna Adamidou, Clerical Assistant, with effect from 1.5.1972.

Miss Maria Mia, Clerical Assistant, with effect from 1.5.1972.

1.3.1.3 Renewal of Contract

Mr. Antonakis Ioannides, Legal Adviser on contract, had his contract renewed for another year, with effect from 19.8.1972.

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. Kyprianos C. Hassabis, from Senior Water Engineer, to Assistant Director, with effect from 1.8.1972.

Mr. Achilleas E. Sophocleous, from Supervisor of Accounts, to Senior Supervisor of Accounts, with effect from 1.6.1972.

Mr. Phoebus HjiIoannou, from Inspector of Works, (on secondment), to the permanent post of Inspector of Works, with effect from 1.1.1972.

Mr. Liassis Savva, from Inspector of Works (on secondment), to the permanent post of Inspector of Works, with effect from 1.1.1972.

Mr. Georghios Koutis, from Assistant Chief Foreman (on secondment), to the permanent post of Assistant Chief Foreman, with effect from 1.1.1972.

Mr. Michael HjiConstantinou, from Assistant Chief Foreman (on secondment); to the permanent post of Assistant Chief Foreman, with effect from 15.7.1972.

Mr. Takis Antoniou, from Foreman 2nd Grade, to the permanent post of Foreman 1st Grade, with effect from 1.5.1972.

Mr. Sofoclis Kyriacou, from Foreman 2nd Grade, to the permanent post of Foreman 1st Grade, on an unestablished basis, with effect from 1.12.1972.

Mr. Chrysanthos E. Metaxas, from Foreman 2nd Grade, to the permanent post of Foreman 1st Grade, on an unestablished basis, with effect from 1.12.1972.

1.3.1.4.2 Secondments

Mr. Christos Phanartzis, from Hydrologist, Class II, (on secondment) was seconded to the Temporary post of Hydrologist, Class I, with effect from 1.10.1972.

Mr. Doloros Pitsillides, from the Temporary post of Inspector of Works (on secondment) was seconded to the permanent post of Inspector of Works, with effect from 1.1.1972.

Mr. Elias Chr. Eliades, from the Temporary post of Inspector of Works (on secondment) was seconded to the permanent post of Inspector of Works, with effect 1.1.1972.

Mr. Michael HjiConstantinou, from the Temporary post of Assistant Chief Foreman (on secondment) was seconded to the permanent post of Assistant Chief Foreman, with effect from 1.1.1972.

Mr. Vassos Athanasiou, from the Temporary post of Assistant Chief Foreman (on secondment) was seconded to the permanent post of Assistant Chief Foreman, with effect from 1.1.1972.

Mr. Panayiotis Polycarpou, from Foreman 1st Grade, to the Temporary post of Assistant Chief Foreman, with effect from 15.7.1972.

1.3.2 Resignations, transfers, retirements

1.3.2.1 Resignations

The following officers resigned from the Department during the year under review:

Mr. Christoforos Georghiou, Technical Assistant, tendered his resignation with effect from 2.3.1972.

Mr. Georghios Teklos, Clerical Assistant, tendered his resignation with effect from 5.7.1972.

1.3.2.2 Transfers

Mr. Soterios Kramvis, Geologist Class II, was transferred from this Department to the Geological Department, with effect from 1.1.1972.

Mr. Nicos Andreou, Technical Assistant, was transferred from this Department to the Geological Department with effect from 1.1.1972.

Mr. Vassos Nicolaou, Technical Assistant, was transferred from this Department to the Geological Department with effect from 1.1.1972.

Mr. Polydoros Gerolemou, Technical Assistant, was transferred from this Department to the Geological Department, with effect from 1.1.1972.

Mr. Georghios Kamintzis, Foreman 1st Grade, was transferred from this Department to the Geological Department, with effect from 1.1.1972.

Mr. Chrysostomos Sotiri, Foreman 1st Grade, was transferred from this Department to the Geological Department, with effect from 1.1.1972.

Mr. Ioannis Karaolis, Foreman 2nd Grade, was transferred from this Department to the Geological Department, with effect from 1.1.1972.

Mr. Nicolas Kyriacou, Foreman, 2nd Grade, was transferred from this Department to the Geological Department, with effect from 1.1.1972.

Mrs. Maroulla HjiGeorghiou, Clerical Assistant, was transferred from the Migration Office to this Department on the 10.5.1972.

Mr. Andreas Yiannakou, Administration Officer, 1st Grade, was transferred from this Department to the Ministry of Communications and Works on the 26.6.1972.

Mr. Charalambos HjiStavrou, Technical Assistant, was transferred from Limassol to Nicosia with effect from 1.7.1972.

Mr. Andreas Ph. Protopapas, Executive Engineer, Class II, was transferred from Nicosia to Limassol with effect from 23.10.1972.

Mr. Vassos Zenios, Technical Assistant, was tranferred from Nicosia to Famagusta with effect from 21.8.1972.

Mr. Antonios Shellis, Technical Assistant, was transferred from Nicosia to Paphos with effect from 1.2.1972.

Mr. Nicos Krashias, Storekeeper 2nd Grade, was transferred from this Department to the Department of Stores, with effect from 20.11.1972.

Mr. Antonios Hangoudis, Storeman 2nd Grade, was transferred to this Department from the Department of Stores on 13.12.1972.

1.3.2.3 Retirements

Mr. Michael Chrysanthou, Foreman 1st Grade, retired from the Government Service, due to age limit on the 31.1.1972.

Mr. Georghios HjiKyprianou, Foreman 1st Grade, retired from the Government Service due to age limit, on the 31.3.1972.

Mr. Georghios Koutis, Assistant Chief Foreman, retired from the Government Service, due to age limit on the 30.11.1972.

Mr. Andreas Zevlaris, Assistant Chief Foreman, retired from the Government Service, due to age limit on the 31.12.1972.

Mr. Georghios Panayides, Messenger 2nd Grade, retired from the Government Service, due to age limit on the 31.12.1972.

1.3.3 Scholarships - Fellowships - Duty Abroad

During 1972 a number of officers were granted scholarships, others were sent on short courses on attended Congresses and/or symposiums. 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. Demosthenes Patsallides, Topographer/Irrigation Engineer, was awarded a Fellowship by the Netherlands Government on Hydraulic Engineering and left Cyprus for Delft University on 26.10.1972.

Mr. Marcos Dymiotis, Executive Engineer, Class II, has also been awarded the same Fellowship. The Fellowship for both Mr. Patsallides and Dymiotis is expected to last until the 17th September, 1973.

Mr. Christos Ioannou, Hydrologist, Class II, was awarded a scholarship by the Government of Israel for the International Post-graduate course in the Exploration and Development of Groundwater Resources between 29/10/72-29/4/73.

Mr. Christos Phanartzis, Hydrologist Class I, who had been awarded a scholarship in Advanced Hydrological Studies by F.A.O. completed successfully his scholarship, and was awarded the M.Sc. in hydrology. He resumed his duties on the 6th of April, 1972. The scholarship was tenable at Arizona University, U.S.A.

Mr. Christos Marcoullis, Executive Engineer, Class I, who had been granted a scholarship by F.A.O. in advanced irrigation and studies, tenable at Utah University, U.S.A., completed successfully his cholarship and was awarded an M.Sc., with a major in Agricultural and Irrigation Engineering. He resumed his duties on the 12th February, 1972.

Mr. Costakis Andreou, Executive Engineer, Class I, 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 15th September, 1972.

Mr. Nicos Tsiourtis, Topographer Irrigation Engineer, who had been granted a scholarship by the Fullbright Programme in advanced Irrigation and Water Supply Studies, tenable at Missouri University, completed his schoralships successfully and resumed his duties on the 12th December, 1972.

1.3.3.2 Conferences Abroad

Mr. C.A.C. Konteatis, Director, attended the Eight F.A.O. Regional Conference for Europe which was held in Munich between the 16th to the 26th September, 1972.

Mr. Chr. Phanartzis, Hydrologist, Class I, participated in the Symposium on "Uncertainties in Hydrologic & Water Resources System", at Tuscon, U.S.A., from the 30th November 1972, to the 18th December, 1972.

1.3.3.3 Duty abroad

Mr. Neophytos Yiannakou, Suporintendent of Works, visited at the invitation of Corinthos Pipe making Factory, Corinthos, Greece, in order to watch the construction and testing of the pipes which were to be used for the Famagusta water supply. His stay lasted from the 10th of January to 16th January, 1972.

Mr. Georghios Michael, Chief Foreman. He too was invited by and attended the same factory.

Mr. J.Jacovides, Hydrologist, Class I, visited London from the 17th April to the 2nd May, 1972 for the completion of his studies on the completion of the Akrotiri Groundwater Mathematical Model in Association with the Institute of Geological Sciences of London.

1.4 Foreigh 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 Cyprus Water Planning Project

The main work carried out under this project was the Paphos Feasibility Study Phase "B" undertaken by the Consultants Sir. M. MacDonald, Howard Humphreys and Huntings of the U.K. The resident engineer of FAO supervising this project was Mr.A. McLaughlan. The project was officially terminated by the end of May 1972. By the end of the year the technical reports for the feasibility study were submitted to the Government.

The feasibility study provides for the irrigation of some 4666 ha of land between the Khapotami and Peyia villages up to an elevation of about 300 meters above sea level east of Paphos and up to an elevation of 500 meters west of Paphos. The project envisages the development of the fluvial groundwater resources of the main Paphos rivers and the construction of a dam on the Xeros river. The main peripheral canal from the dam will command the whole area. Pressure pumps will be provided for supplying water under pressure in most of the area.

As the project involves considerable investment of money foreign financing may be requested by the Government aiming at starting work in 1974. Drilling work and other preparatory works may start as early as 1973.

Under the CWP Project the assignment of Mr. Reid and Dr. Newbery was continued for another two visits for controlling the dam site investigations carried out by the Department on important dams in Larnaca, Paphos and Morphou regions.

1.4.1.2 Morphou-Tylliria Feasibility Study

Officially this study started in 1972 when the Consultants appointed by FAO, Electrowatt of Switzerland, started their work under the supervision of Mr. W. Rodger FAO Resident Engineer. This project whose purpose is the production of a feasibility report for the irrigation development of the Morphou-Tylliria area is scheduled to be completed in $2\frac{1}{2}$ years as from June 1972, with a first phase emergency work to be identified by June 1973, thus enabling an early implementation of this pressing project.

According to the plan of operation of the Morphou Feasibility Study the objectives of the Project are:

"The establishment of a water management plan for the Morphou-Tylliria area aiming at the most efficient use of the water resources available, in order essentially to preserve the present plantations in the Morphou area from destruction through lack of water, salinity, and to study the possibility of extension of irrigation in the Morphou area and in the Tylliria-Pendayia area. Provision will be made for domestic and other water supplies to be derived from the water resources available. On this basis an agricultural development programme shall be established for the area with a view to increasing the agricultural output with emphasis on products suitable for export."

The problems in Morphou are well known and the groundwater over-extraction is now estimated to be 25 million cubic meters annually in excess of the recharge. However, this over-extraction by 1980 should reach to as much as 45 million cubic meters due to the growing demand of the presently young plantations. Sea intrusion has already been noticed coastally and the drop of the water table has been alarming having reached 14 meters below sea level at around Morphou,6 meters at around Syrianochori and 1 meter at around Pendayia. The zero, (sea level), water table has been steadily advancing inland since the last three years having moved for 3 kilometers during these three years and is presently upstream of Morphou as about the position where the Morphou dam is situated on the Serakhis river. This deterioration of the groundwater resources in this region has been accelerated due to the illegal extraction of plantations in the region, the unauthorized extraction of water from many wells and the wasteful methods of irrigation water.

It is quite obvious that the water condition in Morphou is such that there is no time to waste anymore, and that action should be taken by the Government towards many directions.

Offirst interest,it should be the effective control of the region which should be put under strict legal enforcement directed towards proper water extraction, utilization and control of irrigated land utilization. With high efficiency water and land utilization becoming effectively applied in Morphou, it should be possible for the Government to divert excess water into this region from western rivers. It is understood that considerable development work will have to be done in the westerncatchments from where such water is to be diverted to Morphou in order to enable such diversion to materialize.

1.4.2 British Technical Assistance

During the year British Technical Assistance was continued as follows:

1.4.2.1 Akrotiri Feasibility Study

This study continued its functions, being undertaken by Consultants Howard Humphreys, Sir M. MacDonald and Huntings. Most of the reports were submitted by the end of the year but still some more are expected to be available early 1973.

This study is similar to that of Paphos and it also envisages groundwater development in the lower valley of the river Kouris and a major dam on the Kouris river itself. It also provides for the use for the same region of the two dams already built, the one on the Garyllis and the other on the Yermasoyia rivers.

1.4.2.2 The Kyrenia Range Aquifer Investigations

These, continued during the year, and Sir F. Dixey paid two monthly visits for this purpose to supervise the drilling operations on the limestones. This project is considered to have been completed and a report by Sir. F. Dixey is to be published early in 1973. The work carried out and the report will show the significant water storage of the limestone and the possibility of utilizing this water through drilling and pumping.

With this opportunity we wish to congradulate Sir Frank for the knighthood bestowed upon him by H.M. Queen during the year.

1.4.2.3 Desalination Studies

Interesting studies were made for us during the year by the Water Research Association of the U.K. A team visited Cyprus under the leadership of the Chief Economist of the Association Dr. Mawer and two reports were submitted. The one dealt with the Integrated use of desalination with surface water resources with particular emphasis on the Lefkara Dam, the Yermasoyia Dam and the proposed Kalavasos dam in connection with domestic water supplies. The second report dealt with desalting of brackish ground water sources in land with particular emphasis on the Famagusta water supply requirements.

1.5 Cyprus National Inter-Departmental and Departmental Committees

1.5.1 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 Department

Mr. A. Papasolomontos, Director, Agricultural Department

Mr. Th. Christou, Director, Agricultural Research Institute

Mr. G. Seraphim, Director, Forest Department

Mr. C. Philaniotis, Assistant Meteorologist, Meteorological Office

The main activities during the year were the 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.

1.5.2 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 1972 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

Members — Mr. K.C. Hassabis,
Assistant Director

Mr. Y. Zambarloukos,
Representative of the Association of Civil Engineers and Architects

Mr. G. Paraskevaides,
Representative of the Association of Contractors

Towards the end of the year Mr.A. Papadopoulos was appointed as Representative of the Association of Civil Engineers and Architects owing to the appointment of Mr. Y. Zambarloukos as Minister of Communications and Works.

At about the same time Mr. Y. Zambarloukos was nominated as the new Representative of the Association of Building Contractors.

After obtaining Government Approval the Cyprus National Committee has issued an invitation to delegates at the 42nd Executive Meeting of the I.C.O.L.D. (to be held in Athens in September 1974) to participate in a study Tour in Cyprus.

The 40th Executive Meeting was held in Cambera, Australia on 17th-19th April 1972. Cyprus was not represented.

Arrangements are being made for a delagation of the CNCOLD to attend the 41st Executive Meeting and 11th Congress on Large Dams in Madrid during June 1973.

The CNCOLD is fortunate in having Mr. H.H. Dixon, Vice President of ICOLD , currently Chief Resident Engineer, Famagusta Water Supply Project in Cyprus. His attendance at committee meetings and advice on matters of the Committee are invaluable.

1.5.3 International Commission on Irrigation and Drainage

Cyprus is a member country of the International Commission on Irrigation and Drainage since 1954. The International Commission on Irrigation and Drainage is a non profit organization whose objectives is to stimulate and promote the development and application of the science and Techniques of irrigation, drainage, flood control and river training in the engineering, economic and social aspects.

Although Cyprus was a member country since 1954 the Cyprus Committee on Irrigation and Drainage was formed in 1964 and it is now composed of the following.

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

Secretary — Mr. D.Patsalides - August 1971-Sept. 1972
Mr. E. Kambourides - September 1972 - (both)
Irrigation Engineer Water Development Department

Ex-Officio Members — Director,
Department of Forest

Director, Department of Agriculture

Director, Agricultural Research Institute.

DAMS CONSTRUCTED UP TO 1960

No	DAM	TYPE	H.T.	1000m³	YEAR
1	Kouklia	Earth	6.1	4545	1900
2	Lymbia	Masonry	5.2	18	1945
3	Lythrodhonta	Masonry	10.7	32	1945
4	Kalochorio (Kl)	Masonry	9.1	82	1947
5	Akrounda	Masonry	6.7	23	1947
6	Galini	Masonry	11	23	1947
7	Petra	Masonry	9.1	32	1948
8	Petra	Masonry	9.1	23	1951
9	Lythrodhonta	Masonry	10.4	32	1952
10	Kafizes	Masonry	23	113	1953
11	Ayios Loucas	Earth	3.4	455	1955
12	Gypsos	Earth	3.4	100	1955
13	Kandou	Masonry	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	H.T.	1000 m³	YEAR
47	Sotira	Earth	7.6	45	1962
48	Panayia (F)	Earth	7	45	1962
49	Paralimni (45)	Earth	4.6	115	1963
50	Ayia Napa (7)	Earth	8.2	55	1963
51	F'sta Recharge	Earth	4.9	50	1963
52	Phrenaros (6)	Earth	5.5	115	1964
53	Dherynia	Earth	6.1	23	1964
54	Phrenaros (3)	Earth	6.7	45	1966
55	Avgorou (7)	Earth	3	68	1966
56	Kontea (2)	Earth	5.5	82	1966
57	Xylophagou (4)	Earth	6.7	86	1966
58	Sotira (4)	Earth	4.6	32	1966
59	Lysi	Earth	6.7	77	1967
60	Ay. Yeorgios (9)	Earth	3	68	1967
61	Ay. Epiktitos (6)	Earth	6.1	34	1968
62	Akanthou (6)	Earth	6.1	45	1968
63	Akhna (3)	Earth	4.3	40	1968
64	Xylotymbou (5)	Earth	5.5	50	1969

Total Storage Capacity 1.075 $m^3 \times 10^6$

MAJOR DAM PROJECTS FROM 1960-70

No	DAM	TYPE	H.T.	1000m³	YEAR
17	Prodhromos	Earth	10	122	1962
18	Morphou	Earth	13	1,879	1962
19	Letka	Gravity	35	368	1962
20	Geunyeli	Earth	15	1,045	1962
21	Athalassa	Earth	18	791	1962
22	Kanli Keyu	Earth	19	1,113	1963
23	Argaka	Rockfill	41	1,150	1964
24	Mia Milea	Earth	22	355	1964
25	Ovgos	Earth	16	845	1964
26	Tremithios	Earth	22	1,614	1964
27	Agros	Earth	26	99	1964
28	Liopetri	Earth	18	340	1964
29	Polemidhia	Earth	45	3864	1965
30	Ayia Marina	Rockfill	33	311	1965
31	Kalopanayiotis	Earth	40	391	1966
32	Mavrokolymbos	Earth	45	2180	1966
33	Pomos	Earth Rock	38	859	1966
34	Yermasoyia	Earth	49	13600	1968
35	Syngrasis	Earth	73	1,115	1968

Total Storage Capacity 32.041 $m^3 \times 10^6$

MAJOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	H.T.	1000m³	YEAR
36	Ay. Yeorghios	Earth	6.1	90	1962
37	F'sta Antiflood	Earth	7.6	165	1963
38	Ay. Nicolaos	Earth	1.8	1,365	1964
39	Paralimni Lake	Earth	0.9	1,365	1964
40	Fresh Water Lake	Earth	3	4,545	1964
41	Makrasyka	Earth	7.9	195	1966
42	Akhna (Mesania)	Earth	3.7	90	1967
43	Morphou spreading grounds	Earth	4.6	130	1968
44	Ormidhia	Earth	5.5	100	1968
45	Vrysoules	Earth	6.7	140	1969
46	Protopapas	Earth	5.9	90	1970

Total Storage Capacity 8.275 $m^3 \times 10^6$

MAJOR DAM PROJECTS FROM 1971 —72

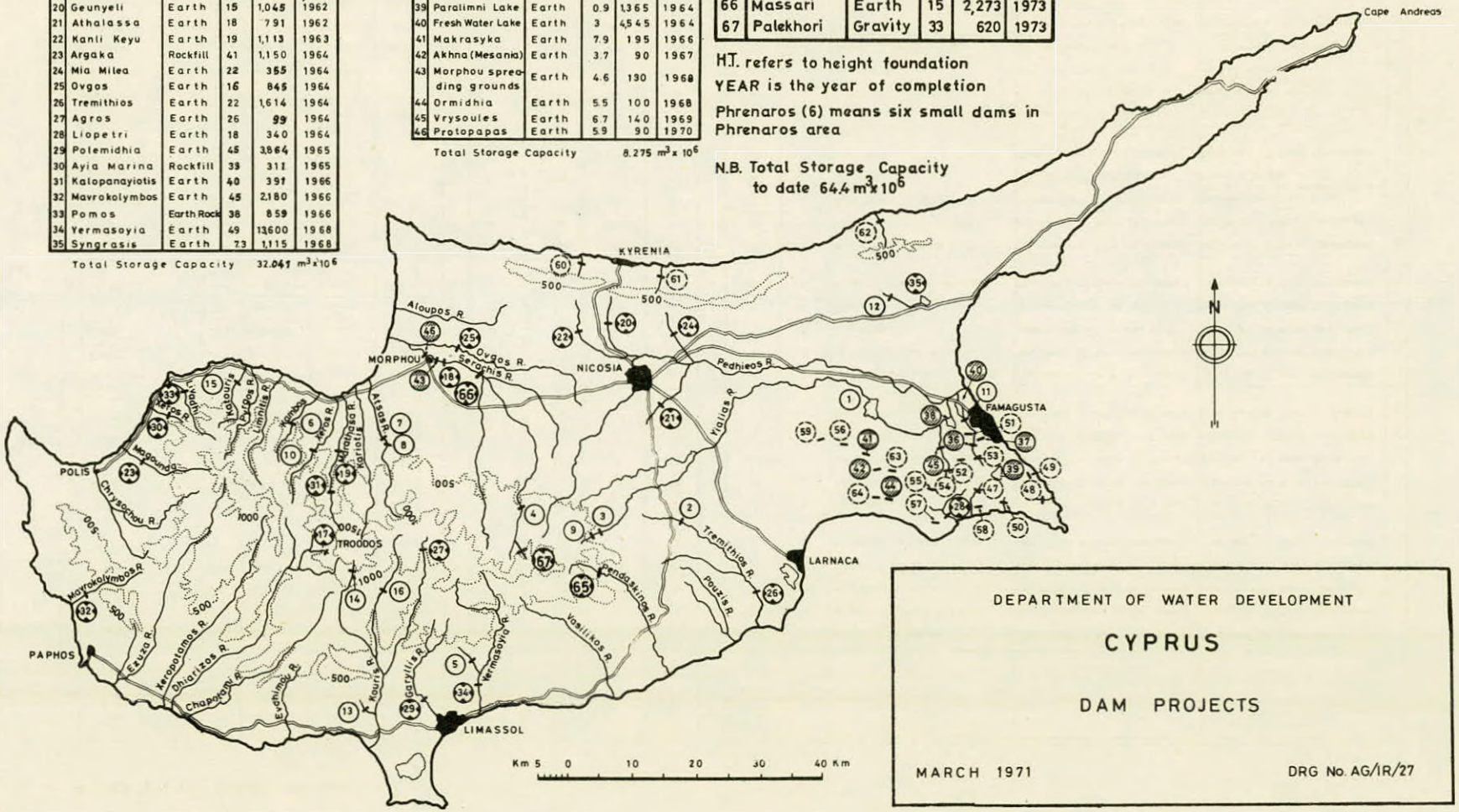
No	DAM	TYPE	H.T.	1000m³	YEAR
65	Letkara	Earth/ Rockfill	71	13,850	1973
66	Massari	Earth	15	2,273	1973
67	Palekhori	Gravity	33	620	1973

H.T. refers to height foundation

YEAR is the year of completion

Phrenaros (6) means six small dams in Phrenaros area

N.B. Total Storage Capacity to date 64.4 $m^3 \times 10^6$



(1) Dams constructed up to 1960

(17) Major dam projects from 1960-70

(36) Major recharge dams from 1960-70

(47) Minor recharge dams from 1960-70

DEPARTMENT OF WATER DEVELOPMENT

CYPRUS

DAM PROJECTS

MARCH 1971 DRG No. AG/IR/27

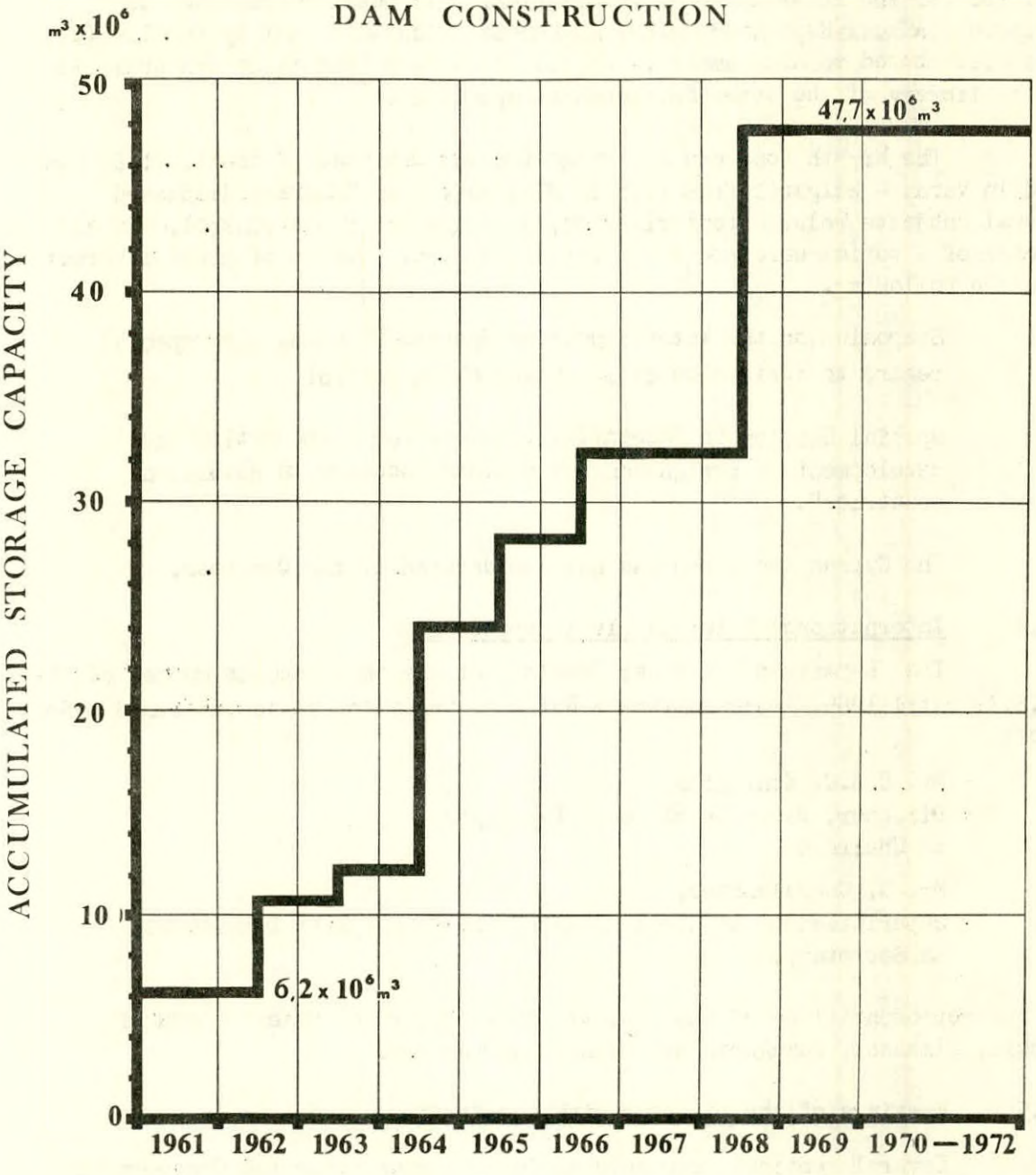
REGISTER OF DAMS IN CYPRUS.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
LINE No	NAME OF DAM	YEAR OF COMPLETION	LOCATION			TYPE	HEIGHT ABOVE LOWEST FOUNDATION (m)	LENGTH OF CREST (m)	VOLUME CONTENT OF DAM (10^3 m^3)	GROSS CAPACITY OF RESERVOIR (10^3 m^3)	PURPOSE	MAXIMUM DISCHARGE CAPACITY OF SPILLWAY (m^3/s)	TYPE OF SPILLWAY	OWNER	ENGINEERING BY	CONSTRUCTION BY	LINE No
			RIVER	NEAREST CITY	District												
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	C/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	Serrakhis	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 MILIA	1964	Pedhieos	Nicosia	Nicosia	TE	22	140	54	355	I	24	L	Mia Milia Irrigation Division	Department of Water Development	Department of Water Development	16
17	OVGOS	1964	Serrakhis	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	71	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	MASSARI	C (1972)	Serrakhis	Nicosia	Nicosia	TE	15	929	245	2 273	I	622	L	Government	Department of Water Development	Department of Water Development	25
26	PALECHORI-KAMBI	C (1973)	Akaki	Nicosia	Nicosia	PG	33	131	27	620	I	65	L	Government & Palechori Irrigation Division	Department of Water Development	Ioannou & Paraskevaides Ltd.	26

PG	Gravity Dam	V	Controlled Spillway
TE	Earthfill Dam	I	Irrigation
ER	Rockfill Dam	S	Water Supply
L	Uncontrolled Spillway	C	Flood Control

DEPARTMENT OF WATER DEVELOPMENT

DAM CONSTRUCTION



The activities of the Cyprus Committee during the year 1972 were limited to the keeping of correspondence with the central office of the I.C.I.D. for the Intercharge of Information. All publications such as bulletins, Annuals Reports and other documents which were sent by the I.C.I.D. were distributed to all members. Copies of these publications are available at the library of the Water Development Department.

The Eighth Congress on Irrigation and Drainage of the I.C.I.D. was held in Varna - Bulgaria from 17th to 27th May. The Congress discussed several subjects related to irrigation, drainage and flood control. In all a total of 5 topics were presented for discussion. Topics of great interest were the following.

Symposium on the Water Resources Systems Planning with special regard to irrigation, drainage and Flood Control

Special Session on "Essential measures for introduction and development of irrigation and drainage schemes in developing countries".

The Cyprus committee was not represented at the Congress.

1.5.4 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.

1.5.5 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.

1.6 Water Resources

1972 was a dry year, the average precipitation having reached 387 millimeters which is only 77% of the normal. The winter months were affected more seriously whereas the spring months were normal. The snowfall on Troodos was also on the low side.

The flow in the rivers was well average and many of the dams received no water at all during the year. The Troodos mountain dams were filled with water and overflowed.

The deterioration of the main groundwater aquifers has now become a permanent feature of our hydrological situation. The Famagusta aquifer situation is now more or less constant with water being pumped depending on the annual recharge, as in its largest part there is no storage available.

Most of the Famagusta aquifer extraction is for spring potatoes, and for such period of irrigation which only lasts until May, the water availability is at the moment satisfactory. Plantations and annual crops are being gradually curtailed. In the case of the Morphou aquifer the groundwater situation deteriorates rapidly, as the efforts undertaken by the Government and the enforcement of the various lows are insufficient. It is to be noted that in Morphou even now considerable quantities of water are wasted through inefficient conveyance and water application systems. On the other hand in Famagusta the water utilization is considered to be efficient and in most cases sprinkler irrigation is applied. In the case of Akrotiri the groundwater situation has declined during the year but the plantations did not experience any shortage. In this area too, considerable improvements in the irrigation systems have to be enforced.

1.7 Planning and Design of Projects

The main projects under design were:

1.7.1 The Paphos Feasibility Study which was completed during the year and the reports submitted to the Government for consideration.

1.7.2 The Akrotiri Feasibility Study which was also completed during the year and the reports are expected in 1973.

1.7.3 The Morphou - Tylliria Feasibility Study was started during the year under FAO supervision and is scheduled to be completed in $2\frac{1}{2}$ years time.

1.7.4 Planning work on a computerized mathematical model was well advanced during the year for an interbasin study between Paphos and Famagusta. This project links all the basins from Paphos to Famagusta utilizing water locally and transferring surpluses eastwards. A great number of alternatives are considered. Two main mathematical models are involved, one for the water resources balance involving project works, and the other being an economic model utilizing costs and benefits and producing benefit cost ratio and internal rate of return for the various alternatives under study.

1.7.5 Also planning and design works were undertaken by the Department for many other projects including Nicosia, Famagusta and Limassol water supplies.

Field and laboratory investigations were extensively carried out during the year mainly on the damsites proposed for the Morphou-Tylliria project, as well as in the Larnaca and in the Paphos districts for the proposed Southern Conveyor System. Investigations for small mountain dams of local interest were also carried out.

For non departmental works, investigations were carried out for the Nicosia-Morphou road, the Nicosia International Airport, and the proposed residential project of the Cyprus Civil Service Building Society. Also grouting works for the reinforcement of the columns and footings of the Ayia Sophia Mosque Nicosia, were executed during the year.

1.8 Construction of Projects

The construction works during the year resulted to a record expenditure having reached £1,910.000.

1.8.1 Major Projects

Three major dams were under construction during the year. The largest one at Lefkara together with a long conveyor from Lefkara to the Treatment Works at Khirokitia which were also under construction.

This dam is the largest built in Cyprus until now being of a height of about 70 meters rockfill, and is estimated to cost about £1,200.000. The Khirokitia Treatment Works is the first treatment water plant to be established in Cyprus involving sedimentation tanks, filtration and sterilization of a capacity of about twenty thousand cubic meters per day. The Palekhori dam is the largest concrete dam built in Cyprus and was built on a side stream of the Maroulena river as on the main stream, the damsite originally envisaged was found to be unsuitable due to a major fault. The third dam under construction was Massari dam being built upstream of the Morphou dam at the confluent of the three main tributaries of the Serakhis river. The main purpose of this dam is the release of water for recharge downstream through the riverbed into the main aquifer.

The main distribution system for the Arkaka-Magounda dam was undertaken also during the year at an estimated cost of £125,000.

The next largest town water supply scheme apart from the Famagusta water supply works carried out during the year, was for the Nicosia water supply involving additional boreholes at Pendayia and the conveyance of water from Pendayia to the pumping station at Syrianochori.

1.8.2 Rural Domestic Water Supplies

About 52 rural domestic water supply schemes at a cost of about £303,000 were constructed during the year. The most important village schemes were Regional Schemes involving groups of villages in Pitsilia, Lymbia and neighbouring villages, Polemidhia and neighbouring villages, Vatili and neighbouring vilages and Lefkara and neighbouring villages the latter one being supplied from the Khirokitia reservoir of the Famagusta water supply system.

1.8.3 Routine Irrigation Works

43 small irrigation schemes were carried out during the year at a total cost of £43,000. These irrigation schemes included lining of earth channels, pipe conveyors, diversion weirs, small reservoirs, borehole pumping schemes, improvement of springs small recharge dams, river training and drainage schemes.

Recharge works were built in Famagusta and in Kyrenia districts, river training works were carried out at Kelokedhara, Mamonia and Nikoklia-Paphos and drainage works were carried out in the Famagusta district at Gadhouras and Koma-tou-Yialou.

The average number of labourers employed by the Department during 1972 was 980 as compared with 954 in 1971. 38% were classed as regulars whilst approximately 57.50% were skilled employees, 8.40% semi skilled and 34.10% unskilled, 8.88% of the labourers employed were Turks.

The approximate monthly average of labourers engaged was as follows:

January	798
February	800
March	785
April	875
May	961
June	1022
July	1162
August	1158
September	1115
October	1083
November	1035
December	973
Monthly average	980

1.9 Operation and Maintenance of Projects

1.9.1 Major Irrigation Works

During the year a number of routine maintenance works were carried out on the major Government dams at a total cost of £3.017. In addition £2,643 were spent on the maintenance of the irrigation systems from this dam thus reaching a total of expenditure of £5,660.

Also maintenance work was done on contributary dams at a total cost of £891. The main repair works were carried out for the operating gates, steel work, and other items requiring maintenance.

1.9.2 Town Water Supplies

For the town water supplies for which a great portion is administered by the Department of Water Development the following work was executed.

1.9.2.1 Nicosia Water Supply

During the year the distribution system of the Nicosia scheme of 4" and 6" diameters asbestos pipes was extended. By the end of the year the number of consumers reached to 10,163. The total amount of water conveyed from all sources during the year was 7,801,006 cubic meters. The highest daily consumption reached in summer at 27,870 cubic meters giving an average of 49 gallons per capita. The revenue from the sale of water was £138,000.

1.9.2.2 Famagusta Water Supply

The Government supply to Famagusta during the year was from the Khirokitia reservoir where water from the nearby boreholes and the Vasilikos sub-surface dam is collected. The total quantity of water conveyed to Famagusta from this system during the year was 1,691,930 cubic meters. The revenue from the sale of this water was £66,720.

1.10 Finance and Expenditure

During the year, the total expenditure reached was £2,289,675 including all administration costs.

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 £1,116.000 were spent. The administration costs including hydrological observations, consultants' fees and major projects investigations reached £381,000 during the year which represents 20% of the total departmental expenditure. This, as can be seen from Table 3, is by 13.5% lower than that of 1971 (33.5%) and is due to the large scale of construction works carried out during 1972.

The monthly expenditure of the Department as can be seen from Table 2 is again very unevenly distributed ranging from 2.6% in January and increasing to 70% 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.

Table 1-1972 Expenditure - Water Development Department

	Details	Government funds £	Contribution by Beneficiaries £	Total
1.	Administration	265,447	-	265,447
2.	Irrigation, Drainage and Dams	1,161,229	73,135	1,234,364
3.	Town Water Supplies	48,815	3,300	52,115
4.	Village Water Supplies	149,940	170,496	320,436
5.	Drilling and Prospecting	11,168	-	11,168
6.	Hydr.Obs.Reseach and Weirs	21,816	-	21,816
7.	Workshops (Maintenance)	23,782	-	23,782
8.	Purchase of Machinery tools and Equipment	8,597	-	8,597
9.	Consultants' Fees	18,653	-	18,653
10.	Govt. Water Supplies	1,840	-	1,840
11.	Major Projects Investigations and Surveys	37,232	-	37,232
12.	Greater Nicosia Scheme	288,174	-	288,174
13.	Water Supply-Special Measures Law	418	-	418
14.	Flood damages	-	-	-
15.	Erection of Buildings	-	-	-
16.	Stores	5,633	-	5,633
	Includes Ordinary and Development Expenditure	2,042,744	246,931	2,289,675
	Breakdown of Administration			
1.	Personal Emoluments	159,641	-	159,641
2.	Casual Assistance	9,893	-	9,893
3.	Technical Assistance	29,568	-	29,568
4.	Travelling	23,799	-	23,799
5.	M'ce and Operation of M. Transport	22,770	-	22,770
6.	Office Expenses	4,322	-	4,322
7.	Leave pay to R.E.	15,294	-	15,294
8.	Lecal Training of Staff	160	-	160
	Total	265,447	-	265,447

Table 2 - Monthly Statement of Development Expenditure for the year 1972

1972 Approved	£2,519,952
Additional S/Warrants Nos. 4,22,25,60 and 81/72	£ 50,243
Total	£2,570,195

Month	Monthly £	Expenditure up-to-date £	Balance £	% to date Expended
January	67,885	67,885	2,502,310	2.6%
February	70,248	138,133	2,432,062	5.4%
March	95,037	233,170	2,337,025	9%
April	183,718	416,888	2,153,307	16.2%
May	132,601	549,489	2,020,706	21.3%
June	248,762	798,251	1,771,944	31%
July	75,098	873,349	1,696,846	33.3%
August	114,553	987,902	1,582,293	38.4%
September	178,007	1,165,909	1,404,286	41.4%
October	109,272	1,275,181	1,295,014	49.5%
November	235,220	1,510,401	1,059,794	58.9%
December	287,899	1,798,300	771,895	70%

Summary

Approved amount	£2,570,195(100%)
Less actual expenditure	£1,798,300(70%)
Unspent Balance	£ 771,895(30%)

Table 3 - Statement of Expenditure

Serial No.	Details	1972
1.	Administration	265,447
2.	W/shops M'ce of Plant and Stores	29,415
3.	Purchase of Machinery tools etc.,	8,597
4.	Hydrological Observations	21,816
5.	Consult[illegible] Fees	18,653
6.	Major Projects Investigations	37,232
	Sub-Total "A"	381,160
7.	Drilling of Water	11,168
8.	Water meters for wells and boreholes	418
9.	Town water supplies	342,129
10.	Village water supplies	320,436
11.	Small Irrigation Projects	118,341
12.	Major Irrigation Projects	1,116,023
	Sub-Total "B"	1,908,515
	Grand Total	2,289,675
	% of A to B	20%

Major Irrigation Works- (2D-11)

Scheme	Amount Dedaggered £ mils	Estimated Cost Government £ mils	Village £ mils	Total £ mils	Government £ mils	Actual Expenditure Village £ mils	Total £ mils
CONTRIBUTORY SCHEMES							
Famagusta-Dherinia	15,426,000	15,426,438	7,713,219	23,139,657	13,819,367	6,909,682	20,729,049
Morphou "Serrakhis" Compens.	525,000	524,254	175,086	699,340	18,851	6,284	25,135
Morphou Recharge"Protopapas"	1,478,000	1,480,891	991,480	2,472,371	487,893	315,681	803,574
Morphou "Serrakhis"Spr.Grounds"	13,533,000	13,533,000	6,767,000	20,300,000	-	-	-
Ovgos-Compensations	336,000	4,172,878	1,390,959	5,563,837	74,793	24,930	99,723
Syrianokhori "Kokkinogi"(1)	753,000	752,975	752,975	1,505,950	591,730	591,729	1,183,459
Syrianokhori "Kokkinogi"(ii)	80,000	80,471	80,470	160,941	-	-	-
Syrianokhori - P.House	188,000	187,872	95,437	283,309	-	-	-
Palekhori "Sklidros" Dam	96,547,000	96,547,000	32,183,000	128,730,000	90,083 ,757	30,027,917	120,111,674
DAMS-GOVERNMENT ONLY							
Pomos-Compensations	851,000	851,000	-	851,000	269,700	-	269,700
Kalopanayiotis	5,245,000	5,245,000	-	5,245,000	910,905	-	910,905
Mavrokolymbos	8,046,000	8,046,000	-	8,046,000	317,650	-	317,650
Agros	222,000	222,000	-	222,000	-	-	-
Polemidhia	400,000	400,000	-	400,000	-	-	-
Yermasoyia	12,475,000	12,475,000	-	12,475,000	3,887,328	-	3,887,328
Kiti	839,000	839,000	-	839,000	838,055	-	838,055
Massari	120,000,000	120,000,000	-	120,000,000	113,647,426	-	113,647,426
Lefkara Dam	451,242,000	451,242,000	-	451,242,000	432,770,864	-	432,770,864
Lefkara Khirokitia Pipeline	270,000,000	270,000,000	-	270,000,000	257,526,842	-	257,526,842
Khirokitia Treatment Plant	58,345,000	58,345,000	-	58,345,000	52,084,242	-	52,084,242
DISTRIBUTIONS							
Kalopanayiotis	2,581,000	2,581,000	-	2,581,000	1,789,110	-	1,789,110
Mavrokolymbos	6,845,000	6,845,000	-	6,845,000	1,944,181	-	1,944,181
Yermasoyia	6,330,000	6,330,000	-	6,330,000	4,657,526	-	4,657,526
Polemidhia	13,502,000	13,502,000	-	13,502,000	6,688,958	-	6,688,958
Pomos Stage III	153,000	153,000	-	153,000	39,893	-	39,893
Kiti - Pervolia	61,000	61,000	-	61,000	-	-	-
Kiti - Stage III	31,250,000	31,250,000	-	31,250,000	30,004,410	-	30,004,410
Argaka-Magounda	50,000,000	50,000,000	-	50,000,000	43,872,545	-	43,872,545
Ay.Marina	28,000,000	28,000,000	-	28,000,000	21,901,075	-	21,901,075
Total	£1,195,253,000	1,199,092,779	50,149,626	1,249,242,405	1,078,147,315	37,876,223	1,116,023,538

Minor Irrigation Works (2D-12)

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
Athienou "Marmarika"	905,734	452,867	1,358,601	889,143	444,572	1,333,715
Akhyritou "Vrysoulles"	985,372	493,184	1,487,556	8,833	4,417	13,250
Ay.Georghios "Kyrenia"	800,000	400,000	1,200,000	1,777,309	888,654	2,665,963
	1,866,000	934,000	2,800,000			
Ay.Epiktitos	2,666,000	1,334,000	4,000,000	2,577,757	1,288,878	3,866,635
Ay.Marina Xyliatos	866,000	434,000	1,300,000	859,706	429,851	1,289,557
Akrounda M'ce of Dam	355,000	177,000	532,000	327,486	163,744	491,230
Ay. Georghios)		3,300,000			2,612,189	
Petra)	10,000,000	1,700,000	15,000,000	7,915,725	1,345,673	11,873,587
Ay. Napa	600,000	300,000	900,000	331,411	165,704	497,115
Ay.Amvrosios "Steradja"	406,000	294,000	700,000	306,523	221,965	528,488
Ay.Amvrosios "Mouthouna"	414,000	486,000	900,000	319,174	374,680	693,854
Ay.Amvrosios Kyrenia	266,000	134,000	400,000	261,313	130,656	391,969
Akhna Recharge	2,466,000	1,234,000	3,700,000	508,589	254,294	762,883
Elia Kyrenia	994,387	497,193	1,491,580	771,942	385,972	1,157,914
Esso-Galata	866,000	434,000	1,300,000	859,345	429,672	1,289,017
Exo Metokhi	280,000	70,000	350,000	185,111	46,279.	231,390
Gaidhouras	329,523	165,262	494,785	162,979	81,490	244,469
Kato Koutraphas (1968)	1,499,773	749,387	2,249,160	1,457,970	728,985	2,186,955
Kelokedhara "Ziripilli"	274,856	95,754	370,610	211,006	73,522	284,528
Nikoklia River Train	1,538,714	1,731,136	3,269,850	1,363,882	1,549,314	2,933,196
Kyperounda "Dhymes"	309,346	206,230	515,576	280,320	186,880	467,200
Kato Pyrgos (Old)	169,864	84,934	254,798	21,334	10,666	32,000
Kato Pyrgos (New)	10,000,000	5,000,000	15,000,000	8,488,973	4,244,486	12,733,459
Koma-tou-yialou Fish Boards	1,496,000	-	1,496,000	1,387,282	-	1,387,282
Kalokhorio M'ce of Dam	54,000	26,000	80,000	42,936	21,468	64,404
Kyperounda "Kardana"	1,235,000	1,235,000	2,470,000	1,216,804	1,216,804	2,433,608
Kyperounda "Earth Res.")		8,000,000			2,365,525	
C.A.Mines)	8,000,000	8,000,000	24,000,000	2,365,523	2,365,524	7,096,572
Karakoumi	1,266,000	634,000	1,900,000	1,077,396	538,700	1,616,096
Marathovounos-Pyrga	2,400,000	600,000	3,000,000	1,738,336	434,585	2,172,921
Moutoullas	8,466,000	4,234,000	12,700,000	7,230,360	3,915,179	11,145,539
Maroni Pumping	18,666,000	9,334,000	28,000,000	12,299,103	6,149,550	18,448,653
C/F	80,441,569	52,769,947	133,211,516	57,263,571		

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	80,441,569	52,769,947	133,211,516	57,263,571	33,069,878	90,333,449
Maroni "Safto"	670,794	335,897	1,006,691	551,758	275,879	827,637
Nata	2,266,000	1,134,000	3,400,000	862,687	431,343	1,294,030
Peristerona)		90,643			63,065	
Astromeritis)	175,876	45,821	351,751	110,363	31,533	220,727
Orounda		39,411			15,766	
Peristerona)		110,217)				
		99,955)			121,337	
Astromeritis)	164,827)	54,609)	329,653)			
	150,436)	50,478)	300,869	182,005	60,668	364,010
Peristerona (1968-1969)	76,744	76,743	153,487	67,755	67,756	135,511
Potami	740,525	371,262	1,111,787	740,000	370,000	1,110,000
Psomolophou	3,601,532	1,800,766	5,402,298	3,571,759	1,785,878	5,357,637
Pelendria "Nikomites"	480,000	320,000	800,000	387,055	258,036	645,091
Psematismenos	9,000,000	4,500,000	13,500,000	5,462,716	2,731,782	8,194,498
Pera-Pedhi-M'ce of Dam	100,000	50,000	150,000	99,233	49,617	148,850
Phrenaros	155,607	77,803	233,410	22,320	11,160	33,480
F'sta-Dherinia	2,786,578	1,394,290	4,180,868	90,000	45,000	135,000
Tris Elies "Milarka"	2,000,000	1,000,000	3,000,000	1,998,000	960,499	2, 881,497
Trimiklini M'ce of Dam	93,000	47,000	140,000	88,018	44,009	132,027
Tymbou No.I	640,000	160,000	800,000	562,743	140,684	703,427
Thermia	1,600,000	800,000	2,400,000	1,255,731	627,866	1, 883,597
Yerasa	1,660,000	840,000	2,500,000	904,678	452,339	1, 357,017
Zigi-Tokhni	554,963	276,982	831,945	6,513	3,257	9,770
Statos	800,000	400,000	1,200,000	625,112	312,555	937,667
Total	108,158,451	66,845,824	175,004,275	74,775,015	41,929,907	116,704,922

Village Water Supplies (2D-21)

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
Alona)		34,402			3,822	
Platanistasa)		29,814			4,446	
Polystipos) I	121,096	28,670	242,192	13,000	1,768	26,000
Lagoudhera)		25,917			1,859	
Sarandi)		2,293			1,105	
Alona)		1,176,981			249,577	
Platanistassa)II	2,573,873	1,396,892	5,147,746	542,559	292,983	1,085,119
Alona Phase II	5,200,000	5,920,000	11,120,000	3,250,976	3,701,495	6,952,471
Platanistassa	2,250,000	2,970,000	5,220,000	1,992,846	2,630,925	4,623,771
Athienou	6,269,926	6,269,926	12,539,852	4,467,407	4,467,408	8,934,815
Kalepia)		1,072,881			1,047,099	
Letymbou) Ayia	2,980,226	1,490,113	5,960,452	2,908,605	1,454,302	5,817,211
Pittarkou)Scheme	417,232	-		407,205	-	
Armenokhori	1,400,000	1,700,000	3,100,000	1,368,489	1,661,822	3,030,311
Akhyritou	10,750,000	12,550,000	23,300,000	8,320,964	9,713,200	18,034,164
Ay.Theodhoros Soleas	7,117,000	3,558,000	10,675,000	3,208,260	1,604,130	4,812,390
Ay.Amvrosios Kyrenia	6,400,000	6,400,000	12,800,000	971,829	971,829	1,943,658
Evrykhou	843,558	843,558	1,687,116	577,694	577,694	1,155,388
Episkopi Paphos	530,133	658,646	1,188,779	3,561	4,419	7,980
Fterykha)		1,725,000			774,000	
Elia)	7,475,000	2,300,000	11,500,000	3,354,000	1,032,000	5,160,000
Fterykha	2,550,000	1,030,000	3,580,000	2,127,119	859,150	2,986,269
Elia	2,600,000	2,720,000	5,320,000	1,773,293	1,855,297	3,628,590
Kalogrea	1,140,175	1,140,173	2,280,348	964,346	964,346	1,928,692
Kapouti	4,146,020	4,696,352	8,842,372	2,207,937	2,502,832	4,710,769
Kontemenos	1,386,189	1,529,333	2,915,522	851,884	940,046	1,791,930
Kambi Pharmakas	848,398	885,068	1,733,466	6,782	7,058	13,840
Korphi	537,494	268,745	806,239	27,527	13,764	41,291
Kedhares	1,478,822	2,051,706	3,530,528	1,132,187	1,563,496	2,695,683
Karavas	16,066,285	19,636,570	35,702,855	11,117,437	13,367,976	24,485,413
Kakopetria	10,750,000	10,750,000	21,500,000	6,492,567	6,492,567	12,985,134
Kouklia Paphos	2,300,000	2,060,000	4,360,000	1,005,045	899,891	1,904,936
C/F	98,131,427	96,921,040	195,052,467	59,093,519	59,662,306	118,755,825

Scheme	Estimated Cost			Actual Expenditure		
	Government £ mils	Village £ mils	Total £ mils	Government £ mils	Village £ mils	Total £ mils
B/F	98,131,427	96,921,040	195,052,467	59,093,579	59,662,306	118,755,825
Kalokhorio Klirou	1,028,836	1,028,831	2,057,667	1,140	1,141	2,281
Klirou	1,250,000	1,250,000	2,500,000	906,620	906,621	1,813,241
Goudhi	1,850,000	2,270,000	4,120,000	218,687	267,824	486,511
Lapithos	11,666,974	17,500,462	29,167,436	7,167,827	10,751,742	17,919,569
Lagoudhera	3,350,000	3,710,000	7,060,000	1,741,654	1,928,850	3,670,504
Pano Lefkara Reg.Scheme	12,495,708	-	12,495,708	6,973,869	-	6,973,869
Pano Lefkara Phase IB2	1,665,792	1,665,792	3,331,584	1,173,078	1,173,079	2,346,157
K.Lefkara Phase I	825,000	825,000	1,650,000	637,665	637,666	1,275,331
K.Lefkara Phase II	1,025,000	1,625,000	2,650,000	773,946	1,226,948	2,000,894
Kato Drys Phase I	1,265,000	1,265,000	2,530,000	568,506	568,507	1,137,013
Kato Drys Phase II	1,675,000	2,275,000	3,950,000	1,094,498	1,486,258	2,580,756
Lymbia)		2,748,000			556,444	
Shia)		581,000			117,902	
Kornos)		1,633,000			330,703	
Mosphiloti) I	14,200,000	746,000	21,300,000	2,875,680	150,974	4,313,519
Psevdas)		767,000			155,286	
Pyrga)		625,000			126,530	
Lymbia II	15,000,000	7,500,000	22,500,000	6,652,866	5,167,541	11,820,407
Melini	1,935,127	966,563	2,901,690	1,481,368	740,685	2,222,053
Morphou	370,264	564,814	935,078	985,170	1,500,122	2,485,292
Meloushia	650,000	650,000	1,300,000	636,549	636,549	1,273,098
Mathiatis	1,690,432	563,475	2,253,907	22,500	7,500	30,000
Marathovounos)		2,000,000			1,982,531	
Vitsadha)	1,200,000	600,000	3,800,000	1,189,075	594,862	3,766,468
Mathikoloni	870,138	870,136	1,740,274	748,602	748,603	1,497,205
Pentakomo	2,823,138	3,459,929	6,283,067	1,140,109	1,396,284	2,536,393
Pano Arodhes	31,217	43,886	75,103	8,500	12,281	20,781
Potamos-Yermasoyias	505,118	126,323	631,441	38,186	178,164	216,350
Pareklishia	750,000	750,000	1,500,000	739,788	739,790	1,479,578
Paphos	4,834,000	9,666,000	14,500,000	4,690,324	9,380,648	14,070,972
Petra	750,000	750,000	1,500,000)			
Petra	168,531	168,530	337,061)	214,286	214,286	428,572
C/F	182,006,702	166,115,781	348,122,483	99,727,300	99,992,055	199,719,355

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	182,006,702	165,115,781	348,122,483	99,727,300	99,992,055	199,719,355
Paralimni	8,600,000	8,600,000	17,200,000	8,487,464	8,487,465	16,974,929
Potami)		1,575,000			585,901	
Vyzakia) I	3,500,000	1,925,000	7,000,000	1,227,637	641,736	2,455,274
Potami II	4,250,000	5,580,000	9,830,000	2,598,369	3,410,809	6,009,178
Vyzakia III	7,050,000	8,330,000	15,380,000	4,371,095	5,164,453	9,535,548
Prastio-Evdhimou	1,400,000	4,350,000	5,750,000	918,982	2,855,073	3,774,055
Polystipos	550,000	550,000	1,100,000	55,205	55,205	110,410
Pissouri	650,000	650,000	1,300,000	529,645	529,644	1,059,289
Pano Pyrgos	6,932,000	3,468,000	10,400,000	3,242,898	1,621,449	4,864,347
Pigenia	12,433,000	6,217,000	18,650,000	3,207,800	1,603,900	4,811,700
Pretori	2,500,000	3,100,000	5,600,000	8,760	10,860	19,620
Vitsadha (New)	1,703,857	851,928	2,555,785	357,895	178,948	536,843
Meloushia)	69,179	-	-	372,322	487,770	
Tremetoushia)		161,413			269,381	
Arsos)A.I	1,272,650	149,889	2,305,970	1,801,871	250,140	3, 848, 296
Vatyli)		583,659			1,116,006	
Strongylos)		69,180			295,450	
Tremethoushia)		426,638			420,613	
Arsos) A.2		398,662			392,573	
Vatyli)	2,933,514	1,765,503	5,695,172	2,888,213	1,738,536	5,608,180
Strongylos)		170,855			168,245	
Arsos)		527,346			517,865	
Vatyli) A.3	3,416,766	2,406,018	6,591,831	3,355,336	2,362,761	6,473,317
Strongylos)		241,701			237,355	
Vatyli)		1,411,512			1,392,000	
Strongylos) A.4	1,690,966	141,227	3,243,705	1,669,333	138,667	3,200,000
Tremethoushia A.5	1,461,630	1,461,628	2,923,258	90,380	90,380	180,760
Arsos A.6	296,878	296,876	593,754	35,750	35,750	71,500
Vatyli A.7	2,955,938	2,955,939	5,911,877	1,612,643	1,612,644	3,225,287
Tokhni I	1,436,784	1,436,783	2,873,567	1,247,851	1,247,852	2,495,703
Tokhni II	5,000,000	6,500,000	11,500,000	3,724,378	4,841,349	8,565,727
C/F	252,109,864	232,417,538	484,527,402	137,927,385	137,915,341	275,842,726

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	252,109,864	232,417,538	484,527,402	137,927,385	137,015,341	275,842,726
Trakhypedhoulas	1,500,000	1,950,000	3,450,000	17,696	23,004	40,7000
Ypsonas)		2,214,000			1,630,915	
P.Polemidhia) I	270,000	-	-	198,892	-	-
K.Polemidhia)	5,400,000	2,916,000	10,800,000	3,977,842	2,148,035	7,955,684
Ypsonas	122,889	1,056,583	1,179,472	18,011	230,888	248,899
Kato Polemidhia	70,809	131,500	202,309	58,780	109,164	167,944
Tseri	393,000	393,000	786,000	342,144	342,145	684,289
Erimi)		115,000			31.740	
Kolossi) II	250,000	135,000	500,000	68,999	37,260	137,999
Kolossi old	2,422,266	2,422,266	4,844,532	1,008,604	1,008,604	2,017,208
Kolossi IV New	385,000	385,000	770,000	303,377	303,378	606,755
Erimi III	700,000	700,000	1,400,000	611,535	611,535	1,223,070
Ypsonas)		183,000			171,295	
Polemidhia) V	1,017,000	834,000	2,034,000	939,358	767,064	1,877,717
Vavla)	3,183,000	1,591,000	6,200,000	1,381,282	564,237	2,198,327
Layia) I	1,426,000	-		252,808	-	-
Vavla II	2,233,000	1,327,000	3,560,000	1,409,091	837,189	2,246,280
Voroklini-Livadhia	155,238	-	155,238	5,008	-	5,008
Total	£271,638,066	248,770,887	520,408,953	146,386,044	144,496,258	290,882,302

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.,N.S.T.C., 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	Executive Engineer Class I	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.
Charis Lapas	Executive Engineer Class II	B.Sc., (Civil Eng.) University of Glasgow
Christodoulos Artemis	Executive Engineer Class II	B.Sc., (Civil Eng.) University of London, A.C.G.I., M.Sc. (Soil Mechanics) D.I.C., Assoc.Memb. I.C.C. - F.G.S.
Markos Dymiotis	Executive Engineer Class II	Dipl. (Civil Eng.) National Technical University of Athens
Nicos Stylianou	Executive Engineer Class II	Dipl. (Civil Eng.) The Polytechnic London, M.Sc. (Foundation Eng.) University of Birmingham, Assoc.Memb. I.C.E.
Vlasis Partassides	Executive Engineer Class II	Dipl. (Civil Eng.) University of Moscow, M.Cs. (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 Eng. 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.

Name	Post	Qualifications
Andreas Lambrou	Executive Engineer Class II	M.Sc (Water Building Engineering) Dipl. (Civil Eng.) University of Budapest.
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).
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.
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.) Technion Israel Inst.of Technology M.A.E.A.I, Assoc.Memb. I. C.E. .
Nicos Tsiourtis	Topographer/Irrigation Eng.	M.Sc. (Civil Engineering) B.Sc.(Agricultural Eng.) Technion Israel Inst. of Technology, M.A.E.A.I.
Elias Kambourides	Topographer/Irrigation Eng.	B.Sc. (Agricultural Eng.) Technion Israel Inst. of Technology M.A.E.A.I.
P. Neophytides	Topographer/Irrigation Eng.	Dipl. (Rural and Topography Engineering) National Technical University of Athens.
Niki Michael	Topographer/Irrigation Eng.	Dipl. (Rural and Topography Engineering) National Technical University of Athens.
Panos Pantelides	Superintendent of Works	
Nicos Toufexis	"	
George Charalambous	"	

TECHNICAL STAFF OF W.D.D. ON 31.12.72

DRG. No. BM/G/17

	MONTHLY AND DAILY PAID TECHNICAL STAFF			D	AD	SWE	SH	EH	EE	ME	Geo	H	TIE	LA	ADM	SW	SIW	IW	CF	EDR	ACF	TA	DR	F	Total Nos
1	Permanent staff			1	2	1	1	1	11		2	1			1	3	5	16	3		7	33		39	127
2	Temporary staff								8	1		2	6	1	1		1	6	1	1	5	67	8	15	123
TOTAL NUMBERS				1	2	1	1	1	19	1	2	3	6	1	2	3	6	22	4	1	12	100	8	54	250
DISTRIBUTION OF STAFF																									
3	Divisions	i	Water Resources								2	2				1		4			1	16		2	28
		ii	Planning						2									2				8		1	13
		iii	Design						4				3				1	2		1		25	8	1	45
		iv	Construction					1	6	1							2	8	3		8	2		43	74
		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				2					1	1										7
5	Regional Offices (Limassol, Famagusta, Paphos & Morphou)								2									2				28		2	34
6	Turkish Officers absent from duty								1													9		2	12
7	On scholarship – or National Service								1			1	1												3
8	Vacancies					1	1		1				1		1						1	7			13
TOTAL NUMBERS				1	2	1	1	1	19	1	2	3	6	1	2	3	6	22	4	1	12	100	8	54	250

REFERENCE

D Director
AD Assistant Director
SWE Senior Water Engineer
SH Senior Hydrogeologist
EH Engineer Hydrologist
EE Executive Engineer
ME Mechanical Engineer
Geo Geologist
H Hydrologist
TIE Topographer/Irrigation Engineer monthly & daily paid
LA Legal Adviser (on contract)
ADM Administrative Officer
SW Superintendent of Works
SIW Senior Inspector of Works
IW Inspector of Works
CF Chief Foreman
EDR Engineering Draughtsman
ACF Assistant Chief Foreman
TA Technical Assistant monthly & daily paid
DR Draughtsman
F Foreman

Departmental Reports 1972

Library Reg.No.	Title	Author	Date
5464 5508 5509	Akrotiri Irrigation Project. Kouris Proposed Dam. Site and Fill Material Investigations. Report N. F/24.	Loucaides P. and Stylianou N. P.	January 1972
5437 5438 5439	Paphos Main Conveyor Route. Site Investigations. Report No. F/25	Stylianou N.P.	February 1972
5719	Drawing branch. Work Done During 1971.	Pitsillides S.C.	March 1972
5522	Preselection of Consulting Engineer for Nicosia Famagusta Water Supply Distribution System	W.D.D.	March 1972
5497 5498 5499	Hydrological Year-Book of Cyprus 1969-1970. Report No. H/12.	Toufexis N.Chr.& Jacovides J.	April 1972
5527 5528	Report on the Economics Programme. "RANT B". Report No. L/13.	Christodoulou C.A.	May 1972
5570 5571 5572	A study in the Salinity Problem of the Area of Ovgos River at Morphou Village. Report No. H/13.	Kypris C.D.	July 1972
5622 5623	Report on Site Investigation for Cyprus Civil Service Co-Operative Building Society. Eylenja Housing Estate. Report No. F/26.	Stylianou N.P.	July 1972
5617 5618 5619	Annual Report of the Department of Water Development for the Year 1971	Konteatis C.A.C.	September 1972
5716 5717	Famagusta Water Supply System Revised. Report No. D/6.	Konteatis C.A.C.	September 1972
5701	The Karyotis River. Water Rights. (Preliminary Report), Report No. W/1.	Pantelides P.	December 1972
5720 5721	Kritou Terra Water Supply House-to-House Scheme. Completion Report. Report No. C/79.	Kazamias Th.P.	December 1972
5564 5565 5566	Index of Boreholes Drilled in 1970	W.D.D.	

II. DIVISION OF WATER RESOURCES

By
D. Kypris
Head of Division

2.1 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.

2.1.2 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 (See map. on page 46).

2.1.3 During 1972 Mr. D.K. 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, Drilling and Geological Sections. Mr. Chr. Ioannou Hydrologist Class II, was the Head of Hydrology and Ground Water Control Sections.

2.1.4 Mr. Chr. . Ioannou offered his services until 29/10/1972 and then proceeded to Israel on scholarship for further studies. So Mr. M. Peppis undertook also the responsibilities of Mr. Chr. Ioannou.

2.1.5 Mr. Chr. Phanartzis, Hydrologist Class I returned from abroad at the beginning of the year and he offered his services to this Division until May, 1972, since then he acted as Hydrologist counterpart of the Morphou-Tylliria Feasibility Study.

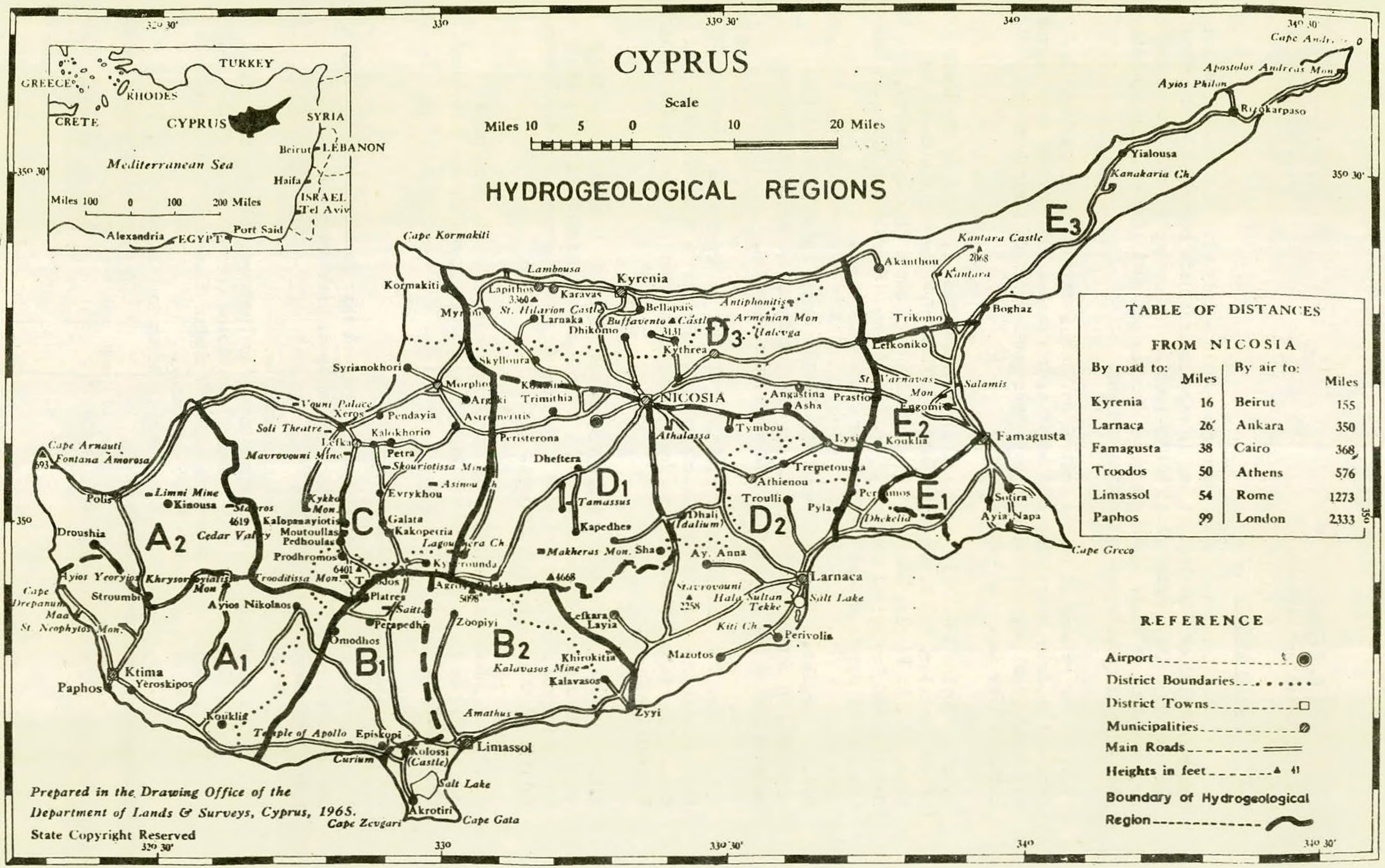
2.1.6 Mr. J. Jacovides during 1972 was not with this Division since he continued acting as Co-Manager of the Paphos and Akrotiri Feasibility Study Projects until May, 1972 and then as Hydrogeologist counterpart of the Morphou-Tylliria Feasibility Study Project.

2.1.7 Mr. Kramvis, Geologist Class II, was not with this Department during 1972 as he accepted an appointment to the Geological Survey Department from 1.1.1972.

2.2 Drilling Operations

Drilling operation for water continued this year on a small scale. One drilling rig Ruston Bucyrus 22W was engaged, with which the following operations were carried out :

1. Cleaning of 4 existing boreholes.
2. Deepening of 2 existing boreholes (penetrated depth 48.2 m).
3. Drilling of three technical boreholes (penetrated depth 106 m).
4. Drilling of 2 private wells 37 inches diameter of total depth 41,5 m. (after Court decision).
5. Replacement of a water supply borehole (not completed, 29 m. penetrated depth).
6. Installation and removing of pumps for test pumpings.


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
Cape Kormakiti
Lambousa
Kyrenia
Kormakiti
Lapithos
Karavas
St. Hilarion Castle
Bellapais
Antiphonitis
Larnaka
Buffavento Castle
Armenian Mon
Dhikomo
Halevga
Kythrea
Skylloura
Syrianokhori
Morphou
Trimithia
NICOSIA
Angastina
Asha
Prastio
Vouni Palace
Xeros
Pendayia
Soli Theatre
Kalokhorio
Peristerona
Athalassa
Tymbou
Lysi
Koukla
Famagusta
Lefka
Petra
Dheftera
Mavrovouni Mine
Skouriotissa Mine
Asinou Ch
Tremetousha
Athienou
Evrykhou
Tamassus
Troulli
Pyla
Dhekelia
Sotira
Ayia Napa
Cape Arnauti
Fontana Amorosa
Limni Mine
Kinousa
Polis
Stavros
Kykko Mon.
Kalopanayiotis
Galata
Kakopetria
Moutoullas
Pedhoulas
Lagoudera Ch
Kapedhes
Dhali
(Idalium)
Prodhromos
Makheras Mon.
Ay. Anna
Droushia
Cedar Valley
Kyperounda
Ayios Yeoryios
Khrysorroyiatissa Mon
Trooditissa Mon.
Troodos
Platres
Agros
Lefkara
Stavrovouni
Hala Sultan Tekke
Larnaca
Salt Lake
Cape Drepanum
Stroumbi
Ayios Nikolaos
Saittas
Pera Pedhi
Zoopiyi
Layia
Kiti Ch
Perivolia
St. Neophytos Mon.
Omodhos
Khirokitia
Mazotos
Kalavasos Mine
Kalavasos
Ktima
Paphos
Yeroskipos
Kouklia
Amathus
Zyyi
Temple of Apollo
Episkopi
Kolossi (Castle)
Limassol
Curium
Salt Lake
Akrotiri
Cape Zevgari
Cape Gata
Cape Andreas
Apostolos Andreas Mon
Ayios Philon
Rizokarpaso
Yialousa
Kanakaria Ch
Kantara Castle
Kantara
Akanthou
Boghaz
Trikomo
Lefkoniko
St. Varnavas Mon
Salamis
Engomi
Cape Greco
A1
A2
B1
B2
C
D1
D2
D3
E1
E2
E3
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

2.3 Surface Hydrology Work

2.3.1 Meteorological Notes

The rainfall records of 168 stations of the Cyprus Government Meteorological Service have been analysed and the principal features of the weather during the hydrological year 1st October, 1971, to 30th September, 1972, are summarized hereunder :-

(i) The average precipitation over the whole island was 387 mm. which is 77% of normal (503 mm) this being the mean since 1916-1950. (See map and diagram on pages 49 and 52).

(ii) The precipitation during the first five months of the hydrological year was below normal. However, the spring months enjoyed precipitation which was normal or above normal as well as the Summer months, during which precipitation on hills and parts of Mesaoria was well above normal. In general, the total precipitation was below average and its distribution was not very good. (See diagram on page 51).

(iii) The highest daily rainfall of the year was 120,7 mm. and occurred at Amiandos on 30th April, 1972.

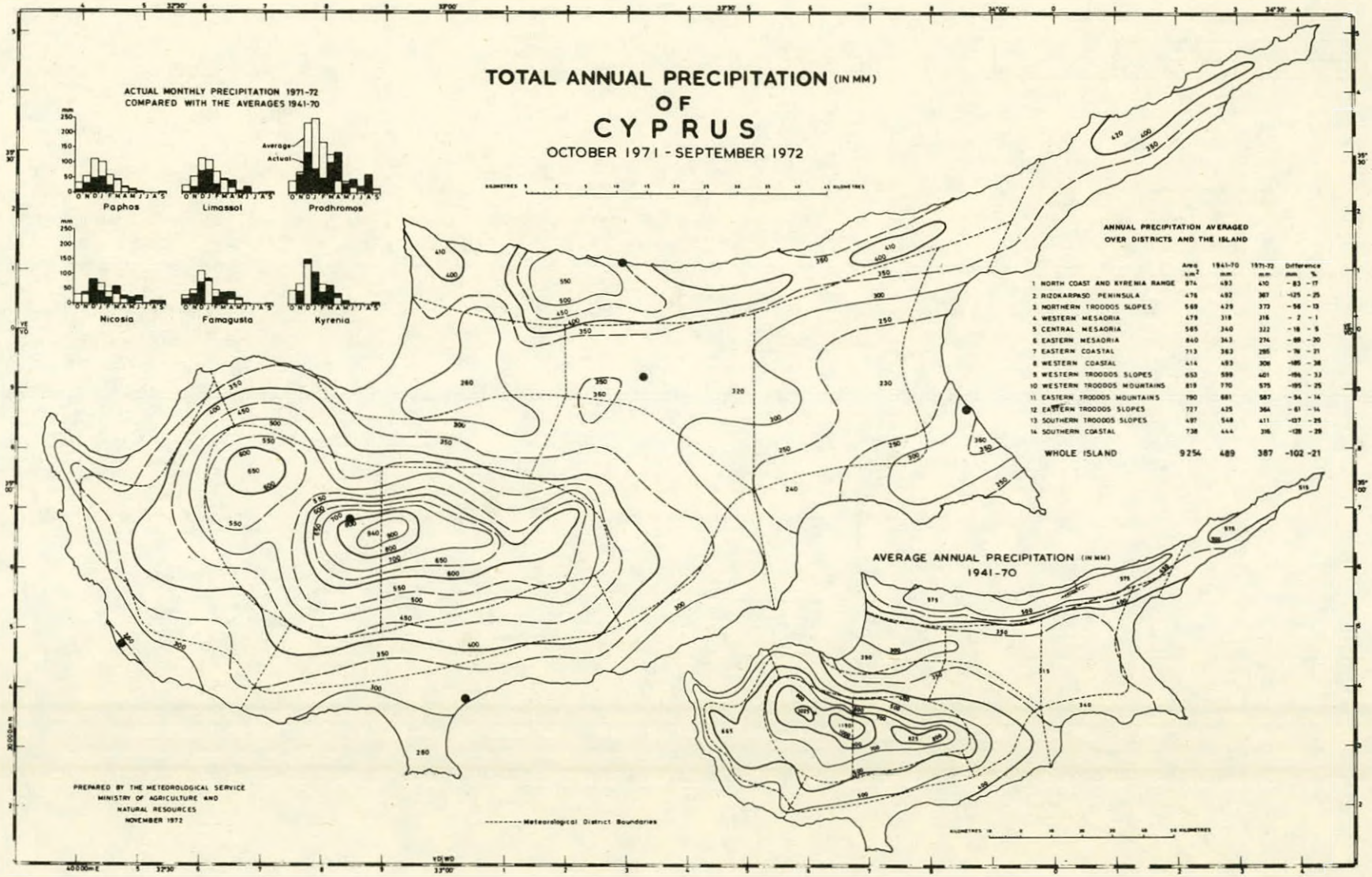
(iv) The first snowfall on the Troodos mountains occurred on 22nd November, 1971 and the last on 14th March, 1972.

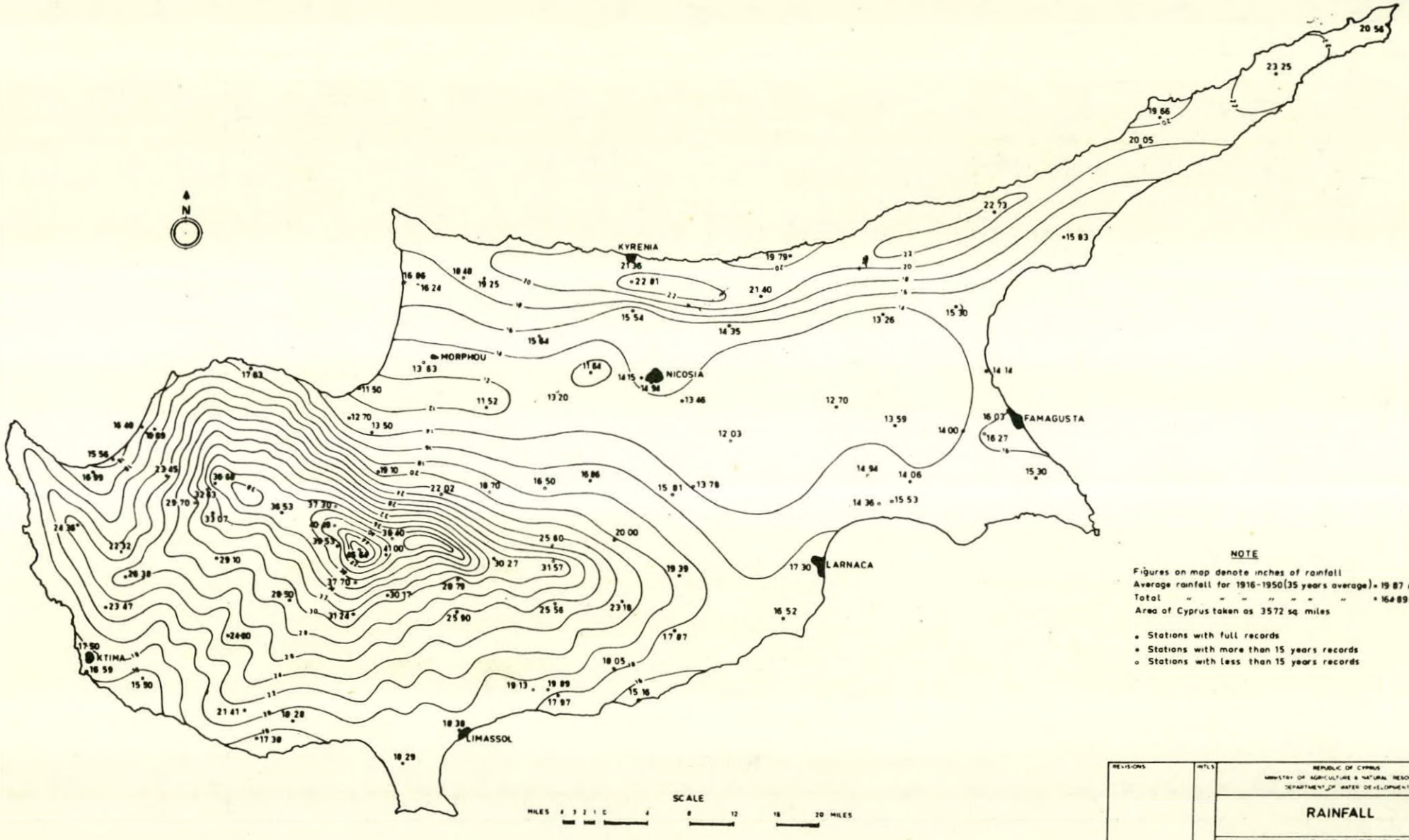
(v) Temperatures for the year as a whole averaged lower than normal. During October, November, January, February, July and August, they were below normal; during December they were at first above normal to become below normal after; during March they were around normal; during April they were above normal; during May and June they oscillated around normal; during September they were below normal till the 16th of the month to become well above normal after, because of an easterly warm airflow the effect of which was high temperatures very infrequently experienced.

The extreme maximum and minimum temperatures recorded during the hydrological year under consideration at various meteorological stations are quoted below:-

Station	Extreme Maximum temperature and date	Extreme Minimum temperature and date
	C°	C°
Nicosia	40.4 (on 14th July)	-0.2 (on 9th February)
Limassol	38.3 (on 13th July and 18th September)	1.1 (on 7th and 8th February)
Larnaca	36.4 (on 17th June)	0.2 (on 5th February)
Famagusta	37.0 (on 3rd August)	-1.0 (on 8th February)
Paphos	32.3 (on 29th September)	2.4 (on 8th February)

Station	Extreme Maximum temperature and date	Extreme Minimum temperature and date
	°C	°C
Kyrenia	36.1 (on 1st August)	2.8 (on 9th February)
Panayia Bridge Forest Station (Between Platanistasa and Kato Moni)	36.1 (on 2nd August and 17th September)	-5.6 (on 8th February)
Morphou	40.0 (on 17th September)	-3.3 (on 9th February)
Halefka	36.1 (on 3rd August)	-0.6 (on 15th January and 15th February)
Saittas Nursery Garden	36.0 (on 5th August)	-2.5 (on 9th February)
Pano Amiandos	31.1 (on 26th July)	-7.2 (on 7th February)
Prodromos Forestry College	31.5 (on 4th August)	-8.0 (on 7th and 8th February)
Stavros tis Psokas Forest Station	35.6 (on 17th September)	-2.8 (on 8th February)
Kornos	37.8 (on 13th July and 18th September)	-0.6 (on 8th February)
Platania (Kakopetria) Forest Station	32.2 (on 3rd August)	-6.7 (on 8th and 9th February)
Phassouri	38.0 (on 17th September)	-3.0 (on 8th February)


TOTAL ANNUAL PRECIPITATION (IN MM)
OF
CYPRUS
OCTOBER 1971 - SEPTEMBER 1972
ACTUAL MONTHLY PRECIPITATION 1971-72
COMPARED WITH THE AVERAGES 1941-70
Average
Actual
O N D J F M A M J J A S
Paphos
Limassol
Prodhromos
Nicosia
Famagusta
Kyrenia
ANNUAL PRECIPITATION AVERAGED
OVER DISTRICTS AND THE ISLAND
Area km²
1941-70 mm
1971-72 mm
Difference mm
Difference %
1 NORTH COAST AND KYRENIA RANGE 974 493 410 - 83 - 17
2 RIZOKARPASO PENINSULA 476 492 367 -125 - 25
3 NORTHERN TROODOS SLOPES 569 429 373 - 56 - 13
4 WESTERN MESAORIA 479 318 316 - 2 - 1
5 CENTRAL MESAORIA 585 340 322 - 18 - 5
6 EASTERN MESAORIA 840 343 274 - 69 - 20
7 EASTERN COASTAL 713 383 295 - 76 - 21
8 WESTERN COASTAL 414 483 306 -185 - 38
9 WESTERN TROODOS SLOPES 653 599 401 -198 - 33
10 WESTERN TROODOS MOUNTAINS 819 770 575 -195 - 25
11 EASTERN TROODOS MOUNTAINS 790 681 587 - 94 - 14
12 EASTERN TROODOS SLOPES 727 425 364 - 61 - 14
13 SOUTHERN TROODOS SLOPES 497 548 411 -137 - 25
14 SOUTHERN COASTAL 738 444 316 -128 - 29
WHOLE ISLAND 9254 489 387 -102 -21
AVERAGE ANNUAL PRECIPITATION (IN MM)
1941-70
PREPARED BY THE METEOROLOGICAL SERVICE
MINISTRY OF AGRICULTURE AND
NATURAL RESOURCES
NOVEMBER 1972
Meteorological District Boundaries



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
- Stations with less than 15 years records

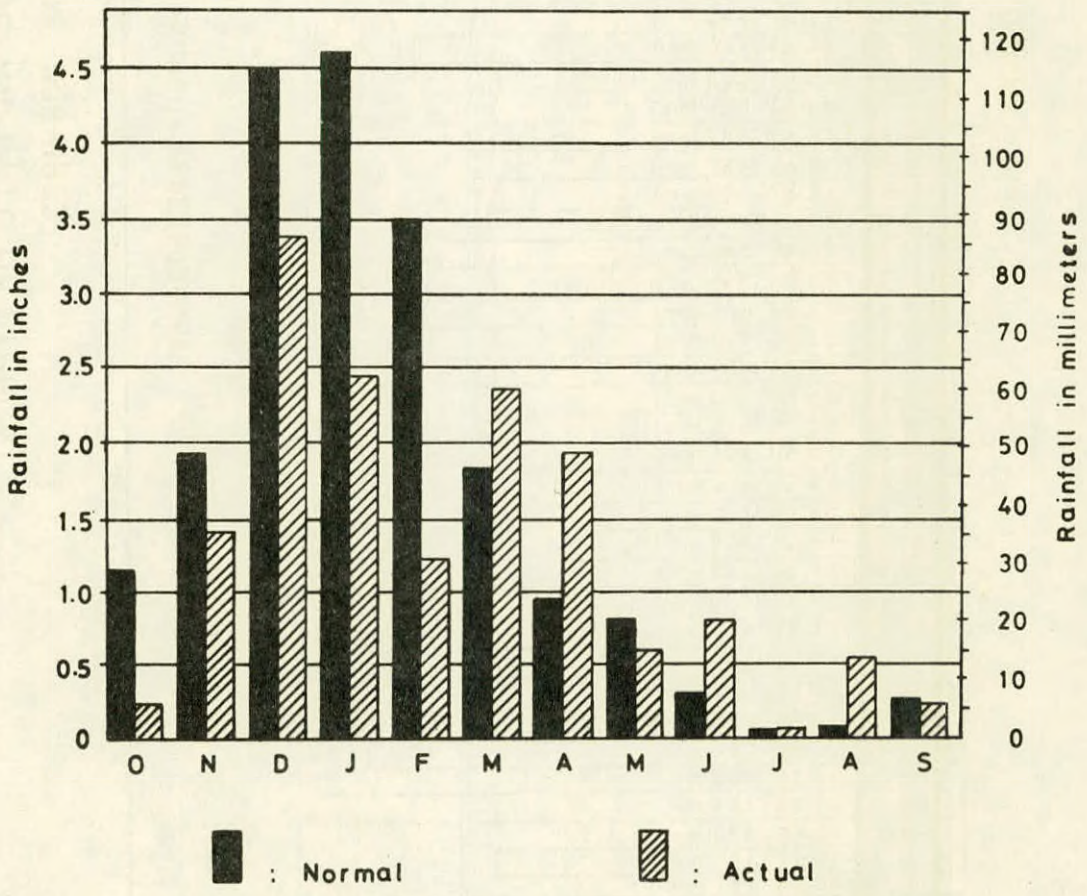
REVISIONS	INITLS	REPUBLIC OF CYPRUS MINISTRY OF AGRICULTURE & NATURAL RESOURCES DEPARTMENT OF WATER DEVELOPMENT
		RAINFALL
		ISOHYETAL MAP OF CYPRUS BASED ON RAINFALL FROM 1916 TO 1950 (35 YEARS AVERAGE)
		DC / DRG No
		SURVEYED BY / TRACED BY
		DESIGNED BY / CHECKED BY
		DRAWN BY / APPROVED BY

INCIDENCE OF RAINFALL

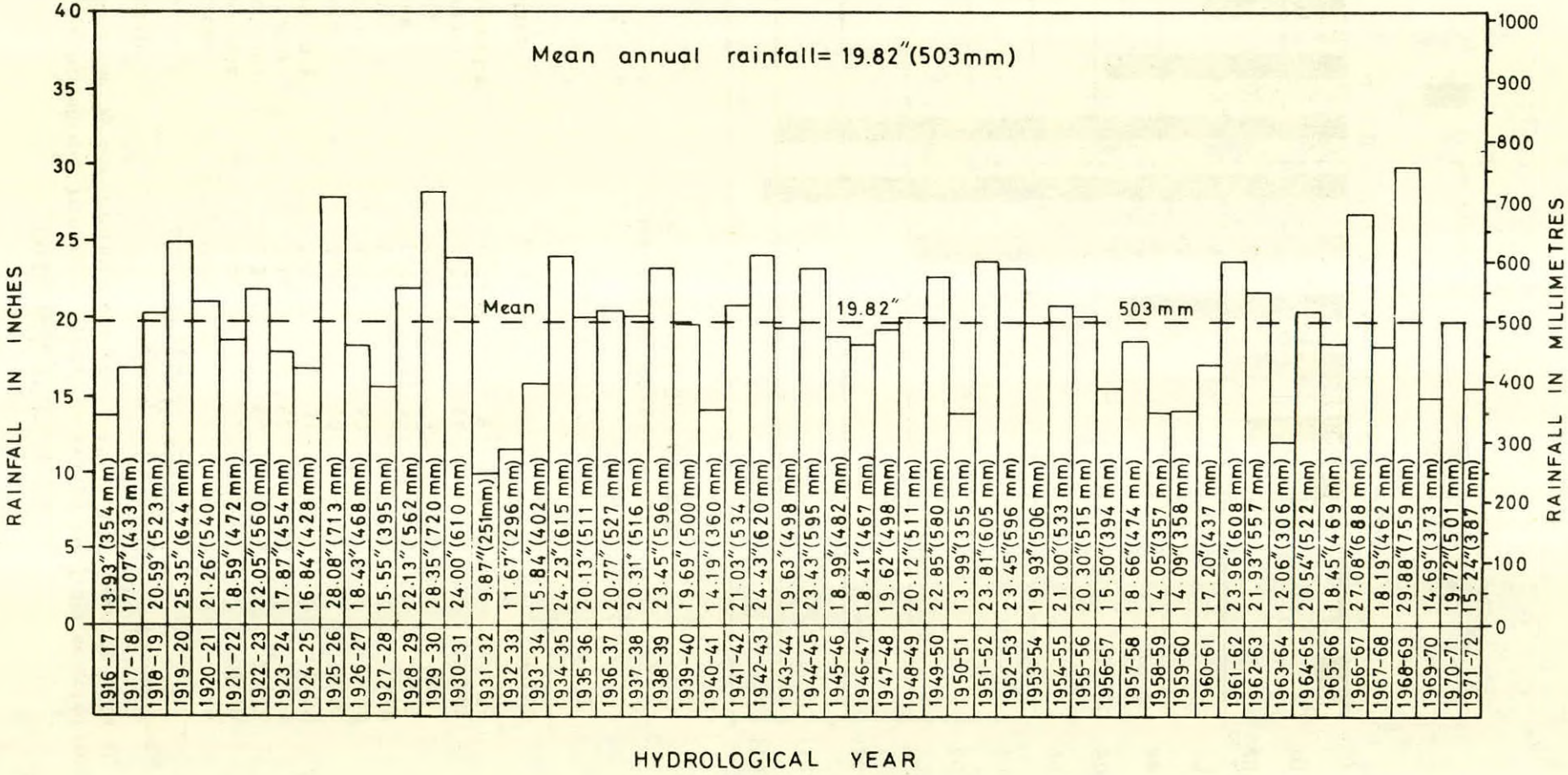
The incidence of rainfall per month as worked out from selected rainfall stations during the hydrological year 1971 - 1972 is given as under+

Month	Rainfall in inches	Rainfall in millimeters	Percentage %
October	0.24	6	1.55
November	1.42	36	9.30
December	3.38	86	22.22
January	2.44	62	16.02
February	1.22	31	8.01
March	2.36	60	15.50
April	1.93	49	12.66
May	0.59	15	3.88
June	0.79	20	5.17
July	0.08	2	0.52
August	0.55	14	3.62
September	0.24	6	1.55
Totals	15.24	387	100.00

GRAPHICAL PRESENTATION
OF INCIDENCE OF RAINFALL



ANNUAL AVERAGE RAINFALL OF CYPRUS
FROM 1916–1972



Permanent Stream Gauging Stations

The following stream measuring weirs 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	VD 805513
1-1-7-95	Khapotami	Kouklia	VD 627383
1-2-4-95	Dhiarizos	Philousa	VD 754575
1-2-7-90	Dhiarizos	Kouklia	VD 601411
1-3-5-05	Xeros	Lazaridhes	VD 725652
1-3-8-60	Xeros	Phinikas	VD 615470
1-4-4-50	Ezouza	Kannaviou	VD 610633
1-4-9-80	Ezouza	Akhelia	VD 524444
1-6-2-80	Mavrokolymbos	Potima	VD 446567
1-8-2-80	Avgas	Toxeftra(Akamas)	VD 394644
2-2-3-95	Khrysokhou	Skoulli	VD 497709
2-2-6-90	Stavros-tis-Psokas	Evretou	VD 549848
2-3-8-95	Yialia	Kato Yialia	VD 549848
2-7-2-75	Pyrgos	Phileyia	VD 717857
2-8-3-15	Limnitis	Limnitis Sawmill	VD 739830
2-9-3-40	Marathos	Varisha	VD 770872
2-9-4-90	Kambos	Potamos-tou-Kambou	VD 826892
3-2-1-85	Marathasa	U/S Kalopanayiotis Dam	VD 842733
3-2-1-95	Marathasa	Kalopanayiotis Dam	VD 841739
3-2-2-90	Marathasa	U/S Lefka Dam	VD 852795
3-2-4-95	Marathasa	Karavostasi	VD 863895
3-3-1-70	Ayios Nicolaos	Kakopetria	VD 900707
3-3-2-60	Platania	Kakopetria	VD 927698
3-3-3-95	Karyotis	Evrykhou	VD 906773
3-3-5-95	Karyotis	Pendayia	VD 883902
3-4-2-90	Atsas	Evrykhou	VD 931810
3-5-3-90	Asinou	Nikitari	VD 997820
3-5-4-40	Elea	Vyzakia	WD 018806
3-7-1-50	Peristerona	Panayia F.S.	WD 075754
3-7-1-50	Akaki	Malounda	WD 163783
3-7-5-95	Merika	Avlona	WD 093924
3-7-7-85	Skylloura	Ayios Vasilios	WD 156969
3-7-8-60	Ovgos	Kyra	WD 050964
3-7-8-65	Ovgos	Ovgos Dam	WD 034973
3-7-8-90	Ovgos	Morphou	VD 973974
3-7-9-50	Serakhis	Morphou Dam	WD 007948
3-8-6-50	Aloupos	Aloupos Chiftlik	VE 980018
4-2-3-70	Panagra	Nicosia-Kyrenia Road	WE 077119
4-4-2-50	Boghazi	Kyrenia Road Forest	WE 296077
4-5-5-90	Alakati	Platymatis	WE 455105
4-7-1-75	Yerokolymbos	Boghaz (Akanthou)	WE 636142
5-2-3-50	Melini	Ayia Trias	XE 125337
5-3-4-85	Laris	Rizokarpaso	XE 218405
5-9-4-90	Kharangas	Boghaz (Famagusta)	WE 883100

Gauging Station No.	Stream	Location	Co-ordinates
6-1-1-80	Ayios Onoufrios	Kambia	WD 225735
6-1-1-85	Pedhieos	Kambia	WD 224741
6-1-4-20	Tengelis	Kythrea	WE 415010
6-1-4-50	Pedhieos	Mia-Milia	WD 376958
6-1-5-50	Vathys	Athalassa	WD 345867
6-5-2-95	Alikos	Ayios Sozomenos	WD 413808
6-5-3-15	Yialias	Nisou	WD 359756
6-5-3-95	Yialias	Pyroi	WD 446824
7-1-7-50	Kolopannes	Kolophidha	WD 746842
7-2-3-50	Liopetri	U/S Liopetri Dam	WD 806732
7-2-7-05	Paralimni Lake out Flow	Paralimni	WD 892801
8-2-1-90	Aradhippou	Nicosia-Larnaca Road	WD 517685
8-2-2-90	Aradhippou	Panayia Yematousa	WD 516689
8-4-3-40	Tremithios	Ayia Anna	WD 442668
8-4-5-30	Tremithios	Larnaca-Limassol Road	WD 490615
8-4-5-40	Tremithios	Kiti Dam	WD 510590
8-5-1-90	Bouzis	Mazotos	WD 472518
8-6-3-50	Xeropotamos	Alaminos	WD 398519
8-7-3-60	Mylou	Kornos	WD 332613
8-7-4-80	Syrgatis	Skarinou Station	WD 343535
8-8-2-50	Maronia	Vavla	WD 261558
8-8-3-30	Maroni	Khirokitia Station	WD 317503
8-9-5-95	Vasilikos	Kalavasos Mine	WD 256503
8-9-7-50	Vasilikos	Kalavasos	WD 257472
8-9-7-95	Vasilikos	Vasiliko	WE 292425
9-2-3-85	Yermasoyia	Phinikaria	WD 093475
9-2-4-95	Akrounda	U/S Yermasoyia Dam	WD 078460
9-4-3-90	Garyllis	U/S Polemidhia Dam	VD 977450
9-4-3-90	Garyllis (Mersina Tr.)	U/S Polemidhia Dam	VD 990435
9-6-4-95	Kourris	Khalassa	VD 920470
9-6-7-75	Zyghos	Khalassa	VD 941471
9-6-9-05	Kourris and Kryos	Khalassa	VD 921466
9-8-1-95	Evdhimou	Evdhimou	VD 780397

Stream discharge measurements from the above Permanent Gauging Stations are given in the Hydrological Year Book issued by the Public Information Office.

2.3.2 Flood Discharges

The most remarkable floods during the year under review occurred mainly in late Spring time; the highest floods reported were in Dhiarizos River on 9.6.72 near Philousa 94 cubic meters per second, on 10.6.72 in Vathis River near Athalassa 27 cubic meters per second, on 21.1.72 in Yialias River near Nisou 32 cubic meters per second, on 10.6.72 in Aradhippou River near Panayia Yematousa 24 cubic meters per second and on 21.1.72 in Tremithios River near Ayia Anna 69 cubic meters per second.

Table showing volume of water accumulated and commencing date of inflow for various dams during the year 1972

No.	Dam	Capacity $10^3 m^3$	Inflow commencing Date(1972)	Maximum Volume Accumulated $10^3 m^3$	Date of Maximum Accumulation 1972	Remarks
1	Agros	100	January	10	May	
2	Akrounda	22	January	4	March	Reservoir totally silted up. Overflowed
3	Akanthou Recharge Dams		February		February	Overflowed
4	Arghaka	1,150	January	467	March	
5	Athalassa	790	February	45	March	
6	Ayios Loucas	450	-	-	-	No inflow
7	Akhna	100	-	-	-	"
8	Ayia Marina	300	January	33	April	
9	F'sta District Recharge Dams		-	-	-	No inflow
10	Galini	22	January	22	January	Overflowed
11	Geunyeli	1,000	January	300	January	
12	Gypsos	113	-	-	-	No inflow
13	Kalokhorio(Klirou)	81	January	81	January	Overflowed
14	Kalopanayiotis	390	January	390	March	Continuous inflow Overflowed
15	Kandou	36	January	27	February	
16	Kanli	1,100	January	350	January	
17	Kiti	1,600	-	-	-	No inflow
18	Kouklia	4,800	-	-	-	"
19	Kyrenia Range Recharge Dams		February		February	Most of them overflowed
20	Lefka-Marathasa	360	January	360	February	Overflowed
21	Lefka-Kafizes	110	January	110	February	Overflowed
22	Liopetri	340	-	-	-	No inflow
23	Lythrodondas Upper	32	February	32	February	Overflowed
24	Lythrodondas Lower	32	February	32	February	"
25	Makrasyka	196	-	-	-	No inflow
26	Mavrokolymbos	2,200	January	1,270	March	
27	Mia Milia	330	March	200	March	
28	Morphou-Serakhis	2,000	January	340	January	
29	Ovgos	850	-	-	-	No inflow
30	Paralimni	65	-	-	-	No inflow
31	Perapedhi	55	January	55	January	Overflowed
32	Petra Upper	22	February	22	February	"
33	Petra Lower	32	February	22	February	
34	Pomos	860	January	860	March	Overflowed
35	Polemidhia	3,400	January	448	March	
36	Prodhromos	110	January	104	August	
37	Pyrgos	270	January	270	January	Overflowed
38	Syngrasis	1,100	-	-	-	No inflow
39	Trimikliṅi	330	January	330	May	Continuous Inflowed Gate closed in May.
40	Yermasoyia	14,000	January	5,520	June	

2.3.3 Spring Discharges

The majority of the observed springs are gauged on a routine basis at monthly intervals, while a number of springs are gauged for a temporary period after the request of another interested Departmental Division.

During the hydrological year, 3,167 spring discharges were gauged averaging 264 gaugings every month; the output of 145 springs is being gauged regularly at monthly intervals, while 169 springs were gauged at various intervals for a certain period during the hydrological year.

As a result of the low precipitation during the current hydrological year, all springs experienced a continuous decrease of flow almost all the year round.

On the Troodos mountains all springs had of continous decrease of flow upto winter months, a slight increase in spring time and then a steady decrease upto the end of the hydrological year.

On the Kyrenia Range all springs had the same behaviour as on Troodos mountains.

In the Central Mesaoria Plain the chain of wells experienced a continuous decrease of flow; most of them went dry.

2.3.4 Chemical Analyses

During the year, 5,022 samples of water were sent to the Government Analyst for Ionic Analyses. Of these, 1.854 samples were taken from springs, wells or boreholes which are used or proposed as Water Supplies sources. The remaining 3,168 samples derived from springs, observation boreholes and from other miscellaneous souroes.

Also 3,300 samples of water taken from observation boreholes in the hydrological survey areas were analysed by the Water Resources Division for Chloride Content.

2.3.5 Bacteriological Analyses

Water Supply	No. of Samples	No. of Unsatisfactory samples
Nicosia	15	1
Famagusta	228	34
Limassol	157	34
Larnaca	157	34
Kyrenia	22	1
Total	549	74

The unsatisfactory samples at Limassol, Famagusta, Larnaca and Kyrenia, were usually of unchlorinated water.

All chlorinated samples at main reservoirs were satisfactory.

2.3.6 Suspended Sediment Analyses

In view of the future construction of large dams in Cyrpus and the problem arising from reservoir sedimentation a sediment sampling programme was initiated. Though not very intensive the programme provided for sampling during routine visits to the flow gauging stations, and additional sampling during floods in as many rivers as possible.

During the year, 145 samples of rivers water were taken and were analysed by the Soils Laboratory for suspended sediment.

2.3.7 Repairs and improvements to existing stream gauging stations

Ezouza River near Kanaviou: Alterations to the lower section of the weir by replacing the 1.20 m. notch with a "V" shaped structure 10 m. wide, and lining the river bed upstream of the weir for the normal operation of the station.

Platania River near Kakopetria: Alterations to the lower section of the weir by replacing the 2" x 6" notch with a "V" shaped structure 20 ft. wide.

Panagra River near Panagra: Alterations to the lower section of the weir by replacing the 2" x 6" notch with a "V" shaped structure 27 ft. wide, and cleaning the river bed upstream of the weir for the normal operation of the station.

2.3.8 Temporary flow gauging stations

At the beginning of the year within the frame of Morphou Feasibility Study, seven flow gauging stations were put in operation on seven irrigation intakes on lower Serakhis River. The above work involves a small structure for the stabilization of the section of the irrigation channels, a small float well, and the installation of water level recorders.

At the end of the year, 10 additional flow gauging stations were put in operation on 10 irrigation intakes on Peristerona, Akaki, Elea and Karyotis Rivers.

2.4 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.

The last addition to the Hydrological Survey areas was made during 1969, with Ay. Amvrosios-Kalogrea-Akanthou aquifers.

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 and they are shown on map on page 59.

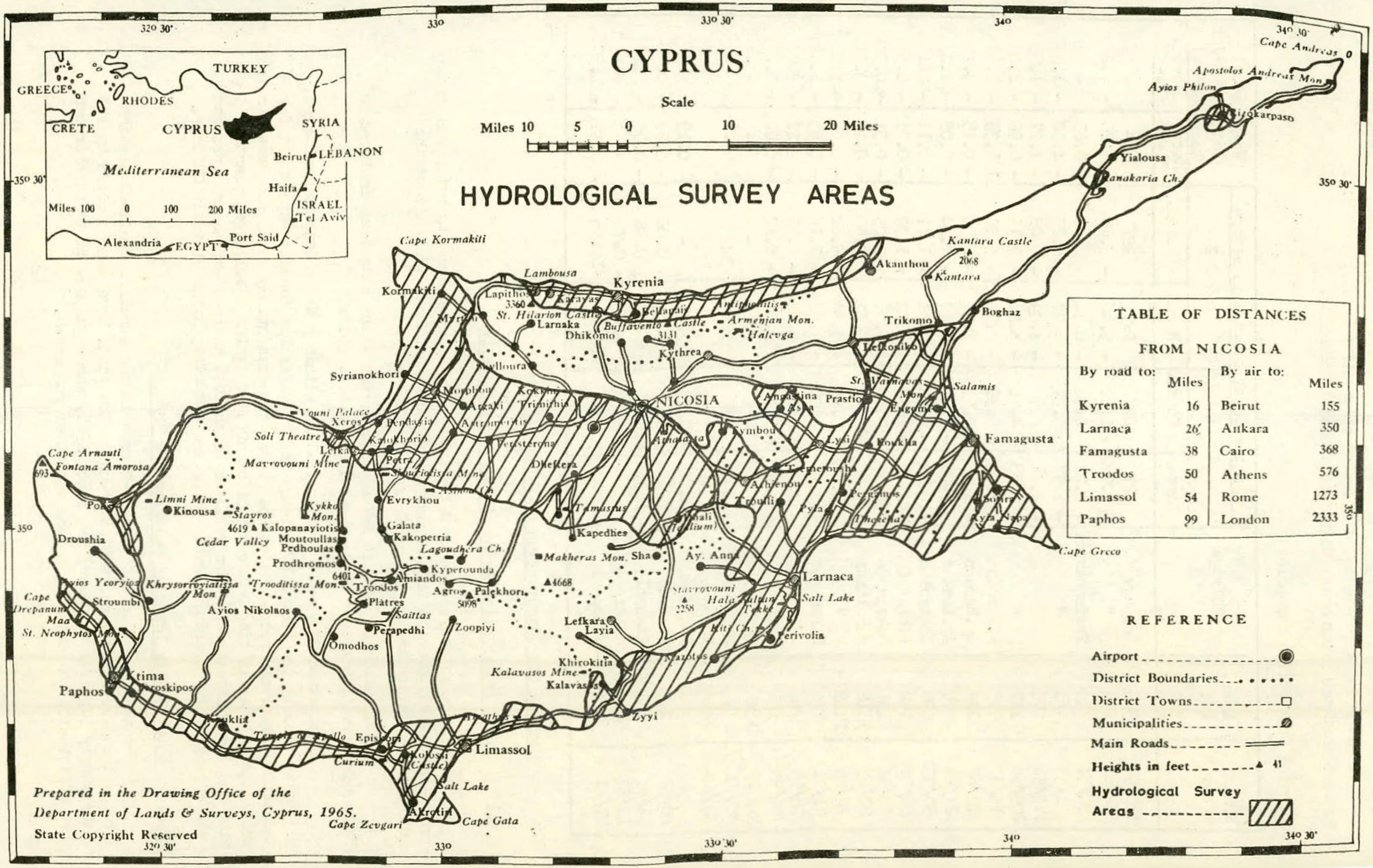
Analytically the observation network was distributed throughout the Island during 1972 as shown below:

Groundwater Observation Net Work

	Hydrological Area	Number of observation wells/boreholess for water level	Number of observation wells/boreholes for water samples
1.	Western Mesaoria	830	397
2.	Central Mesaoria	755	213
3.	S.E.Mesaoria (Famagusta)	693	226
4.	S.E.Mesaoria (Larnaca)	474	196
5.	Kyrenia Region	308	84
6.	Akrotiri-Phasouri	275	115
7.	Yermasoyia-Moni-Pyrgos	151	55
8.	Zygi-Maroni-Kalavasos-Ay.Theodoros	163	78
9.	S.W.Paphos	360	93
10.	Polis Khrysokhou	103	56
11.	Lapathos-Ay.Andronikos Rizokarpaso-Akanthou	253	92
12.	Pissouri-Paramali	61	23
	T o t a l	4,426	1,628

From the above observations, groundwater table contour maps and isochloride maps have been prepared for each aquifer for March and November, 1972.

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.



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
Boghaz
Trikomo
Salamis
Famagusta
Cape Greco
Ayia Napa
Cape Kormakiti
Kormakiti
Lambousa
Kyrenia
Lapithos
3360
St. Hilarion Castle
Larnaka
Buffavento Castle
3131
Armenian Mon.
Halevga
Dhikomo
Kythrea
Myrtou
Syrianokhori
NICOSIA
Vouni Palace
Xeros
Soli Theatre
Lefka
Cape Arnauti
Fontana Amorosa
Mavrovouni Mine
Limni Mine
Kinousa
Stavros
Polis
Evrykhou
Galata
Kakopetria
Kykko Mon.
4619 Kalopanayiotis
Moutoullas
Pedhoulas
Cedar Valley
Prodhromos
Droushia
Kyperounda
Lagoudhera Ch.
Makheras Mon.
Amiandos
Troodos
6401
Trooditissa Mon.
Khrysorroyiatissa Mon.
Ayios Yeoryios
Cape Drepanum
Stroumbi
Maa
St. Neophytos Mon.
Ayios Nikolaos
Platres
Saittas
Agros
Palekhori
5098
4668
Perapedhi
Omodhos
Zoopiyi
Lefkara
Layia
Khirokitia
Kalavasos Mine
Kalavasos
Zyyi
Ktima
Yeroskipos
Paphos
Kouklia
Temple of Apollo
Episkopi
Curium
Kolossi Castle
Limassol
Salt Lake
Akrotiri
Cape Zevgari
Cape Gata
Larnaca
Salt Lake
Stavrovouni
2258
Hala Sultan Tekke
Perivolia
Ay. Anna
Kapedhes
Tamassus
Dheftera
Peristerona
Athienou
Troulli
Pyla
Pergamos
Lysi
Prastio
Enkomi
Sotira
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
Hydrological Survey Areas
Prepared in the Drawing Office of the Department of Lands & Surveys, Cyprus, 1965.
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From the table below of selected observation boreholes it will be seen that the groundwater situation is still worsening.

Selected Observation Boreholes

Serial No.	Hydr. No.	Village	Water level a.m.s.l.in meters				Water level Increase (+)or Decrease (-)	
			1971		1972			
			March	Novem.	March	Novem.	March 71-72	Novem. 71-72
168/50	309	Morphou	DRY	DRY	DRY	DRY	-	-
44/62	1695	"	+ 9.72	+ 1.12	+ 5.44	- 3.00	- 4.28	- 4.12
150/54	15	Syrianokhori	+ 0.22	- 0.70	- 0.41	-	- 0.63	-
1/55	61	"	- 2.57	- 5.37	- 4.07	- 7.22	- 1.50	- 1.85
113/56	76	"	- 2.81	- 4.76	- 4.08	- 6.48	- 1.27	- 1.72
209/56	117	"	- 2.88	- 4.76	- 3.84	- 7.16	- 0.96	- 2.40
15/62	875	K.Varosha	- 5.54	- 5.38	- 4.19	- 5.58	+ 1.35	- 0.20
18/62	228	Ay.Memnon	- 1.81	- 2.53	- 1.96	- 2.78	- 0.15	- 0.25
27/62	285	Ay.Loukas	- 3.05	- 3.91	- 3.10	- 4.14	- 0.05	- 0.23
50/53	558	Dherynia	- 0.20	- 0.96	- 0.31	- 1.11	- 0.11	- 0.15
56/56	192	Liopetri	+ 2.49	+ 1.72	+ 1.52	+ 1.39	- 0.97	- 0.33
49/54	134	Makrasyka	+36.30	+35.97	+35.99	+36.05	- 0.31	+ 0.08
20/63	1516	Paralimni	+19.86	+19.71	+20.62	+19.50	+ 0.76	- 0.21
22/63	1518	"	+ 5.82	- 0.26	+ 5.80	+ 5.62	- 0.02	+ 5.88
51/51	774	Phrenaros	+ 8.11	+ 8.20	+ 7.48	+ 7.16	- 0.63	- 1.04
76/56	972	"	- 2.94	- 4.65	- 5.16	- 6.65	- 2.22	- 2.00
79/56	975	"	+ 8.06	+ 7.95	+ 8.04	+ 8.12	- 0.02	+ 0.17
264/57	D438	Xylophagou	-	-	-	-	-	-
70/51	D 66	Ormidhia	DRY	DRY	DRY	DRY	-	-
12/63	806	Cherkes Chiftlik	+ 1.09	+ 0.52	+ 0.90	-	- 0.19	-
88/54	24	Kolossi	+ 2.16	+ 0.75	+ 2.75	+ 0.06	+ 0.59	- 0.69
51/63	813	Limassol	+ 1.33	+ 0.97	+ 1.27	+ 0.78	- 0.06	- 0.19
13/63	807	Zakaki	-	-	+ 0.16	- 0.78	-	-
107/61	17	Yermasoyia	+ 2.00	+ 2.78	+ 8.38	+14.33	+ 6.38	+11.55

2.5 Control and Conservation of Groundwater

2.5.1 Water Conservation Areas (Wells Law Cap. 351)

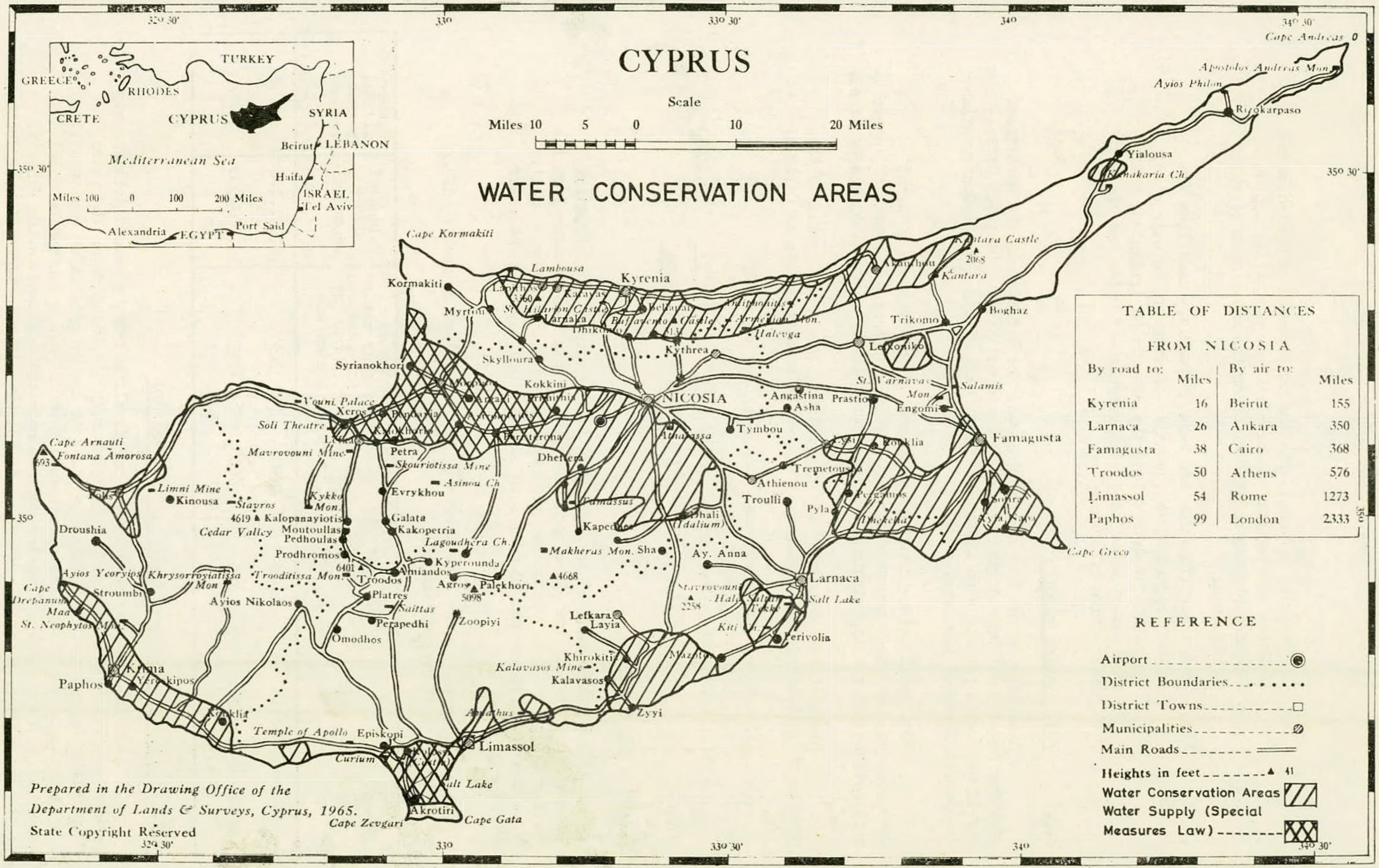
An area is declared as a Water Conservation Area when its water resources are being overexploited or the pumping trends are such, that will affect the quantity or quality of the water of that area.

On map on page 61 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.

2.5.2 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.



CYPRUS
Scale
Miles 10 5 0 10 20 Miles
WATER CONSERVATION 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
Cape Kormakiti
Kormakiti
Lambousa
Kyrenia
Myrtou
Kantara Castle
Kantara
Trikomo
Boghaz
Syrianokhori
Skylloura
Kythrea
Halevga
Kokkini
NICOSIA
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Petra
Skouriotissa Mine
Asinou Ch.
Tymbou
Athalassa
Dhenia
Athienou
Troulli
Pyla
Cape Arnauti
Fontana Amorosa
Limni Mine
Kinousa
Stavros
Mavrovouni Mine
Kykko Mon.
Evrykhou
Galata
Kakopetria
Kalopanayiotis
Moutoullas
Pedhoulas
Cedar Valley
Prodhromos
Lagoudhera Ch.
Kyperounda
Makheras Mon.
Dhali
(Idalium)
Kapedhes
Tamassus
Ay. Anna
Cape Greco
Larnaca
Salt Lake
Droushia
Ayios Yeoryios
Khrysorroyiatissa Mon.
Trooditissa Mon.
Troodos
Amiandos
Agros
Palekhori
Platres
Saittas
Ayios Nikolaos
Stroumbi
Cape Drepanum
St. Neophytos Mon.
Perapedhi
Zoopiyi
Lefkara
Layia
Kiti
Perivolia
Omodhos
Khirokitia
Kalavasos Mine
Kalavasos
Mazotos
Ktima
Yeroskipos
Paphos
Temple of Apollo
Episkopi
Curium
Amathus
Limassol
Zyyi
Salt Lake
Akrotiri
Cape Zevgari
Cape Gata
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FROM NICOSIA
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Ankara 350
Cairo 368
Athens 576
Rome 1273
London 2333
REFERENCE
Airport
District Boundaries
District Towns
Municipalities
Main Roads
Heights in feet
Water Conservation Areas
Water Supply (Special Measures Law)
Prepared in the Drawing Office of the Department of Lands & Surveys, Cyprus, 1965.
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(i) The District Officer, with the concurrence of the Director of Water Development can withdraw any permit for any well or can apply any 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.

2.5.3 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 other applications not failing within the above referred areas have also been examined.

Analytically the number of applications during 1972 received for permits of drilling and enlarging existing wells/boreholes area as follows:-

(i)	Water Supply (Special Measures) Law Areas	625
(ii)	Water Conservation Areas	2566
(iii)	Non-Water Conservation Areas	657
	T o t a l	3848

2.5.4 Water Meters

The fulfillment of the objection of the water supply (Special Measures) Law that is the close control of the extraction of water from the aquifer under such Law, cannot be attained without difining the quantity of water allowed to be pumped from each borehole and watering the water extracted.

According to the above referred law the following number of water meters have been installed.

Area	Number of water meters installed	Number of water meters in operation	Number of water meters in operation without any breakdowns	Volume of water Recorded	Number of illegal pumping (excess water extracted)
Western Mesaoria	603	598	343	29.022.000 m^3	96
Limassol-Akrotiri	396	363	315	14.500.000 m^3	88

2.5.5 Private Drillers (Wells Law, Section 36)

According to the above Law no one is allowed to operate a drilling rig without a Driller's licence issued every year by the Director of the Water Development Department. According to the same law every driller has to notify the Director of the Water Development Department of his intention to drill a borehole, to keep samples from the rocks penetrated and send to the Director of the Water Development Department, a technical report on each borehole drilled.

During the year 1972, the number of licenced private drillers were 77. The number of private drilling rigs drilling for water were 68.

2.6 Cost of Hydrological studies

		Approved Estimated Cost	Actual Expenditure
2.6.1	Hydrological observations and research	£ 18,000	£18,000
2.6.2	Construction and Maintenance of Measuring Weirs	£ 4,000	£ 3,890
	T o t a l	£ 22,000	£21,890

2.7 Special Hydrological Studies

2.7.1 Hydrogeological Investigations of the Kyrenia Range Limestone

The special hydrogeological study of the Kyrenia Range was continued throughout the year and was concluded at the end of the year by the writing of a report by Sir F.Dixey on all the work geological and hydrological.

Sir Frank Dixey spent two months in Cyprus in two separate visits one in June and the other in December.

Mr. M. Peppis, Geologist acted as Counterpart to Sir F. Dixey and was responsible for the collection of all required data and for the preparation of graphs, drawings and tables.

Graphs were prepared for all the boreholes on the Kyrenia Range showing in detail monthly water-level elevations and monthly output if the borehole is used for a particular water supply scheme. Measurements are also taken of the flow of 12 springs and records were prepared for the final report on the flow of these springs for the past 15-20 years. The respective rainfall measurements were also included on this graphs.

Many boreholes sited and started in 1970-1971 were completed by the Geological Survey Department in 1972. These include boreholes in the Ayios Amvrosios-Trypimeni area, the Bellapais area, and the Kyrenia Gap area.

2.7.2 Akrotiri Mathematical Model

The Akrotiri mathematical model for which data were prepared and collected during 1971 by Mr. J. Jacovides, Hydrologist of this Department was partly calibrated in London in association with Dr. Kitching of the Institute of Geological Sciences. The model was completed subsequently and operated on an I.B.M. 1130 computer in Nicosia.

The model which consists of 42 one-square-kilometer inside model areas was calibrated over 60 months (1967-1972). 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.

The results obtained after the last calibration run are very interesting and they are carefully studied and evaluated.

2.7.3 Environmental Isotope Survey

The first one year Research Contract on Environmental Radioisotopes in Cyprus sponsored by the International Atomic Energy Agency with Mr. J. Jacovides, Hydrologist as the principal Scientific Investigator was completed on the second part of 1972. Under this project 107 samples from springs and boreholes throughout the island have been analysed for oxygen -18, 54 samples for Tritium and 6 samples for carbon-14.

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 differentiation of the water masses from each other by the natural labelling of them by the stable isotopes and the radioisotopes of tritium and carbon - 14.

The results of the samples which are being studied in detail show that such techniques are very promising and that the application of these will greatly assist in understanding further the various hydrogeological phenomena.

The research contract has been extented for another year so that the aquifers of Western Mesaoria (Morphou) and the Kyrenia Range limestone aquifer could be studied in more detail with this technique.

2.7.4 Morphou Mathematical Model

Near the end of 1972 data were being collated to formulate the input data for a mathematical model of the Western Mesaoria consisting of 59 four-square-kilometer model areas for an initial calibration over 12 months which is to be undertaken in early 1973. This model is to be utilised in the course of the Morphou-Tylliria Feasibility Study.

III. DIVISION OF PLANNING

By
C.A. Christodoulou
Executive Engineer

3.1 Master Plan

3.1.1 Introduction

The study of the Master Plan for the development of the Water Resources of the island which commenced in 1971 was continued during 1972.

3.1.2 Northern Project

For the northern part of the island and within the frame of the master plan a feasibility study has started with F.A.O. financing which is described further under the title Morphou-Tylliria.

3.1.3 Southern Project

For the southern part of the island a preliminary study was undertaken by the Department. The watersheds from Ezouza river all the way up to Famagusta region are included in the southern project. The main idea is to interconnect all watersheds with a conveyor, the water flowing by gravity from West to East. The result of this connection will be the better balance of the water resources i.e. surplus water in the west to be used in water deficit areas in the east.

Within the Southern Project study various alternatives were studied which included mainly the following:-

(i) Ezouza diversion structure
(ii) Xeropotamos diversion structure
(iii) Arminou dam on the Dhiarizos river
(iv) Dhiarizos diversion structure
(v) Khapotami diversion structure
(vi) Kourris dam (Data taken from Akrotiri Project)
(vii) Kalavassos dam on the Vasilikos river
(viii) Dhypotamos dam on the Pendaskinos river
(ix) Conveyor from Ezouza to Avgorou

For all the above, preliminary engineering studies have been carried out and cost estimates were obtained.

In the meanwhile reservoir operation and diversion studies were carried out by means of an Electronic Computer for four alternatives using 60%, 70%, 80% and 90% of the surplus water.

By the end of the year the economic evaluation of the project has started by collecting all Agricultural Data regarding input and output of various crops. The final objective is to design a dynamic Simulation Model by means of which various alternatives can be studied in a short time facilitating in this way the selection of the optimum one.

3.1.4 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 Common Wealth Office, London.

The intention of the Akrotiri Project was to develop the resources of the Kouris, Garyllis, and Yermasoyia rivers, and their associated aquifers, for perennial irrigation in the project area, which included the possible reclamation of the Akrotiri Salt Lake, together with providing for the increasing urban demands of Limassol Town.

A detailed study of the Akrotiri aquifer was carried out, and the surface water potential of the three river systems has been determined. Also, a full review was undertaken of the agricultural resources of the project area together with a detailed study of the problems associated with the present land ownership.

Various alternative schemes for comprehensive and reduced agricultural development of the project area have been analysed with a view to recommending possible alternative use of the resources, or partial use of the resources.

The project was virtually completed by March 1972 and the Project team departed to United Kingdom for the preparation of the reports.

3.1.5 Paphos Feasibility Study Phase "B"

The consulting firms of Sir M. MacDonald and Partners in association with Hunting Technical Services, Jean Saliba and Howard Humphreys and Sons acting as sub-contractors employed by the Food and Agriculture Organization of the United Nations under contract No. SF/CYP 6 - 3/LA embarked on the Paphos Feasibility Study phase "B" on the 1st of March 1971.

The study was carried out in three stages - a data collection and appraisal period of six months, a data evaluation and project formulation period (in Cyprus), and finally a design and report writing period in the U.K. The team completed its field work in March 1972 and returned to the U.K.

The project envisages a phased development plan of the water resources of the Xeropotamos river together with the groundwater resources of the Dhiarizos, Ezouza river bed and the calcarenite aquifer of the coastal plain of the South Eastern Paphos area. These water resources are to be used in the irrigable lands between the Ha-Potami and Mavrokolymbos river along the coastal plain.

The project, further to making recommendations on the engineering solutions (Asprokremmos dam, main canal, distribution systems, well construction and irrigation techniques) examines the agricultural development considering cropping patterns, land consolidation and marketting. Also the financial and economic justification of the project has been analysed.

3.1.6 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 project which commenced in June 1972 is anticipated to last two and half years.

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

The whole feasibility study comprises:

(i) Hydrological study. This study which includes updating of the existing data and reassessment of the surface water resources of the area was largely completed by the end of 1972.

(ii) Hydrogeological study. This includes collection and interpretation of data on the small aquifers on the Tylliria-Pendayia catchments and a similar evaluation in Morphou area together with a mathematical simulation of the aquifer dynamics on a digital model. Substantial progress was made in 1972.

(iii) Water mobilization planning. This study includes the formulation of alternative development plans, taking in consideration the dependability of the existing water resources and the availability and capability of the land, and indicating the type and size of engineering structures to be studied.

(iv) Engineering study. This includes the design of the above structures such as storage and diversion dams, diversion and conveyance schemes, distribution systems and all other infrastructure for irrigation development. All of the above design have commenced during 1972 and are expected to be completed by 1973.

(v) Agricultural studies. During 1972 much of the data required to carry out studies such as on land classification, irrigation practices and methods, cropping patterns, irrigation water requirements and farm management studies, were collected and compiled.

(vi) Economic studies. These include socio-economic studies marketing studies and sensitivity analysis of yields, market prices and cost of production. During 1972, preliminary marketing studies completed.

By the end of 1973 based on the conclusions of all the above studies an interim report will be produced for consideration by the Government. The final report which will constitute a comprehensive bankable report, for appraisal by international financing agencies will be prepared by 1974.

3.2 Site Investigations Soils and Concrete Laboratories Grouting

3.2.1 Site Investigations

3.2.1.1 General

During 1972, site investigations were carried out on fourteen different projects. Most of the investigations were connected with the feasibility studies on various projects undertaken by the Food and Agricultural Organization (FAO) of the United Nations Development Programme, and their Consultants. The site investigation and laboratory work for these projects was carried out as specified by these Consultants. Work on some projects was started towards the end of 1971 and was completed during 1972. The following work is usually carried out during a site investigation:

(i) Geological mapping of the damsite and reservoir areas.

(ii) Foundation Investigations by drilling, sampling, in-situ testing and excavation of trenches.

(iii) Material Investigations - excavation of pits and sampling.

(iv) Laboratory Testing.

(v) Interpretation of results for design.

(vi) Report on the Investigations.

Site investigations were carried out for projects of other Government Departments and public or private firms.

3.2.1.2 Schemes Investigated during 1972

3.2.1.2.1 Ayios Theodhoros Dam

The investigations here started in late December 1971 at the recommendations of the Consultants and were completed by May 1972. The following work was carried out:

(i) Drilling of six boreholes to a total depth of 301 m, four of which inclined.

(ii) Water pressure tests were performed in all boreholes at 3m stages.

(iii) Perforated stand pipes were installed in the boreholes for water level measurements.

(iv) Eleven trial pits were excavated at the proposed core material borrow areas and samples were taken and tested.

3.2.1.2.2 Panayia-Tis-Agapis-Dam

The investigations started in late December 1971 at the recommendations of the Consultants and were completed by the end of March 1972. The work was carried out as follows:

(i) Four vertical boreholes were drilled to a total depth of 142 metres.

(ii) Water pressure tests were performed in all boreholes at 3 m stages.

(iii) Perforated stand pipes were installed in all boreholes for water level measurements.

(iv) Six trial pits were excavated at the proposed core material borrow area and samples were taken and tested.

3.2.1.2.3 Arakapas Dam

The investigation work was carried out in two stages. The first stage was carried out between December 1971 and March 1972 and the second stage in October and November 1972.

(i) Seven boreholes were drilled, one of which inclined, to a total depth of 110 metres.

(ii) Water pressure tests were performed in four of the boreholes at 3 m stages.

(iii) Perforated stand pipes were installed in three of the boreholes for water level measurements.

(iv) Nine trial pits were excavated at the proposed core material borrow area and samples were taken and tested.

(v) Samples of the river gravels were taken downstream of the proposed dam axis and tested.

3.2.1.2.4 Ayios Nicolaos Dam

In addition to the investigations carried out in 1971, the following work was carried out in 1972.

(i) Drilling of one inclined borehole to a depth of 66 metres.

(ii) Water pressure tests were performed at 3 m stages.

(iii) Perforated stand pipe was installed in the borehole for water level measurements.

3.2.1.2.5 Kalo Chorio Diversion

At the recommendations of the consultants the following additional investigations were carried out during 1972.

(i) Three percussion holes were drilled to a total depth of 103 metres.

(ii) Pumping in or pumping out tests were carried out in the boreholes.

(iii) Trial pits were excavated at the new proposed core material borrow area near the damsite, and samples were taken and tested.

(iv) Geophysical investigations were carried out by the Geological Survey Department, to find the depth of gravels.

3.2.1.2.6 Limnitis Dam

The investigations here were carried out at the request and recommendations of the consultants as follows:

(i) Five inclined boreholes were drilled to a total depth of 204 metres.

(ii) Water pressure tests were performed in all boreholes at 3 m stages.

(iii) Perforated standpipes were installed in the boreholes for water level measurements.

(iv) Trial pits were excavated downstream of the proposed dam axis, for investigating possible borrow area for core material and samples were taken and tested.

3.2.1.2.7 Phlevas Dam

The investigations for this dam were carried out according to instructions given by the Consultants. The work was carried out in two stages; the first stage was started in February 1972 and was completed in June 1972, and the second stage started in November 1972 and it's hoped to complete it in early February 1973. The following work was carried out during the investigations:

(i) Three boreholes were drilled during the first stage, two of which inclined to a total depth of 170 metres.

(ii) Four boreholes were completed during the second stage of the investigations, one of which inclined to a total depth of 110 metres.

(iii) Water pressure tests were carried out in five of the boreholes at 3 m stages.

(iv) Perforated stand pipes were installed in four boreholes for water level measurements.

(v) Trenches were opened down to sound rock on both abutments.

(vi) Investigations for construction materials and laboratory testing will continue in 1973.

(vii) Geophysical investigations will be carried out by the Geological Survey Department in 1973.

3.2.1.2.8 Kyra Dam

The following additional investigations have been carried out during 1972: the work was performed according to instructions given by the Consultants.

(i) Three boreholes were drilled in the alluvial deposits to a total depth of 34 metres using the Mobile Auger Drill.

(ii) Permeability tests using the well permeameter method, were carried out in the three holes.

(iii) Samples from the holes were taken for identification purposes.

3.2.1.2.9 Arminou Dam

The following investigations were carried out in accordance to the recommendations of the Consultants:

(i) Seven boreholes were drilled, two of which inclined, to a total depth of 410 metres. Another two inclined boreholes were started and will be completed in 1973.

(ii) Water pressure tests were performed in five of the boreholes at 3 metres stages.

(iii) Perforated stand pipes were installed in the boreholes for water level measurements.

(iv) Trial pits were excavated at two probable core material borrow areas and samples were taken and tested in the laboratory.

3.2.1.2.10 Khirokitia Dam

At the recommendations of the Consultants the following additional investigations were carried out in 1972.

(i) Two inclined boreholes were drilled totalling a depth of 140 metres.

(ii) Water pressure tests were carried out in the boreholes at 3 metres stages.

(iii) Various types of probable shell material were sampled and tested in the laboratory.

3.2.1.2.11 Prastio Reservoir (Morphou)

The following investigations were carried out at the request of the Consultants:

(i) Nineteen trial pits were excavated totalling a depth of 33 metres and samples were taken and tested in the laboratory.

(ii) Eight boreholes were drilled to a total depth of 122 metres using the Mobile Auger Drill.

(iii) Permeability tests, using the well-permeameter method, were carried out in the upper layers and gravels encountered in the boreholes.

(iv) Disturbed and undisturbed samples were taken from the holes and tested in the laboratory.

(v) The investigations and laboratory testing will continue in 1973.

(vi) Standard Penetration Tests were performed in all boreholes.

(vii) Geophysical investigations were started by the Geological Survey Department and will continue in 1973.

3.3 Investigations for Other Departments

Investigations undertaken in 1972 for other Departments were that of the new Nicosia Morphou Road, Nicosia International Airport and that of the Cyprus Civil Service Co-operative Building Society.

3.3.1 New Nicosia - Morphou Road

These investigations were started in November 1971 at the request of the Director of Public Works Department and were completed by the end of February 1972. The sites investigated were at the points of road interchanges and river bridges. Sampling, in-situ and laboratory testing was carried out during the investigations.

Fourteen boreholes were drilled using the overburden and the Mobile Auger Drills.

3.3.2 Nicosia International Airport

The investigations here were carried out at the request of the Director of Public Works Department. Their purpose was to find out the exact depth of fill material placed in the new run-way. Eighteen boreholes were drilled totalling a depth of 215 metres.

3.3.3 Cyprus Civil Service Co-Operative Building Society Ltd

The aim of the investigations was to examine the subsoil conditions at the proposed site of the Eylenja Housing Estate and to provide information relevant to the design and construction of the building foundations.

(i) Twelve boreholes were drilled totalling a depth of 139 metres, using the Mobile Auger Drill.

(ii) Standard Penetration Tests were carried out in most of the boreholes.

(iii) Disturbed and undisturbed samples were taken and tested.

(iv) Three test pits were excavated using pneumatic rock drills and three plate bearing tests were carried out in the pits.

(v) One permeability test was performed in one of the boreholes.

3.4 Equipment for Field Investigations

Table 1 shows a list of the equipment available for field investigations.

3.5 Grouting Section

The only grouting work carried out by the Grouting Section of W.D.D. was that of Ayia Sophia in Nicosia. The grouting section was also involved in the control and supervision of the grouting at Lefkara and Palekhori Dams, carried out by the contractors.

3.5.1 Grouting at Ayia Sophia Mosque

Grouting was carried out here at the request of the Director of the Department of Antiquities, in connection with the restoration work now being performed under the direction of UNESCO Experts.

The grouting was mainly confined on the masonry columns of the structure with the object of strengthening these columns by filling all voids inside the columns and replacing the weak lime mortar. The work was done during November and December 1972.

3.5.2 Grouting at Lefkara Dam

The grouting work here was done by a specialist sub-contractor and the grouting section was involved in the site control and supervision of the work. The work started in late December 1971 and was completed by the end of October 1972 exept for the grouting of the diversion tunnel. Altogether 559 holes were drilled and grouted having a total depth of 6,820 metres. The grout mixture used composed of water and ordinary Portland cement. The total quantity of dry cement used was 134,000 kilograms.

3.5.3 Grouting at Palekhori Dam

Here again the work was done by a sub-contractor, but the drilling and grouting equipment of the W.D.D. were used. The control and supervision of the grouting works was undertaken by the grouting section of W.D.D. The work was started in May 1972 and completed in early November 1972.

The total depth drilled was about 1570 metres out of which 1270 metres were grouted. The mixture used was made of ordinary Portland cement diluted in water. The total amount of dry cement used was 14 tons.

3.5.4 Grouting Equipment

A list of the grouting equipment is shown in Table 2.

3.6 Laboratory Branch

An increase in the number of laboratory tests performed during 1972, has been noticed in both the soils and concrete laboratories of the Department. Most of the laboratory tests were performed in connection with foundation and material investigations of proposed dam sites; a great number of tests were also performed on construction materials being used in the construction of dams and other water works.

Tables 5 and 6 show the type and number of tests performed in the soils and concrete laboratories respectively, during the year. The testing facilities available during 1972 in the soils and concrete laboratories are shown in Tables 3 and 4.

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	Coredill	Boyles	1971
WDD 560	Auger Drill	Atlas	1971
WDD 553	Ligh percussion Drill	Edeco	1970
WDD 587	Mini-Wagon-Drill	Atlas	1972

(ii) Other Equipment for Use on Site

Serial Number	Apparatus	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 - W.D.D. Grouting Machinery in 1972

1.	One "Moyno" Grout pump (Pneumatic) Capacity = 50 gal./min. Pumping Pressure = 200 psi
2.	One "Craelius" Grout pump Reciprocating with Diesel Engine Capacity = 11 gal./min. Pumping Pressure = 1000 psi
3.	Two Z-M-300 High Speed Mixers (Pneumatic), Craelius Capacity = 66 Imp. gallons
4.	Two ZA-600 Grout Agitators (Pneumatic), Craelius Capacity = 132 Imp. gallons
5.	1 No. colloidal grout mixer "Semix 175" type, Craelius
6.	1 No. Grout Agitator "Colcrete" type Craelius

Table 3 - Soils Laboratory Equipment

Serial Number	Apparatus	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	" 1970
4	Standard and modified proctor apparatus	prior to 1967
5	Sand replacement apparatus	" 1967
6	Sieve analysis, hydrometer and pipette apparatus	" 1967
7	Falling and constant head permeameters	" 1967
8	Unconfined compression apparatus	" 1967
9	Triaxial apparatus ($1\frac{1}{2}$" diameter specimens)	" 1967
10	Small shear box machine (6 x 6 cm specimens)	" 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

Table 3 - Soils Laboratory Equipment (Cont')

Serial Number	Apparatus	Year Acquired
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

Table 4 - Concrete Laboratory Equipment

Serial Number	Apparatus	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

Table 4 - Concrete Laboratory Equipment (Cont')

Serial Number	Apparatus	Year Acquired
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 5 - Tests carried out in the W.D.D. Soils Laboratory in 1972

TESTS	Paphos Canal	Panayia tis Agapis Dam	Kalon Khorion Lefkas	Dhypotamos Dam	Khirokitia	Ayios Theodhoros	Kyra Dam	Limnitis	Kalavassos	Prastio Reservoir	Arminou	Mussari Dam	Nicosia-Morphou New Road	Civil Service Building Society	Miscellaneous	Arakapas Dam	Total of each kind of test
Atterberg Limits	18	14	39	47	2	17		13	37	31	3	42	7	16		19	305
Moisture Content	18		33						37	37		1006	32	20			1183
Standard Proctor		13	33	26	3	15		12	25	21		41				9	198
Sand Replacement												466					466
Core Cutters												370					370
Hydrometer Analysis	18	14	39	47	2	17	3	15	37	40	3			15	11	21	267
Permeability		14	29	24	1	15	2	12	21	22		12				6	173
Triaxial Undrained				4						11				10			25
Triaxial Drained		1	1		1		2										5
Triaxial with P.W.P.							6			6						1	13
Shear box (large)					5											1	6
Consolidation										8				2			10
Silt Content															167		167
Specific gravity	18		39	47	2	17	3	14	37	38	3		32	15	11	21	297
Field density										6				2			8
Wet analysis		4	4	-	22												30
Dry analysis		4	4		22												30
Grusting strength						4										4	8
T o t a l	72	64	221	195	60	85	16	66	194	220	9	1937	71	80	189	82	3561

Table 6 - Tests carried out in the W.D.D. Concrete Laboratory in 1972

T E S T S	Massari Dam	Tenders for concrete aggregates	Miscellaneous	Tests for private firms	Khirokitia Reservoir	Palekbori Dam	Total of each kind of test
Sieve analysis	246	76	27		5	10	364
Silt content	113	42	12		2	5	174
Organic Impurities	113	42	12		2	5	174
Specific Gravity	14	4			1	2	21
Aggregate Crusting test	5	11	8			4	28
Fineness Modulus	52						52
Cubes prepared and or crushed	439		59	752	73	35	1358
Slump Test	97						97
Water Absorption	14	4				2	20
Rock Cores - crushing			69				69
T o t a l	1093	179	187	752	83	63	2357

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 1972 consisted of :

1 No. Executive Engineer I - Head
8 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 Avios Nicolaos Dam - Kakopetria

The preliminary design of this dam commenced during the second half of 1971, but its final and detailed design was continued and completed during 1972. Most of the work done throughout the year involved the preparation of General layout and detailed drawings, the revision of final Bill of Quantities and Cost Estimate, and the preparation of a design and technoeconomical report.

The dam which is situated on Karyotis River about a mile from Ayios. Nicolaos Village is of the concrete gravity type with a max height of 33 m and a total crest length of 110 m. The dam which will be of max capacity of 265,000 m3 will have a total concrete volume of about 27,000 m3.

The dam which will be mainly used for irrigation will accomodate a step type spillway 40 m wide, with a desilting outlet 1.52 x 1.83 m discharging into a reinforced concrete flip bucket.

The total cost of the dam was estimated to about £234,000.

4.2.2 Arakapas Dam

Preliminary investigations for this dam commenced mid 1971 but it wasn't until early 1972 where design work was actually taken in hand. Before this date most of the time was spent in Geological and Soils investigation of three possible dam sites. All three locations are situated on the same river about 2 miles apart from each other.

The river is a main tersiary of Yermasoyia river appr. one mile from Arakapas village.

Several alternative types of dams have been considered and a preliminary design with a cost estimate has been prepared in each case.

Finally the upper dam site has been chosen as the most suitable from geological point of view and a concrete gravity type of dam as the most feasible from the economical point of view.

The second half of 1972 was therefore spent on the final design, and the preparation of detailed drawings, bills of quantities and a cost estimate as well as preparing a feasibility report for the overall project.

The dam will be of concrete gravity type of max height above river bed of 15 m with a step type spillway 63 m wide. At the left abutment an R.C. conduit of 1.8 m x 1.8 m will be serving as a diversion tunnel during construction and as a desilting outlet on completion of the project.

The dam with a capacity of 115,000 m3 will be used for irrigating about 200 donums of citrus. Its total cost including the distribution network has been estimated to about £106,000.

4.2.3 Palekhori-Kambi Dam

This dam is situated on Kambi-River about a mile of the main road just before Apliki Village.

The final design of the dam including preparation of drawings, Bills of Quantities, Specification and Conditions of Contract, have been carried out and completed by the Department in 1971. Never the less a lot of design work, involving mainly supplementary details as well as modifications on existing contract drawings in the light of new data available have been prepared and issued to the Contractor by the design section throughout 1972.

The dam which is of concrete gravity type of max height from river bed of 33 m and fill of 35,000 m3 will have a capacity of 620,000 m3 and will be mainly used for irrigation.

4.2.4 Massari Dam

This dam is situated at the junction of the three main tributaries of Serakhis river, about 2 miles upstream of Massary bridge. The final design, including preparation of drawings, Bills of Quantities etc have been prepared long ago by the Department. Inspide of this, throughout the year 1972 quite an amount of design work, mainly on supplementary details and modification of existing drawings in the light of new data available has been carried out by the design section. In a number of cases new design work has been undertaken as in the case of the R.C. Bridge over the spillway, designed to take light traffic , and the inlet structure designed to carry the loads of the hydraulic gate.

4.2.5 Kalokhorio-Klirou Dam

A reasonable amount of design work has been done also throughout the year on the raising of existing masonry dams.

The design calculations commenced in 1971, but they were completed in 1972 including the preparation of Bills of Quantities Cost Estimates and technoeconomical reports.

The Klirou Dam with an existing capacity of 33,000 m3 is to be raised by 2 m, in order to accomodate an additional capacity of 32,000 m3. As a result of the increased capacity an additional area of 64 donums of spring crops will be irrigated. The max height of the dam will now be 13 m and the works are estimated to cost about £18,000.

4.2.6 Galini Dam

The design calculations for the raising of Galini masonry dams were started and completed during 1972. A cost estimate with a technoeconomical report has also been prepared.

The existing dam with a capacity of 16 x $10^3 m^3$ is to be raised by 4.5 m in order to accomodate an additional capacity of 38 x $10^3 m^3$. As a result of the increased capacity an additional area of 38 donums of citrus will be irrigated.

It is estimated that the works will cost about £22,000.

4.2.7 Nicosia Water Supply - Morphou Bay Scheme

The preparation of Morphou bay scheme commenced in 1971, but its full completion and operation was to be achieved in the first half of 1973.

The scheme whose object is to provide Nicosia town with additional 10,000 cu.meters of water per day from new boreholes in the Pentayia area involves:

(i) the use of five new boreholes, and a new 18" A.C. pipeline from the boreholes to the main Prastio Pumping Station.

(ii) the provision of two additional electrically driven centrifugal pumps with auxiliary equipment at the Prastio Station.

(iii) A booster station near Philia Village which will enable the existing Morphou-Nicosia pipeline to convey the additional quantity of water.

(iv) A reservoir next to Engomi existing reservoir to accomodate the additional 10,000 cu.m. of water.

4.2.7.1 Philia Booster Station

The drawings for the construction of the Booster Station were prepared by "Howard Humphreys and Sons" consultants U.K. but the structural design of the Building itself was done by the Design Section of the Department in the second half of 1972. The Booster Station consists of the main bulding accomodating the booster pumps and pipework and two auxiliary buildings one to be used as office and accomodation building and the other as a workshop and transformer room.

The two later buildings have been design in R.C. slab and beam construction, with pad footings, while the main building has been design in portal frame construction with a continuous beam foundation. Detailed R.C. drawings have been also prepared for all three buildings.

4.2.7.2 New Engomi Reservoir

The preliminary design of new Engomi reservcir commenced late in the year.

Three alternative solution have been investigated as to the type of reservoir design to be adopted, followed by the corresponding cost estimate. Finally it was found that the beam and slab design and the flat slab construction type, would cost about the same. The later was then adopted being a better design from space economy within the reservoir as well as from aesthetics point of view.

The reservoir which will be constructed, next to the existing Engomi reservoir and operated together, will have a capacity of about 10,000 m3 and it is estimated to cost around £96,000.

The final design including preparation of general layout and detailed drawings is expected to be completed early 1973.

4.3 Report on Construction of Major Projects

The year 1972 has been mainly a "year of construction", as quite a number of Major Projects whose construction commenced in 1971, have actually reached a full scale activity during the year 1972. A general report on the various Projects undertaken during 1972, followed by a detailed construction progress report is given below for each Project.

4.3.1 Palekhori-Kambi Dam

4.3.1.1 General

The Palekhori-Kambi Dam is located S.W. of Nicosia on the Kambi river, and at a distance of approximately 26 miles.

The dam which will be used for irrigation is a mass concrete gravity dam type. It will have a max height of 107 ft. (32,6m) from river bed level to the crest of the dam, and 100 ft (30,5m) to spillway crest level.

The capacity of the dam is 136 x 10^6 gallons (620.000 m^3) with normal irrigation outlet flow 120l/sec.

The dam consists of 13 vertical blocks with a continuous grout curtain extending over the entire length of the dam.

The fifth block from the left abutment of the dam will be serving as a spillway, 34 ft. wide, discharging overflow water into a flip bucket.

A drainage and inspection gallery having a cross section 5' x 7' runs through almost the entire length of the dam. A valve chamber formed partly within the gallery accomodates the sluice valves. A 12" ϕ and 8" ϕ steel pipes situated in a recess along the sluiceway will be serving as irrigation and compensation pipes respectively.

The construction of the dam which has been entrusted to Joannou 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, and construction works are still continuing since then.

Inspite to other Projects given to Contract, construction works on this dam are supervised and controlled entirely by the Department.

The work executed at the site office, which are manned with one Executive Engineer,one Inspector of Works,two Technical Assistants two foremen and two laboratory technicians involves quality control of everyday routine work, preparation of progress charts and record keeping on the various sections of the works, and in general control of any work associated with the contract drawings and application of contract specification and general conditions.

Although this project was due to be completed in May 1973 according to contract, about only 40% of the works has been executed upto the end of the year which means there will be a delay of 3 to 4 months. The work executed during the year by the contractor according to monthly measurements and interim certificates has been valued to £216,000. It is expected however that the final cost of the Project will finally exceed that of the contract price, in view of different foundation conditions encountered during construction.

4.3.1.2 Progress of works in 1972

4.3.1.2.1 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 the dam foundation, approach channel to sluiceway, flip bucket and stilling basin foundation started early in the year 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 anavoidable 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.

As a result this operation was delayed by about two months.

4.3.1.2.2 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.

4.3.1.2.3 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 work. 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 60 ft. deep, and the second of about 35 ft. 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 critirion. Therefore a considerable quantity of drilling and grouting for the second grout curtain was omitted, at these particular sections.

After the completion of the grou ting works, number of control holes were drilled 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 nearby 50% due to the elimination of the work for the second line of grouting.

4.3.1.2.4 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 but still not satisfactory. The Contractor has used a crushing plant on Malounda village for the supply of aggregates with an automatic batching plant for mixing the concrete. Two power cranes were used for the transportation and placing of concrete.

The total volume of concrete done upto the end of the year was about 12000 cu.yds out of about 40.000 cu.yds. Most of the concrete blocks have reached a satisfactory level above river bed, especially at both abutments, but at the deepest sections the elevations are still quite low.

Assessing the whole progress of the works upto the end 1972 the Contractor was behind schedule by about 3 months.

The Contractor however attempted to accelerate progress by working overtime and double shift (from 23rd October to 9th November 1972). Double shift was then stopped due to very low temperatures during the night shift, not permitting concrete to be placed on one hand and shortage of materials on the other.

An assessment made on the output of concrete has shown that unless the Contractor is prepared to produce a minimum amount of 350 cu.yds per day the works will not be completed in time. But it is most unlikely that he will be in a position to increase his output subsantially, in order to cover the time lost, although pressure has been put on the Contractor to this effect.

4.3.1.3 Expenditure

The total expenditure incurred from the commencent of the works upto the end of December 1972 was about £139,000. Out of this amount about £126,000 were paid to the Contractor with the balance of £13,000 being spent for direct expenditure by W.D.D.

4.3.2 Massari Dam

4.3.2.1 General

The 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 earthrockfill dam of max. height about 50 ft. and a capacity of 500 x 10^6 gallons. It consists of an impervious clay core with an impervious upstream clay blanket and upstream and downstream filter and shell zones.

A reinforced concrete spillway of width 200 ft. will be serving as a discharge spillway in case of floods. An R.C. conduit of 11 ft. diam. at the deepest section of the dam will be serving as a diversion tunnel.

The construction of Massari dam which has been undertaken by the Department commenced in July 1971. In view of the late date of commencement the embankment was constructed in two stages, the first stage being completed by December 1971. The second stage which constituted the major part of the embankment as well as the R.C. conduit and part of the spillway were constructed during 1972.

The whole of the works have been 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 had been hired.

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

The site supervisory staff for the works consisted of one Executive Engineer, a Senior 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 everyday 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. It is estimated that the entire cost of the project will finally reach the amount of £166,000.

4.3.2.2 Progress achieved in 1972

The construction work of the second stage was more laborious and difficult as this part of the work included the construction of the R.C. conduit and spillway. Inspide of the difficulties encountered however the work proceeded in full scale and at an accelerated rate.

4.3.2.2.1 Embankment

The second stage of the embankment was almost completed by the end of 1972 with the only part remaining being the placing of part of the rup-rap on the upstream face. A total of 366,000 yds^3 of compacted fill material has been placed since work commenced out of which 280,000 yds^3 were placed during 1972. The rates achieved in all items of work were very low indeed, with the result that the final cost of the works was very satisfactory.

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

Summary of Quantities Placed in Dam Embankment

Description	Quantities (Yd 3)	Cost (£'s)mils
	Actual Executed	Actual
Corefill	111 000	19 623.458
Filters	35 000	8 012.569
Shell-fill	211 000	21 106.066
Toe-drain	6 000	1 547.434
Rip-rap	5 050	1.426.324
Total	366 000	£51.715.851

4.3.2.2.2 Spillway

The Construction of the Spillway started in December 1971 and was completed by August 1972. The only part still under construction is the reinforced concrete bridge over the spillway which has now been designed to carry light traffic.

A total of 4000 yds^3 of reinforced concrete (mix 1:2:4) and 510 yds^3 of mass concrete (1:2½:5) were placed during the year. An average cube strengths of 4,500 and 3,500 lbs/in were obtained respectively.

4.3.2.2.3 R.C. Conduit

Concreting of the conduit commenced in June 1972 and was completed by August 1971. A total of 1320 yds^3 (mix 1:1.8:3.2) and 300 yds^3 (mix 1:3:6) were placed during this period. The output reached in several occasions was 70 yds^3 in one day. The average cube strength achieved was 5,500 lbs per in^2.

The only remaining section of the work to be completed is the erection ofthe inlet gate which is to be delivered from Austria in February 1973.

4.3.2.3 Expenditure

The total expenditure incurred from the commencement of the works upto the end of December 1972, for all sections of the works are as indicated in the table on next page.

Sections of work	Expenditure upto end Dec.1972
1. General	£23 126.946
2. Dam	£54 697.227
3. Spillway	£50 412.106
4. Outlet	£21 373.311
5. Land acquisition	£ 38.812
Total	£149 648.402

4.3.3 Nicosia Water Supply-Morphou Bay Scheme

The first two stages of the above scheme i.e. the laying of 18" A.C. pipeline from existing boreholes at Pentayia to Prastio-Booster Station and the installation of two additional pumps at the station were completed by the second half of 1972. The third stage of the works i.e. the construction of Philia Booster Station was still under construction by the end of the year.

4.3.3.1 Philia Booster Station

The construction of the station which has been undertaken by the Department through direct labour commenced during the second week of August 1972 with the excavation of the foundations of the main booster house.

By the end of the year, concreting of the foundation ground beams, columms, gantry beams for the crane and the slab over the workshop were completed. The three bases for the booster pumps were also constructed and the brickwork was commenced in the workshop.

The total cost of the building works which is expected to be completed by May 1973, is expected to reach the amount of about £22,000. The expenditure incurred upto the end of December 1972 was about £9,600.

4.3.4 Famagusta Water Supply Scheme - Stage III

This stage is the final stage of the new scheme for meeting the water supply requirements of the town of Famagusta until 1985 and includes:

(i) Lefkara Dam
(ii) Khirokitia Treatment works
(iii) The Lefkara - Khirokitia pipeline

The first two projects have been designed by consultants while the pipeline has been designed by the Department.

The Construction of Lefkara Dam which commenced in May 1971 was awarded to international contractor in a joint venture with a local Contractor.

The construction of the dam is supervised on behalf of the Department by a Senior Resident Engineer for the Consultants and other Engineers and technical staff of the Department. The whole project is to be completed according to contract November 1973.

The construction of Khirokitia Treatment Works and the laying of the Lefkara-Khirokitia pipeline has been undertaken by the Department early in the year. Both Projects are supervised by Engineers and technical staff of the Department. The work involved includes the planning and programming of the works, quality control and cost control and finally the preparation of progress charts and monthly progress reports. Detailed reports of progress achieved in 1972 for these Project appear on next page.

4.3.4.1 Lefkara Dam

4.3.4.1.1 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 for 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 Medcon Construction Ltd.," The letter of Acceptance of the Tender was dated 29th April, 1971. 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 of Commence.

The dam will be of the rockfill type with a central clay core. It will be 70 metres high, crest elevation being at 361.0 metres above sea level, with a total fill volume of about 800,000 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 km^2. 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.

4.3.4.1.2 Expenditure

The total expenditure incurred from the commencement of the works up to the end of December 1972 was £586 700 of which £534 970 was for work done by the Contractor up to December 1972 and the balance of £51 730 represents direct expenditure by the Department. The expenditure incurred during the year 1972 is as follows:-

(i) Payments to Contractors	£390 919
(ii) Direct Expenditure by W.D.D.	46 732
Total for Dam	£437 651

The value of the work carried out by the Contractor to the end of the year of £534 970 representing 51% of the Contract Price in 64% of the Contract Period.

4.3.4.1.3 Progress achieved in 1972

In general progress was rather slow in the first 7 months of the year, but resulting from pressure being applied on the Contractor by both the Consulting Engineers and the Department of Water Development in May through to July 1972, progress was accelerated and from August to the end of the year a steady and satisfactory rate of progress was achieved.

4.3.4.1.3.1 Diversion Tunnel

The tunnel lining is being constructed in two sections. An invert subtending an angle of 90° at the centre of the circle is case first and the remainder of the lining is completed in a second operation. Two 6 m. long sections having been cast in December 1971, work on the invert was not resumed until 26th June 1972. Placing was done by the ram pump and later by a pneumatic placer. The process continued up to 14th October by which time 91% of the invert had been concreted, leaving the downstream end to be done in 1973. Casting of the lining above the invert started from the upstream end on 24th November and continued in 3m. lengths and later in 6m. lengths to the end of the year by which time. 37% of the work had been completed. Placing was again done by pneumatic placer.

The overall percentage of completion of the tunnel is 67%.

4.3.4.1.3.2 Embankment

Construction of the cofferdam started on January 16th 1972. It was built of rockfill with a central clay core flanked by sand-gravel filters on both the upstream and downstream faces. The cofferdam was completed on 6th April 1972 with a crest elevation of 306.00 m.a.s.l.

The first five months of the year were taken up by removal of spoil pushed into the riverbed from the abutments.

The first rockfill in the downstream shoulder of the dam was placed on 30th May 1972 over a 1 m. thick layer of gravel size material used as a transition blinding to a wide gabbro seam running along the riverbed. The first clay fill was placed in the cut-off area on 18th July and it wash't until August that the placing operations were in full swing. Since that period filling has been in progress to the end of the year, by which time the construction surface had risen to an average elevation of 315.80 m.i.e. 40.8% of the overall height and 36.4% of the total fill volume of the dam.

The finished crest level is to be at 361.0 m. and the lowest point in the foundation is at elevation 285.0 m.a.s.l.

Drains have been constructed under the downstream shoulder on both flanks at approximate elevations 295 m. and 309 m.

Instrumentation has been installed in the core at elevations 291,306 and 313.

4.3.4.1.3.3 Spillway

At the beginning of the year the spillway cut had been excavated by drilling and blasting down to level 365'. This work continued in 1972 and the bulk of the excavation down to formation levels from 355 upstream to 341 downstream had been completed by the end of July.

The final trimming and removal of loose and overhanging rocks from the cut slopes has not yet been carried out.

Concreting started with the weir block on 18th August and was discontinued on 26th October in order to concentrate on more urgent work. 28% of the concrete works have been completed.

4.3.4.1.3.4 Intake Works

The bulk of the excavation for the inclined gallery was carried out in October 1972. Final trimming and clearing down to an acceptable foundation remains to be done in 1973.

Construction of the massive concrete valve chamber at the entrance of the tunnel and the lower end of the inclined gallery started on 20th October and has been substantially completed. All valves and pipework in the valve chamber are in position.

4.3.4.1.3.5 Drilling and Grouting Subcontract

This work was subcontracted to "Technoexportstroy" of Bulgaria. Work started on 28th December 1971 with initial drilling and water testing of 7 exploratory holes on the centreline of the dam. This was followed by systematic

drilling and grouting of a central deep grout curtain constisting of holes drilled at 2 m. spacing the actual depth depending on the condition of the rock along the centreline flanked by 2 rows of shallower holes at 2½ m. spacing. Finally 7 control holes were drilled and water tested to check the results of the work. Grout consumption was generally lower than provided for. The results of the final testing proved to be satisfactory. This work was completed on 24th October 1972.

There still remains the work of drilling and grouting the tunnel to be carried out in 1973.

4.3.4.1.3.6 Rainfall and River Flows

From the beginning of the year there was a flow in the river which ceased by about the middle of July. There was a flood of about 5 cu.m./ sec. on 21st January 1972 after a rainfall of 62 mm on the previous day.

This flood caused some minor damage mainly to temporary works such as temporary dam No.3 which was breached and temporary dam No.4 the downstream shoulder of which was out back considerably. Some fill placed at the base of the cofferdam was also washed away. A second flood of just under 4 cu.m./sec. occurred on 14th March after a rainfall of 41 mm over the previous two days. This and a subsequent flood of 1 cu.m./sec. on 1/5/72 were effictively diverted through the tunnel, the cofferdam having been completed.

The rainfall at the damsite during the first 6 months of the year totalled 305 mm. The rainfall over October, November and December was only 49 mm. As a result the river remained dry to the end of the year.

4.3.4.2 Khirokitia Treatment Works

4.3.4.2.1 General

In its first phase which is at present under construction the Treatment Works will be capable of treating approximately 21,000 cubic meters of water per day, but there is provision for extending the works for the treatment of 30,000 m3/day.

The consultants for the Khirokitia treatment works are Messrs. Howard Humphreys and Sons Ltd., of U.K. and the plant will be supplied by U.F.E.L. also of U.K. The construction of the works is being carried out by direct Labour by the Department of Water Development.

The Khirokitia treatment works consist of three main parts as follows:

(a) The sedimentation tanks, through which the raw water for the dam will first pass and in which the heavier particles carried by the water will settle out with the assistance of Aluminium Sulphate which is added and acts as a coagulant.

(b) The filters in which the water from the sedimentation tanks will be filtered by four "Rapid Gravity Sand Filters" and

(c) The Administration and Control Building.

4.3.4.2.2 Progress during 1972

During 1972 the following progress was achieved:

4.3.4.2.2.1 Sedimentation Tanks

Approximately 550 m3 representing 65% of the structure concrete in the sedimentation tanks was placed by the end of 1972. Considering the excavations and preliminary works carried out in this section this would represent approximately 80% of the work.

4.3.4.2.2.2 Filters

Approximately 270 m3 representing 65% of the structural concrete required in the filters was placed by the end of 1972. This would represent approximately 75% of the work.

4.3.4.2.2.3 Administration and Control Building

Approximately 320 m3 representing 60% of the structural concrete in the Administration Building was also placed during 1972 but considering the rather extensive finishes required in this part of the works it is difficult to estimate the percentage of the total work carried out.

The structural part of the works is programmed to be completed during the first week of April 1973, when the U.F.E.L. erector will arrive in Cyprus to supervise the erection of the plant.

4.3.4.2.3 Expenditure

The estimated cost of the treatment works was £260,000.- out of which £97,730, was the treatment plant contract. The actual cost up to the end of 1972 was as follows:

Description	Actual costs
1. Sedimentation tanks	£20,729.673
2. Filters	11,958.819
3. Administration Building	17,080,198
4. Site works	919.503
5. Electrical installation	26,308
6. Miscellaneous and supervision	3,024.962
T o t a l	£53,739.463

4.3.4.3 Lefkara Khirokitia Pipeline

4.3.4.3.1 General

The Lefkara Khirokitia pipeline forms part of the third stage of the new Famagusta Water Supply Project.

Its purpose is to convey raw water from the Lefkara Dam to the Khirokitia Water Treatment Works, where the water will be treated and then conveyed to Famagusta through the Khirokitia-Phrenaros-Famagusta pipeline which has already been constructed as part of the stage II works of the same scheme.

The pipeline which will discharge 13 m3/sec is about 49,000 ft long and consists of 22" outside dia. steel pipes of different thicknesses. The pipes are spirally welded and internally lined. They are also externally protected with coal tar enamel. In addition the pipeline is protected against corrosion by providing cathodic protection.

The Contract for the supply of the pipes was awarded to Corinth Pipeworks of Greece. While the Contract for the supply of most of the valves to Messrs. Glenfield and Kennedy U.k.

The Construction work which was undertaken by the Department commenced in March 1971 by the opening and formation of the Access Roads.

4.3.4.3.2 Progress achieved in 1972

During 1972 a total length of 48,252 ft of pipes have been layed and tested between Lefkara Dam and Khirokitia treatment works. The work involved also quite an amount of initial levelling, 27 river crossings, 20, major stream crossings and 18 minor on stream crossings.

Thirty washout valve chambers have been constructed during the year with only their steel covers remaining to be installed.

4.3.4.3.3 Expenditure (1971-72)

Description	Actual cost
1. Pipes, fittings and Miscellaneous	£ 163,317.972
2. Valves, Meters	£ 18,837.161
3. Trenching and laying	£ 79,188.121
4. Miscellaneous	£ 34,035.172
T o t a l	£ 295,378.426

4.3.6 Summary of Expenditure (1971-72) for Major Projects

P r o j e c t	Actual Expenditure upto end Dec.1972	
	Contract	W.D.D.
1. Lefkara Dam	£ 534,970	£ 51,730
2. Khirokitia Treatment Works	-	£ 53,739
3. Lefkara -Khirokitia Pipeline	-	£295,378
4. Palekhori-Kambi Dam	£ 115,148	£ 12,879
5. Massari Dam	-	£149,648
6. Nicosia Water Supply (Pendayia Scheme)	-	£196,467
7. Argega Magounda Distr.System	-	£ 43,873
Total	£650,118	£803,674

4.3.5 Distribution Systems

The following design and construction works have been undertaken during 1972.

4.3.5.1 Argaga-Magounda Distribution System

This scheme, which will command an area of approximately 2300 donums, was designed by this Department at an estimated cost of £128,000.- and will be executed in two stages as follows:

Phase I	- Main conveyor and main branches	£ 60,000.-
Phase II	- Tertiary system	£ 68,000.-
	Total	£ 128,000.-

An amount of £50,000.- for Phase I was included in the 1972 Development Estimates and the work on pipe laying started soon after the arrival of pipes in March 1972.

Phase I envisaged the laying of approx. 8500 m. of A.C. pipes in sizes varying from 500 mm to 150 mm dia., the construction of a break-pressure tank near the dam and the installation of 26 No.-4"ø outlet with water meters, for each individual irrigation block.

By the end of the year 1972 pipe laying as well as the relevant auxilliary works were completed and the construction of the break-pressure tank was at an advanced stage.

Pipe laying commenced on 12/4/1972 and completed on 31/10/1972 and the following pipes were laid:

Asbestos Cement Pipes Cl. 'B'

Lebanon (Eternit) Origin

Diam. m/m	Length/m
500	2050
450	405
400	517
350	30
300	612
250	842
200	1480
150	2060
Total	7996

4.3.5.2 Ayia Marina Distribution System

Tertiary distribution system was designed consisting of steel pipes. It is estimated to cost around £22,000 and it will command an area of 1500 donums.

4.3.5.3 Kiti Distribution System - Stage III

Work carried out during the year 1972 at the above distribution. A length of 23421 ft. of prefabricated canals of types R.50 and R.45 were installed with all necessary irrigation outlets, measuring devices, crossings and other structures required for the best possible operation of the whole system against a total expenditure of approximately £32,000.-, covering an area of about 1110 donums.

Following is the number of prefabricated canals installed and other structure constructed.

1.	Prefabricated Canals	R.50	No. 31
2.	" "	R.45	No. 1275
3.	Saddles - Bases	R.50	No. 36
4.	" "	R.45	No. 1436
5.	V-Weirs XI		No. 32
6.	Ports XXI		No. 9
7.	Simple ports		No. 80
8.	Bends		No. 44
9.	Syphons		No. 39
10.	Parshal Flumes		No. 5

4.3.5.4 Lefkara Distribution System

New design was prepared for Lefkara Distribution System. The proposed scheme will consist of steel pipes, it will cover a net area of about 430 donums and the total estimate cost is around £58,000.

4.3.5.5 Yermasoyia Distribution System

Akrounda-Phinikaria irrigation scheme was studied and tenders have been invited to supply the necessary equipment for the implementation of the scheme which is to convey water to Akrounda and Phinikaria village at the estimated cost of £166,000.

4.3.5.6 Polemidhia Distribution System

The scheme at an estimated cost of £7,800.- was prepared by the Water Development Department and envisaged the laying of a 10"ϕ A.C. pipe line of total length of 1800m.

The object of the scheme was to extend the irrigable land under the Polemidhia Distribution System and relieve the depleting acquifer at Zakaki area. The additional land covered by this extension is in the region of 400 donums of citrus plantations properly of Lanitis Farm.

Pipe laying commenced on 4/9/72 and completed on 15/12/72 and a total length of 1810 m. of 10" ϕ A.C. pipes class 'B' were laid.

4.3.5.7 Land Consolidation

Closely related to Distribution Systems is land consolidation. During last year the following irrigable areas were undergoing land consolidation: Kissonerga, Khloraka, Akrounda, Phinikaria and Paleckhori. Our Department is a member of Land Consolidation Committee responsible for every particular area. Irrigation Engineers Mr. D. Patsalides and Mr. E. Kambourides were representing our Department at the meetings of the above Committees.

4.3.6 Drawing Branch

The staff of this Branch numbered 21 i.e. 11 daily paid Technical Assistants, 8 draughtsmen scale 8, 1 Foreman scale 5 and 7, one Technical Assistant scale 8, and the Head of the Branch.

4.3.6.1 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 Paphos and Akrotiri Project as well as the Morphou Tylliria Feasibility Study.

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
(i)	Existing and Proposed Dam	5 675	35.2
(ii)	Irrigation Distribution Systems for Dams	360	2.2
(iii)	Routine Irrigation Schemes	2 305	14.3
(iv)	Domestic Water Supplies	5 340	33.2
(v)	Recharge Schemes	155	1.0
(vi)	Antiflood Schemes	25	0.2
(vii)	River Training Works	250	1.5
(viii)	Hydrological	765	4.7
(ix)	Programmes and Organization.....	265	1.6
(x)	Watershed Surveys	5 750	35.7
(xi)	Paphos Project	765	4.8
(xii)	Akrotiri Project	1 165	7.2
(xiii)	Morphou Tylliria Project	3 655	22.7
(xiv)	Dam Investigations (Project)	255	1.6
(xv)	Completion Plans	620	3.9
(xvi)	Completion Reports	100	0.6
(xvii)	Reports	370	2.3
(xviii)	General	685	4.2
(xix)	Odd Jobs	160	1.0
(xx)	Training of staff.....	Nil	Nil
(xxi)	Auxiliary Services:		
	Technical Library	1 475	9.1
	Plan Registry	425	2.6
	Plan Reproduction	280	1.7
	Registry work	105	0.7
	Drawing Materials/Store	160	1.0
	Leave paid 1 865)	11.6)	
	Leave without pay 375)	2.3)	
	Sick Leave 1 800)	11.2)	30.2
	Maternity 560)	3.5)	
	D.C. 270)	1.6)	
	Totals	36 000	224

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 instruments is not included.

4.3.6.2 Library and Technical Information Section

During 1972, 8 new books at a total cost of approx. £30 were purchased by the Department and subscription was continued on 7 Technical Periodicals at a total cost of £33. In addition 13 reports were prepared by Officers of the Department and numerous other books and periodicals were received free of charge.

The Library is grateful to the Government of the Netherlands for the gift of very useful books chosen by senior staff of the Department.

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

4.3.6.3 Reproduction Section

Plan reproduction continued during 1972 with the automatic continuous process dyeline paper printing machine with the old machine as stand-by. Some 3,400 orders were issued to the Reproduction Section and 35,000 prints were made of various sizes and of all types.

4.3.6.4 Photo Process Lab.

The Photo Process Lab. was not functioning between April and December 1972 due to the dismissal of the pensioner Photolithographer. In December a new Photolithographer was employed and the work of the Photo Process Lab. on reproduction, enlargement and reduction of maps and drawings started to function smoothly again on departmental work, work for the M.T.F.S. and other departments of the Ministry and Government in general.

4.3.6.5 Photographic Section

Record of the work on major construction project water supply and irrigation schemes was carried out throughout 1972 in black and white photos and colour slides.

4.3.7 Topography Branch

This branch, headed by Inspector of Works Andreas Evripidhou, has dealt with all the Survey Work of the Department. These Surveys were mainly 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 L.R.O. maps for acquisition purposes and completion plans.

Some officers from this branch (1 Inspector of Works and 7 Technical Assistants) were assigned to the construction of major projects and it was therefore found necessary to train some new recruits so as to be able to cope with the survey work required by the Department. These recruits are already assisting the experienced staff and their efficiency is most satisfactory.

Seven Technical Assistants of this branch have attended a course on Water Development activities at Trikoykia Agricultural Training Centre during the period 18-30/9/72. The lectures were offices of the Department of Water Development.

The staff of this branch during the year 1972 was as follows:

Post	No.	Class	Remarks
Inspector of Works	1	Monthly paid	1/c of branch
Technical Assistants	4	Monthly paid	
Technical Assistants	3	Daily paid	
Technical Assistants	5	Hourly paid	now recruits

This Branch has dealt with the following Projects :

Project	Type of Survey	Remarks
Pareklisha Reservoir	Contour Survey	Departmental
Angastina Reservoir	-do-	for minor Projects Branch
Asgata Reservoir	-do-	-do-
Zakaki pipeline	Profile-levelling	Extension of existing Distribution System
Ayios Nicolaos Kakopetria Reservoir	Contour Survey	Departmental
Pyrgos Reservoir	Contour Survey	Tylliria Project (raising)
Limnitis Reservoir	Plotting of BH's	-do-
Pentayia D. Site	Contour Survey	-do-
Skarinou Reservoir	-do-	Minor Projects Branch
Ayia Marina - Xyliatos	-do-	-do-
Ayios Theodhoros (Agros)	-do-	Departmental
Arminou Reservoir	-do-	Paphos Project
Ovgos Existing Dam	Cross Sectioning	Sedimentation Studies
Kalopanayiotis Existing Dam	Inst.Observating	Movement Detection
Panagra Gauging Station	Contour Survey	Hydrological Studies
Petra Dam Site	-do-	Minor Projects Branch
Arakapas Dam Site III	-do-	Departmental
Messa Potamos	-do-	Minor Project Branch
Saittas Canal	Profile levelling	-do-
Yermasoyia-Limassol pipeline	-do-	Limassol Water Board

Project	Type of Survey	Remarks
Dhali Site	Contour Survey	Minor Project Branch-Charge
Potamia Site	-do-	-do-
Nissou Site	-do-	-do-
Penalayia contour strip	-do-	Tylliria canal
Galini contour strip	-do-	-do-
Massari reservoir	Cross-sectioning	Administration studies
Argaka-Magounda Dam	Contour Survey	-do-
Ayios Theodhoros (Scheme)	-do-	

View of tunnel outlet of Lefkara Dam

Wading across the river for Flood-discharge measurement by current meter at Peristerona gauging station

DIVISION OF CONSTRUCTION

By

H.P. Karakannas
Head of Division

5.1 This Division has to deal with all constructional activities of the Department in the field of Domestic Water Supplies and Irrigation. It has to manage the year's constructional programme and administer the Civil Engineering contracts, the use of constructional plant and the Departmental workshop.

The Division has to do with labour laws and deal with problems arising during the execution of a project and to observe the safety of the workers, and the community and labour good relations.

All the above functions demand that both the indoor and outdoor technical staff of the Division should be technically widely experienced and at the same time able administrators.

The staff of the Division during 1972 consisted of:

1	No.	Engineer Hydrologist - Head
1	No.	Civil Engineer
1	No.	Mechanical Engineer
2	Nos.	Senior Inspector of works
7	Nos.	Inspectors of works
3	Nos.	Chief Foreman
8	Nos.	Assistant Chief Foremen
1	No .	Technical Assistant
90	Nos.	Monthly and weekly paid foremen
362	Nos.	Weekly paid regular artisans
476	Nos.	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 completed the programme of works valued at £2,497,132.

The construction programme for 1972 included 157 schemes of an estimated cost of £2,497,132. Out of these 157 schemes 70 were Rural Water Supply Schemes estimated at £611,833,63 were Minor Irrigation Schemes estimated at £245,556,21 were Major Irrigation Schemes estimated at £1,226,963 and 3 were Town Water Supply Schemes estimated at £412,780. In detail the schemes included in the Development Estimates for Construction in 1972 are shown, hereunder:

Ser. No.	No. of schemes	Nature of scheme	Amount allocated for 1972 £
1	70	Rural Domestic Water Supply Schemes	611,833
2	63	Minor Irrigation Schemes	245,556
3	21	Major Irrigation Schemes	1,226,963
4	3	Town Water Supply Schemes	412,780
	157	T o t a l	£2,497,132

Over and above the 157 projects that were included in the 1972 construction programme of works, the Division has carried out considerable work on a number of Town and Village Water Supply Schemes, as well as on irrigation schemes, from funds deposited by the appropriate authorities. The expenditure incurred during 1972 on the construction of these communal schemes, as well as on a number of other schemes, especially Water Supply, executed for private developers reached the amount of £76,097.

The overall expenditure incurred on the construction of all schemes referred to above during 1972, reached the amount of £1,830,637. This amount was spent on carry over and new schemes included in the 1972 development estimates of the Department as well as on schemes executed for other Government Department or from funds deposited by Water Boards, Municipalities, Village Water Commissions, or Irrigation Committees. Out of this amount £303,464 were spent on 52 Rural Domestic Water Supply Schemes, £109,171 on 43 Minor Irrigation Schemes, £1,116,039 on 21 Major Irrigation Schemes, £225,866 on 3 Town Water Supply Schemes and £76,097 on 224 Water Supply or Irrigation Schemes carried out on behalf of Towns, Villages, or Irrigation Committees from Deposits. In detail the expenditure incurred on the construction of all the schemes mentioned above is shown on the list herebelow:

Ser. No.	Nature of scheme	No. of schemes	Expenditure incurred during 1972 £
1	Rural Domestic Water Supply Schemes	52	303,464
2	Minor Irrigation Schemes	43	109,171
3	Major Irrigation schemes	21	1,116,039
4	Town Water Supply Schemes	3	225,866
5	Water Supply or Irrigation Schemes carried out from deposits	224	76,097
	Total	343	1,830,637

5.1.1 Labour Force

For the execution of all the schemes mentioned above, the Department has made use of its 362 regular employees and a number of casual artisans and employees that were recruited from the areas where the works were executed. During 1972 over and above the 362 regular employees of the Department a daily average of 619 casual employees were engaged for the construction of the works. In total during 1972 an average of 981 regular and casual employees were engaged daily by the Department, and the overall expenditure on wages for the year was £528,000 including arrears and 13th salary.

It is worth mentioning that during 1972 great difficulties were faced on securing skilled and unskilled labour force on the execution of many schemes. In rapidly developing areas such as Kyrenia, etc., the Department had to recruit its labour force from isolated villages situated away from the Towns and pay for the transport of the labourers to the site of the work. In spite of the great efforts made by the Technical Staff of the Division some works had to be suspended due to shortage of labour force.

5.1.2 Constructional Plant

As it is the usual practice Departmental and Government Machinery is used primarily for the construction of the schemes included in the Department's Development Construction Programme.

As however the Departmental heavy machinery is quite limited, it was necessary to hire machinery from private owners through tenders. In total during 1972 machinery was hired for 51,135 working hours at an expenditure of £56,057. Machinery was also hired for the excavation of 274,229 running feet of trenches for the laying of pipes at a cost of £7,951.

5.1.3 Materials

Most of the materials used for the construction of the projects are purchased from the Government Central Stores. Such materials are pipes, pipe fittings, steel, pumping units, water meters, etc. Building materials, however, such as gravel, sand, aggregate, etc. are purchased through tenders. During 1972 the Construction Division awarded 69 such tenders for the purchase of 66,535 cubic meters of these materials, at a cost of approximately £66,535. The needs of the Division in cement were purchased through a Government general contract from the Vasiliko Cement Factory. During 1972, 3,821 tons of cement, valued at £26,747 were used for the works executed by the Department.

During 1972 a total length of 259,643 of pipes of all types were laid by the Division for Domestic Water Supply and Irrigation Schemes. In addition for all the Water Supply Schemes 7,458 water meters of ½" in diameter, were installed. Tables showing in detail the pipes and other materials used by the Division for its 1972 construction programme are given hereunder :

(i) Galvanized mild steel pipes laid during 1972

Nominal diameter in inches	4"	3"	2½"	2"	1½"	1 1/4"	1"	3/4"	½"	Total length in metres
Length of pipes in laid meters	37,140	22,338	21,048	34,458	24,438	17,904	5,586	360	19,800	Total 183,072

(ii) Steel Victaulic pipes laid during 1972

Nominal diameter in inches	10"	8"	6"	-	-	-	-	-	-	Total length in metres
Length of pipes in laid meters	30	849	9,216	-	-	-	-	-	-	10,095

(iii) Asbestos cement pressure pipes laid during 1972

Nominal diameter in inches	10"	8"	6"	4"	3"	- -	-	-	-	Total length of pipes laid in meters
Length of pipes laid in meters	9,628	6,274	24,388	23,168	3,018	- -	-	-	-	66,476

(iv) Materials and machinery used during 1972

Ser. No.	Description	Quantity	Expenditure
1	Water meters $\frac{1}{2}$" ϕ	7,458 Nos	£ 17,899
2	Cement	3,821 tons	£ 26,747
3	Gravel, sand and aggregate	66,535 m^3	£ 66,535
4	Heavy machinery	51,135 working hours	£ 56,057
5	Excavation of trenches	274,229 running feet	£ 7,951
	Total		£175,189

5.1.4 Rural Domestic Water Supply Schemes

As already stated the construction programme for 1972 included 70 Rural Domestic Water Supply Schemes of an estimated cost of £611,833. Out of these schemes 20 were completed during the year, 32 were put in hand but could not be completed by the end of the year and were carried over for completion in 1973., and 18 schemes could not be put in hand for various administrative and other difficulties and were also carried over for execution in 1973.

The expenditure incurred on all the Rural Domestic Water Supply Schemes reached the amount of £303,464. The 70 schemes included in the 1972 construction programme have been split into three categories as under:

(i) Schemes completed during 1972
(ii) Schemes put in hand during 1972 but not completed and carried over for completion in 1973, and
(iii) Schemes not put in hand during 1972 and carried over for execution in 1973.

All these schemes are shown in detail on the lists that follow.

5.1.5 Rural Domestic Water Supply Schemes completed during 1972

Out of the 70 Rural Domestic Water Supply Schemes that were included in the 1972 construction programme 20 schemes of an estimated cost of £72,630 were completed during the year. The expenditure on these schemes during 1972 was £57,971. A list showing in detail these 20 schemes is given on next page:

Rural Domestic Water Supply Schemes
Completed during 1972

Ser. No.	Name of scheme	Amount approved for 1972 £	Expenditure incurred during £	Type of scheme	Nature of work
	Nicosia District				
1	Evrykhou	1,687	1,155	Gravity	X
2	Tseri	786	684	Pumping	X
3	Klirou	2,500	1,813	Gravity,Pumping	X
4	Paleometokho	4,000	3,471	Pumping	X
	Limassol District				
5	Pendakomo	6,283	2,536	Gravity,	
6	Korphi	1,025	628	and Pumping	*X
7	Kilani	500	271	Gravity	X
8	Monagri	750	698	-do-	X
9	Armenokhori	3,100	3,030	Pumping	*H
10	Pareklishia	1,500	1,480	-do-	X
11	Prashio (Evdhimou)	5,750	3,774	Gravity	*H
	Famagusta District				
12	Vitsadha Marathovouno	6,355	4,303	Pumping and Gravity	X
13	Paralimni	17,200	16,975	Pumping	X
	Larnaca District				
14	Melini	2,901	2,222	Pumping	*
	Paphos District				
15	Ayia Pipeline (Kallepia,Letymbou, Pitarkou)	5,960	5,817	Gravity	X
16	Episkopi	1,188	98	Gravity	*H
17	Kedhares	3,530	2,696	-do-	*H
18	Kholetria	4,685	4,291	Pumping	*H
19	Statos-Ayios Photios	650	100	-do-	*H
	Kyrenia District				
20	Kalogrea	2,280	1,929	Pumping	*H
	T o t a l s	72,630	57,971	-	

LEGEND

* means new scheme
X means improvements to an existing scheme
H means house - to - house service

5.2 Rural Domestic Water Supply Schemes put in hand during 1972 but not completed by the end of the year and carried over for completion in 1973

As already stated out of the 70 Rural Domestic Water Supply Schemes that were included in the 1972 construction programme, 32 schemes of an estimated cost of £445,028 were put in hand during the year but were not completed by December, and were carried over for completion in 1973. The expenditure on these 32 scheme for 1972 reached the amount of £245,493. The reasons for not completing these 32 schemes are:

(i) some of these schemes are major ones involving a great expenditure and programmed for construction for a longer period,

(ii) some schemes are combined and their construction has been split into two, three or even more phases,

(iii) some schemes were put in hand late in the year as a result of the delay in the completion of the administrative formalities and the provision of the loan funds, and

(iv) some schemes were approved for execution very late in the year from the Drought Relief Fund, and it was impossible to complete them, or even put them in hand.

These 32 schemes include the major Water Supply Schemes for Morphou, Alona-Platanistassa - Lagoudera - Sarandi - Polystipos Regional Scheme, Kakopetria, Lymbia - Shia - Mosphiloti - Kormos - Psevdas - Pyrga Regional Scheme, Polemidhia - Ypsonas - Erimi - Kolossi Regional Scheme, Lefkara Regional Scheme, Lapithos and Karavas. Considerable work was carried out on most schemes and some of them are expected to be completed early in 1973.

A list showing these 32 schemes as well as the amount allocated and spent for each scheme separately during 1972 is shown hereunder:

Rural Domestic Water Supply Schemes put in hand during 1972 but not completed and carried over for completion in 1973

Ser. No.	Name of scheme	Amount approved for 1972 £	Expenditure incurred during 1972 £
	Nicosia District		
1.	Alona, Platanistassa, Lagoudera, Sarandi, Polystipos (combined scheme)	34,222	25,179
2.	Kapouti	8,842	4,711
3.	Morphou	5,905	2,485
4.	Petra	1,837	429
5.	Piyenia	18,650	4,812
6.	Pano Pyrgos	10,400	4,864
7.	Ayios Theodoros (Soleas)	10,675	4,812
8.	Kakopetria	21,500	12,985
9.	Lymbia, Shia, Mosphiloti, Kornos, Psevdhas, Pyrga (combined scheme)	43,800	16,134
10.	Vizakia, Potami (combined scheme)	32,210	18,001
	Limassol District		
11.	Mathikoloni	1,740	1,497
12.	Polemidhia Kato, Polemidhia Pano, Ypsonas, Erimi, Kolossi (combined scheme)	26,100	14,238
13.	Potamos-tis-Yermasoyias	1,064	216
14.	Pissouri	1,300	1,059
	C/F	218,245	111 ,422

Ser. No.	Name of scheme	Amount approved for 1972 £	Expenditure incurred during 1972 £
	B/F	218,245	111,422
	Famagusta District		
15.	Vatyli) Strongylos) Arsos) Tremetoushia) Meloushia) combined scheme	27,289	14,936
16.	Akheritou	23,300	18,034
	Larnaca District		
17.	Athienou	12,540	8,935
18.	Tokhni	14,373	11,061
19.	Lefkara Pano) Lefkara Kato) Kato Dhrys) Vavla) Layia) combined scheme	12,495	6,973
20.	Lefkara Pano	3,331	2,346
21.	Lefkara Kato	4,300	3,276
22.	Kato - Dhrys	6,480	3,718
23.	Vavla	3,560	2,246
24.	Vavla - Layia	6,200	2,198
	Paphos District		
25.	Kouklia	4,360	1,905
26.	Goudhi	4,120	487
27.	Trakhypedoula	3,450	41
	Kyrenia District		
28.	Kondemenos	2,915	1,792
29.	Elia) Phterykha) combined scheme	20,400	11,774
30.	Karavas	35,703	24,485
31.	Lapithos	29,167	17,920
32.	Ayios Amvrosios	12,800	1,944
	T o t a l	£445,028	£245,493

5.3 Rural Domestic Water Supply Schemes Included in the 1972 Construction Programme but not put in hand and carried over for execution in 1973

Out of the 70 Water Supply Schemes approved for construction in 1972, 18 schemes of an estimated cost of £94,175 could not be put in hand for various administrative, or legal difficulties and were carried over for execution in 1973. 11 of these schemes were approved by Government for execution very late in the year from the Drought Relief Funds and there was not sufficient time for completion by the District Officers of the administrative formalities and the provision of the loan funds. A list showing these 18 schemes in detail is given below:

Schemes included in the 1972 Dev.Estimate but not put in hand during the year and carried over for execution in 1973

Ser. No.	Name of scheme	Amount approved for 1972 £	Remarks
	Nicosia District		
1.	Kalokhorio (Klirou)	2,058	Objections from owners of spring Case with D.O.
2.	Kalopanayiotis	4,635	Acquisition of water pending before the Supreme Court.
3.	Kambi tou Pharmaka	1,733	Objections from owners of spring.
4.	Mathiatis	2,253	Balance for distr.in Turkish Quarter.
5.	Nikitari	1,986	Acquisition of spring pending.
6.	Pharmakas	4,580	
7.	Alithinou	2,880	Schemes approved for execution late in the year from Drought Relief Funds
8.	Kannavia	4,220	
9.	Apliki	2,440	
10.	Peristeronari	2,140	
11.	Gouri	5,380	
	Limassol District		
12.	Prodromos	1,700	Scheme rejected by V.A.
13.	Ayios Dhemetrios	6,360	Schemes approved for execution late in the year from Drought Relief Funds.
14.	Ayios Constantinos	2,820	
	Larnaca District		
15.	Skarinou Ayios Theodoros Alaminos	20,090	Administrative obstacles and delay in the issue of loan funds.
	Paphos District		
16.	Panayia	18,400	Schemes approved for execution late in the year from Drought Relief Funds.
17.	Pretori	5,600	
18.	Ayia Marina Nea Dhimmata	4,900	
	Totals	£94,175	

5.4 Small Irrigation Works

The construction programme for 1972 included 63 small irrigation schemes of an estimated cost of £245,556. Out of these schemes 32 were completed during the year, 11 were put in hand but could not be completed by December and were carried over for completion in 1973 and 20 schemes could not be put in hand during the year and were carried over for execution in 1973.

The expenditure incurred during 1972 on all the small irrigation schemes reached the amount of £109,171.

The 63 small irrigation schemes included various types of schemes such as pumping - schemes, recharge - schemes, lining of canals etc. All of them are shown in detail on the three lists that follow. These schemes have been split into three categories as under:

(i) Schemes completed during 1972
(ii) Schemes put in hand during 1972 but not completed by the end of the year and carried over for completion in 1973, and
(iii) Schemes not put in hand during 1972 and carried over for construction 1973.

5.5 Small Irrigation Schemes Completed during 1972

As stated above 32 out of the 63 small irrigation schemes included in the 1972 construction programme were completed. The amount allocated for these schemes was £50,494 and the overall expenditure was £43,148. A list showing in detail these 32 schemes and the expenditure incurred on each one separately, as well as the nature of the work, is given hereunder:

Small Irrigation Schemes Completed during 1972

Ser. No.	Name of scheme	Amount approved for 1972 £	Expenditure incurred during 1972 £	Nature of work
	Nicosia District			
1.	Peristerona	153	136	Lining of canals
2.	Peristerona Astromeritis Orounda	352	221	Lining of canals
3.	Peristerona Astromeritis	631	364	-do-
4.	Kato Koutraphas	2,249	2,187	Pumping
5.	Potami	1,111	1,110	-do-
6.	Galata (Esso)	1,300	1,289	Digging of a well
7.	Psimolophou	5,402	5,358	Lining of canals
8.	Ayia Marina (Xyliatou)	1,300	1,290	-do-
9.	Exo Metochi	350	231	Irrigation gates
10.	Tymbou	800	703	Sub-surface weir
	C/F	13,648	12,889	

Ser. No.	Name of scheme	Amount approved for 1972 £	Expenditure incurred during 1972 £	Nature of work
	B/F	13,648	12,889	
	Limassol District			
11.	Kyperounda (Piyi Dhemon)	515	467	St. tank and G.I.distribution pipes
12.	Pelendria (Nikomitis)	800	645	G.I. Distribution pipes
13.	Tris Elies (Mylarka)	3,000	2,881	Intake weirs and G.I. Distribution pipes
14.	Kyperounda (Kardama-Solomidhes)	2,470	2,434	St. tank G.I.distribution pipes
	Famagusta District			
15.	Gaidouras	495	244	Drainage
16.	Koma tou Yialou	1,496	1,387	Fish ponds (Drainage of March)
17.	Marathovounos Pyrka	3,000	2,173	Groy intake and earth channels
18.	Ayia Napa	900	497	One recharge earth dam
	Larnaca District			
19.	Athienou (Marmarika)	1,358	1,334	Pumping unit and distribution pipes
20.	Maroni (Safto)	1,006	828	Inst.of pumping unit
	Paphos District			
21.	Statos	1,200	938	G.I. distribution pipes
22.	Nikoklia	3,270	2,933	River training
23.	Kelokedhara (Ziripillis)	370	285	River training
24.	Mamonia	500	408	River training
	Kyrenia District			
25.	Ayios Epiktitos	4,000	3,867	Two recharge earth dams
26.	Ayios Yeorghios	4,675	2,666	Two recharge earth dams
27.	Elia	1,491	1,158	One recharge earth dam
28.	Karakoumi	1,900	1,616	One recharge earth dam
29.	Thermia	2,400	1,884	One recharge earth dam
30.	Ayios Amvrosios (Steradjia)	700	528	Spring and distribution pipes
31.	Ayios Amvrosios (Mouthounas)	900	694	Spring and distribution pipes
32.	Ayios Amvrosios (Recharge scheme)	400	392	Recharge scheme through wells.
	T o t a l s	£50,494	£43,148	

5.6 Small Irrigation Schemes put in hand during 1972, but not completed by the end of the year and carried over for completion in 1973

Out of the 63 small irrigation schemes approved for construction in 1972, 11 schemes were put in hand during the year but could not be completed, and were carried over for completion in 1973. On these 11 schemes of an estimated cost of £100,545 the expenditure during 1972 reached the amount of £66,023. Some of these 11 schemes are expected to be completed early in 1973. A list showing in detail these schemes with the amount allocated and spent on each one separately is given hereunder:

Small Irrigation Schemes put in hand during 1972 but not Completed and carried over for completion in 1973

Ser. No.	Name of scheme	Amount approved for 1972 £	Expenditure incurred during 1972 £	Remarks
	Nicosia District			
1.	Kato Pyrgos	15,254	12,765	Distribution system
2.	Ayios Yeorghios Petra	15,000	11,874	R.C. channels
3.	Moutoullas	12,700	11,146	St.tank and distribution pipes
	Limassol District			
4.	Yerasa	2,500	1,357	G.I.distribution pipes
	Famagusta District			
5.	Akhyritou-Vrysoulles	1,478	13	Compensations
6.	Famagusta - Dherinia	4,180	135	-do-
7.	Phrenaros	233	33	-do-
8.	Akhna	3,700	763	One recharge earth dam
	Larnaca District			
9.	Maroni	28,000	18,449	Pumping units,St.tank and distribution pipes
10.	Psematismenos	13,500	8,194	Pumping units,st.tank and distribution pipes.
	Paphos District			
11.	Nata	4,000	1,294	Pumping unit
	Totals	£100,545	£66,023	

5.7 Small Irrigation Schemes Included in the 1972 Construction Programme but not put in hand and carried over for execution in 1973

Out of the 63 small irrigation schemes approved for execution in 1972, 20 schemes of an estimated cost of £94,517 could not be put in hand during the year and were carried over for execution in 1973.

A list showing in detail these 20 schemes, as well as the amount allocated for each one separately, and the reasons for not starting them is given hereunder:-

Small Irrigation Schemes Approved for Execution in 1972 but not put in hand during the year and carried over for execution in 1973

Ser. No.	Name of scheme	Amount approved for 1972 £	Remarks
	Nicosia District		
1.	Massari	3,300	Old scheme abandoned due to construction of dam
2.	Laghoudera	950	Delay in completing Adm. and loan formalities
3.	Pharmakas	2,000	Scheme approved very late in the year from Drought Relief Funds.
	Limassol District		
4.	Saittas - Moniatis	11,215	Scheme not accepted by beneficiaries
5.	Kilani	6,500	Schemes approved very late in the
6.	Agros (P.Taliou)	1,250	year from the Drought Relief Funds
7.	Phini	5,400	Request from beneficiaries for revision of scheme
	Famagusta District		
8.	Akanthou	16,700	Delay in land acquisition
9.	Aloa	630	Delay in providing loan funds
10.	Ayios Andronikos	2,200	Scheme approved very late in the year from Drought Relief Funds
11.	Makrasyka	4,800	Scheme to be revised after request from beneficiaries
	Larnaca District		
12.	Athienou (Athanasis)	5,500	Scheme under revision pending drilling of new borehole
13.	Zyyi - Tokhni	822	Installation of pumping unit pending as borehole is still artesian
14.	Kalavasos	13,250	Delay in approving scheme and provision of loan funds
	Paphos District		
15.	Kato Akourdalia	3,600	Loan not issued due to arrears
16.	Pano and Kato Akourdalia	1,600	-do-
17.	Nea Dhimmata	1,800	Scheme revised and add. funds required
	Kyrenia District		
18.	Kazaphani	7,400	Land acquisition formalities not completed
19.	Karavas	3,000	Loan formalities not completed by D.O.
20.	Vasilia	2,600	
	Total	£94,517	

5.8 Major Irrigation Schemes

The 1972 construction programme included 21 Major Irrigation Projects for which an amount of £1,226,963 was allocated during the year. The actual expenditure on these schemes during the year reached the amount of £1,116,039. Out of these 21 schemes 11 were involving works on dams. 7 on distribution systems of dams and 3 were recharge works. The biggest expenditure incurred on these schemes was on Lefkara Dam where the expenditure reached the amount of £432,771. On Lefkara-Khirokitia pipeline the expenditure reached the amount of 257,527, on Palekhori Dam the expenditure was £120,112 and on Massari Dam the expenditure was £113,647. A list showing in detail all the Major Irrigation works as approved for execution in 1972 is shown hereunder:

Major Irrigation Works

Work carried out on Major Irrigation Works during 1972

Ser. No.	Name of scheme	Amount approved for 1972 £	Expenditure in 1972 £	R e m a r k s
	A. Dams			
1.	Lefkara Dam	451,242	432,771	
2.	Lefkara-Khirokitia Pipeline	270,000	257,527	
3.	Khirokitia Treatment Plant	58,345	52,084	
4.	Massari	120,000	113,647	
5.	Palekhori	128,730	120,112	
6.	Pomos	851	270	For compensations
7.	Kalopanayiotis	5,245	911	-do-
8.	Mavrokolymbos	8,046	318	-do-
9.	Yermasoyia	12,475	3,887	
10.	Kiti	839	838	
11.	Ovgos	5,564	100	For compensations
	B. Distr.Systems			
12	Kalopanayiotis	2,581	1,789	
13.	Mavrokolymbos	6,845	1,944	
14.	Yermasoyia	6,330	4,658	
15.	Polemidhia	13,502	6,689	
16.	Kiti	31,250	30,004	
17.	Argaka-Magounda	50,000	43,873	
18.	Ayia Marina	28,000	21,901	
	C. Recharge Works			
19.	Famagusta-Dherinia	23,140	20,729	
20.	Morphou-Serrakhis (Protopapas)	2,472	804	
21.	Syrianokhori (Kokkinoyi)	1,506	1,183	
	Totals	£1,226,963	£1,116,039	

5.9 Town Water Supplies

The construction programme for 1972 included three Town Water Supply Schemes, namely Nicosia, Famagusta and Paphos. The amount allocated for these three schemes for 1972 was £412,780 and the expenditure during the year reached the amount of £ 225,866.

A list showing in detail the amount allocated and the expenditure on each of these schemes separately is given hereunder:

Town Water Supplies

Expenditure incurred during 1972

Ser. No.	Town	Amount allocated for 1972 £	Expenditure in 1972 £	Remarks
1.	Nicosia Town			
	(i) Pendayia scheme	374,300	196,467	
	(ii) Tseri scheme	3,980	831	
2.	Famagusta Town	20,000	14,497	
3.	Paphos	14,500	14,071	
	Totals	412,780	225,866	

5.10 Water Supply and Irrigation Scheme carried out from deposits

Over and above the 157 schemes that were included in the 1972 construction programme, the Division carried out considerable work on 224 Water Supply and Irrigation Schemes from funds deposited by Municipalities, Vallage Water Commissions Irrigation Committees and private Developers. The expenditre incurred on all these schemes during the year reached the amount of £76,097. Out of this amount £8,853 were spent on Water Supply schemes for Municipalities, £41,524 were spent on Village Water Supply Schemes, £2,961 on Irrigation schemes, and £22,759 on private developers. The works carried out by this Division from deposits are shown on the list below:

Ser. No.	Nature of work	No. of scheme	1972 Expenditure
1.	Municipalities	2	8,853
2.	Rural water supply schemes	140	41,524
3.	Irrigation schemes	28	2,961
4.	Private developers (installation of water mains for building sites, etc.)	54	22,759
	Totals	224	£76,097

5.11 Workshop

The workshop of the Depart.forms a bracnh of the construction Division, but it carries out for other Divisions as well, i.e. the planning the Maintenance and Operation and water resources. It is equipped with all facilities for carrying out all kind of constructional works, that include earth moving equipment, motor transport,carpentry, plumbing and fittings, the slotting and perforation of drilling casing and grouding and electrowelding of drilling bits. Installations and maintenances of pumping units for domestic water supplies and irrigation is carried out by the workshop. The despatching of materials and stores to all sites of work all over the island is also done by the workshop.

The labour force of the workshop during 1972, consisted of an average of 56 regular and 15 casual artisans specialized 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 rigs, was carried out at the cost of £48,300 and includes replacement of fittings, and other accessories.

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

Heavy earth moving equipment .....19,515 hours
Motor vehicles .....911,169 mils

The activity of the workshop was extended to :

	Amount Spent £
38 new pumping installation for domestic supplies	17,680
12 new pumping installation for irrigation	3,205
74 repairs to pumping installation for domestic supplies	2,686
20 repairs to pumping installation for irrigation	675
Various casting and fittings	23,299
Various carpentry works	5,346
Various masonry works	1,293
Despatching of materials and stores	4,200

Mechanical Equipment	No.
Ruston Bucyrus Drilling Rig 22W	1
Caterpillar D8	3
Caterpillar traxcavators 955	2
Allis Chalmers traxcavator	1
Ruston Bucyrus Excavator RB.10	1
Ruston Bucyrus Excavator RB.19	1
Excavator "Smith" 3/4 c.yd.	2

Mobile Plant	
Mobile drill	1
Mini Core Drill	1
Small Core Drill	1
Core drills 200ft. depth	6
Groutings pumps	2
Wagon drill	1
Overburdens	3
Concrete Pumps	1
Compressors	12
Diesel Alternators	6
Electrosubmersible pumps	7
Turbine pumps	2
Centrifugal pumps	14
Portable pumps	5
Sheep foot rollers	18
Vibrating soil compactors	3

Vibrating rollers	2
Concrete vibradors	7
Concrete mixers	49
Mobile Cranes	2
Hoists	3
Thornycroft tractive unit low loader	1
Dumpers	3
5 ton diesel lorry (Austin)	1
Bedford R.L. Lorry	3
Land Rovers	23
Toyota Land Cruisers	6
Toyota Station Wagon	8
Pumps for testing pipes	12
Rubber tyred compaction rollers	2
Unipowers	2
Utility hoist crane AC 623	1
Air pumps	2
Flush pumps pneumatic	7
Cutting machines for pipes	13
Air concrete vibrators	12
Small drilling rig	1

Workshop Plant	No.
Bench drilling machine	1
Upright drilling machines	4
Planner timber machines	1
Bandsaw timber	1
Bar bender	1
Bar cutter	2

Mechanical Equipment

Electric welders	9
Forge	1
Air compressors (tecalemit)	2
Grinding machines	4
Power hack-saw	2
Wood cutting machine	1
Plate bending machine	1
Spark plug testing machine	1
Buttery charging unit	1
Hydraulic press 100 tons capacity	1
Band saw ginding machine	1
Hydraulic pipe bending machine	1
Tractor track service tool	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
Head of Division

This division includes two 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 1972 maintenance work involved mainly routine maintenance of the various works, apart from the case of Mavrokolymbos Project where some major works have been done as detail below.

6.1.2 Summary of Expenditure on Maintenance Works

(i) Government Projects

Dams	£3017
Distribution Systems.....	2643
Sub-Total (i)	£5659

(ii) Contributory Projects

Government Share	£ 689
Village Contribution.....	202
Sub-Total (ii)	£ 891
Total (i) + (ii)	£ 6550

6.1.3 Details of Maintenance Works - Dam Projects

6.1.3.1 Government Dams

Argaka

Construction of metric water level indicator, repairs to hydraulic system, treating of all underwater metal structures with bituminous paint, painting of bridge railings and treating of woodwork with creosote.

Expenditure : Dam : £112

6.1.3.2 Ayia Marina (Special Case)

Emergency repairs to gate, painting of railings and ladder, cleaning of access road and removing of unwanted vegetation from embankment.

Expenditure : Dam : £36

6.1.3.3 Kalopanayiotis

Painting of metal structures and treating of woodwork with solignum of both the spillway and upstream recorder bridges, and painting of lea recorder.

Emergency repairs to main line and painting of all manhole covers.

Expenditure :	Dam	: £79
Distribution		£90
Total		£169

6.1.3.4 Kiti

Emergency repairs to gate, modifications to hydraulic system, and painting of underwater metal turret of gate.

Construction of an R.C.C. bridge over the Tersephanou main canal.

Expenditure :	Dam	: £ 98
Distribution		£149
Total		£247

6.1.3.5 Kouklia

Repairing of 600' of eroded embankment and lining with rip-rap.

Expenditure : £ 777

6.1.3.6 Mavrokolymbos

Painting D/S side of gate with bituminous paint, sinking of trial pits, for landslides observations, regrading of landslides area with buldozer, repairing of crack in shaft, painting of all metal structures, installation of new metric W.L. indicator, cleaning of embankment drain, canals, and cleaning of access road.

Slabbing of 2500 feet of canals with precast R.C.C. slabs and painting of all metal manhole covers and control valves.

Expenditure :	Dam	: £1279
Distribution		£1708
Total		£2987.

6.1.3.7 Polemidhia

Fencing up of departmental outdoors stores (purchase of materials and labour) totalling a length of 400' x 5' high.

General repairing and cleaning of 90 No. meters, 100 No. sluice valves (replacing of salamander) air valves, ball valves, and painting of 250 No. manhole covers plus the pipe fittings.

Expenditure :	Dam	: £178
Distribution		£271
Total		£449

6.1.3.8 Pomos (Special Case)

Painting of all manhole covers and slabbing of 800' of canals with precast R.C.C. slabs.

Expenditure :
Distribution £ 425

6.1.3.9 Syngrassis Nil

6.1.3.10 Yermasoyia

Repairs to main gate, painting of gate and transition metal lining with bituminous paint, painting of railings of bridge, W.L. indicator, fencing, ladders and piers, constructing of concrete platforms on either side of bridge entrance, painting of 3'ϕ inlet pipe and grill with bituminous paint, cleaning of buoyancy tanks sumps and spillway from a cumulated debris, and painting of engine room.

Expenditure : £ 457

Maintenance of Dam Project - Summary table of expenditure

Government Dams

No.	Project	Expenditure			Remarks
		Dam £	Distr. £	Total £	
1.	Argaka	112	-	112	
2.	Ayia Marina (Special Case)	36	-	36	
3.	Kalopanayiotis	79	90	169	
4.	Kiti	98	149	247	
5.	Kouklia	777	-	777	
6.	Mavrokolymbos	1279	1708	2987	
7.	Polemidhia	178	271	449	
8.	Pomos (Special Case)	-	425	425	
9.	Syngrassis	-	-	-	
10.	Yermasoyia	457	-	457	
	Total	3017	2643	5659	

Maintenance of Dams
Contributory Dams

No.	Project	Expenditure			Remarks
		Govt. £	Contr. £	Total £	
1.	Agros	-	-	-	-
2.	Ayios Pappos	-	-	-	-
3.	Akrounda	218	110	328	Purchase of "Guest and Crimes" gate and installation of (24" x 24")
4.	F'sta recharge dams	-	-	-	-
5.	Galini	-	-	-	-
6.	Geunyeli	-	-	-	-
7.	Gypsos	-	-	-	-
8.	Kandou	-	-	-	-
9.	Kanli	-	-	-	-
10.	Kalo khorio (Klirou)	28	15	43	Emergency desilting repairing of gate and grille
11.	Kyrenia Area Recharge Dams	-	-	-	-
12.	Lefka Kafizes	-	-	-	-
13.	Lefka Marathassa (Special Case)	162	-	162	Installation of new "Ham Baker" 36" x 36" gate
14.	Lythrodhondas(2 dams)	-	-	-	-
15.	Mia Milia (Special Case)	127	-	127	Repairing of fence and guard house and painting of woodwork of guard house
16.	Morphou Serrakhis	-	-	-	-
17.	Ovgos	-	-	-	-
18.	Pera Pedhi	66	33	99	Emergency desilting, repairing of grille, main axle and gate
19.	Petra (2 dams)	-	-	-	-
20.	Prodhromos	-	-	-	-
21.	Pyrgos	-	-	-	-
22.	River Training general	-	-	-	-
23.	Trimiklini	88	44	132	Installing of 2 No. air valves and 1 No. 6"ϕ S.V. on main line and constructing of 3 No.3'x3'manhole
	Total	689	202	891	

6.2 Management and Operation of Major Irrigation Projects

The year under review was one of the dry years on record and the quantity of water collected in most of the major dams was below normal, since rainfall and run-off continued to be low.

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

The water available for irrigation from the various Government dams amounted to $3.777 \times 10^6 m^3$ (excluding Yermasoyia Dam, where there is no distribution system) as compared to $5.352 \times 10^6 m^3$ for 1971.

The amount of water sold for irrigation was 2,757,251 m^3 i.e. 73% of the water available. The corresponding quantity of water utilised in 1971 was 2,466,851 m^3 i.e. there was an increase in utilization amounting to about 12%.

Gross income from the sale of water was £29,391, compared with £26,891 for 1971 while the net income was £17,260 compared with £15,861 for 1971.

The following table gives comparative figures for income and expenditure for the last five years :

Data on Water Usage for 1968-1972

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

Data on the Operation of Government Dam Projects for 1972

Ser. No.	Project	Capacity $m^3 \times 10^6$	Stored water $m^3 \times 10^6$	Water sold $m^3 \times 10^6$	Gross income £	Expenditure			Net income	Remarks
						Operation £	Maintenance £	Total £		
*	2	3	4	5	6	7	8	9	10	11
1	Argaka - Magounda	1.150	0.538	0.199000	1 990	708	113	821	+ 1 169	Distribution system under construction
2	Ayia Marina	0.300	0.037	0.185450	1 854	1 058	36	1 094	+ 760	Additional water imported from Pomos Dam
3	Kalopanayiotis	0.358	0.358	0.063486	825	668	169	837	- 12	
4	Kiti	1.610	0.257	0.048600	408	159	247	406	+ 2	
5	Mavrokolymbos	2.180	1.280	0.961665	10 142	1 961	2 987	4 948	+ 5 194	
6	Polemidhia	3.430	0.447	0.544300	7 060	1 281	449	1 730	+ 5 330	
7	Pomos	0.860	0.860	0.754750	7 112	1 447	425	1 872	+ 5 240	8700m3 sold as overflow at reduced rates
8	Yermasoyia	13.500	5.530				423	423	- 423	No distribution system some water used for recharge
9	Syngrasi	1.110								
10	Athalassa	0.790								
	T o t a l s		9.307	2.757251	29 391	7 282	4 849	12 131	+ 17 260	

6.3 Domestic Water Supply Branch-Management of Water Supplies under the Provision of Law Cap. 350

This Branch of the Operation and Maintenance Division embraces all administration and operation activities in the field of Town Water Supplies, Government Water Supplies and technical advice to Appropriate Authorities regarding parcellation of land into building sites.

The National Committee Cyprus of the International Water Supply Association is represented by this Branch. Correspondence was exchanged with this organization on subjects related to new methods adopted by developed countries on water for domestic use.

6.3.1 Administration of Greater Nicosia Water Supply Scheme

Amalgamation of this scheme with that of the Nicosia Water Board has not as yet materialized and therefore, administration of Greater Nicosia Scheme is still in the hands of Government, being implemented by this Division of the Water Development Department.

6.3.1.1 Operation of Greater Nicosia Scheme

Greater Nicosia Scheme is an independent water supply scheme run by Government and provides water to the suburban area of Nicosia Town. Its sources and installations are capable to suffice fully the needs of the consumers residing in its "area of supply". This scheme also supplies water "in bulk" to the Nicosia Water Board.

The highest daily consumption for 1972 was 10,800 c. meters on 31.8.1972 (under restrictions).

During the year 1972, the distribution system of Greater Nicosia Scheme was extended by 38,850' ft. of 6" ϕ and 4" ϕ asbestos cement pipes, mainly laid in new parcellations and 688 new house connections were made. By the 31.12.1972 the number of the consumers reached the figure of 10,163.

A statement showing expenditure and revenue of the Greater Nicosia Scheme for the year 1972 is given on page 130.

6.3.1.2 Nicosia Town and Suburbs Water Supply

It is known by now that the water supply for Nicosia and Suburbs is faced commonly by the three existing authorities due, however, to the dry weather in winter months, available water from the various sources could not face the ever increasing demand in summer months and restrictions to the supply were imposed on 26th June, 1972. The total amount of water conveyed from all sources was 7,801,006 c. meters and was distributed as follows :

(i) G.N.S. "area of supply"	2,684.740 c.m.
(ii) N.W.B. -do-	4,167.792 c.m.
(iii) N.W.C. (Town within walls)	712,272 c.m.
	7,564.804 c.m.

The highest consumption was 27,870 c.m. daily which equals to 49 gls, per capita on an estimated population of 125,000 people.

During the year under review work on supplementary supplies, from Pendayia continued and by the end of the year, sources and feeder lines of this scheme were completed. Similarly the installation of additional boosting units at Morphou Pumping Station was made. The remaining item for the completion of this supplementary scheme is the construction of "Philia" Booster Station which is expected to be completed by May - June 1973. Implementation of this scheme will result to the addition of10,000 c. metres daily to present available quantities.

6.3.1.3 Water Supply to Government Residence and Institutions

Other than water supplied for domestic use, separate sources are used for the supply of water for irrigation to all Government residences and institutions including the Presidential Palace.

6.3.1.4 Famagusta Water Supply Project

The construction of Lefkara Dam which will form the main source of this town's water supply was in progress. According to contract, the scheduled completion date of the dam will be late in 1973. In the meantime, construction of the treatment plant at Khirokitia and the laying of the conveyor pipe from Lefkara will be ready for operation.

Pumping of water, therefore, could only be made from Khirokitia and "Vassilikos" sources from which the amount of 1,691,930 c.m. was extracted. This quantity was delivered to Famagusta Water Board, to the villages of Pano and Kato Lefkara, Vavla, Kato Drys, Tokhni and to local irrigator whose sources were affected from the pumping made in the area.

A statement showing expenditure and revenue of the Famagusta Water Supply Project for the year 1972 is given on page 131.

6.3.1.5 Technical Advice to Water Boards

Under the capacity of the official member, this Branch attended all meetings of the existing water boards and offered its technical advice where necessary.

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

6.3.1.6 Nicosia Water Board

Other than supplementation of water, improvements of this Board's distribution system is necessary and, therefore, tenders have been invited for a study to be made in conjunction with Greater Nicosia Scheme and that of the Nicosia Water Commission (Town within walls). Other activities are displayed hereunder:

(i) The total quantity of water supplied from owned sources and private boreholes other than that delivered by Greater Nicosia Scheme, was 2,777.919 c.m.

(ii) The total quantity of water consumed as registered by area meters was 4,880.064 c.m. (including Nicosia Water Commission).

(iii) The total maximum consumption per day (including Nicosia Water Commission) was 17,070 c.m. on 11.8.72, (with restrictions).

(iv) The total number of consumers on 31.12.72 was 12.707.

(v) Extension of distribution system

(i) 133 ft. of 6" ϕ A.C. pipes
(ii) 11.835 ft. of 4" ϕ A.C. pipes

Re-laying of distribution system

(i) 755 ft. of 12"ϕ A.C. pipes
(ii) 183 ft. of 4"ϕ A.C. pipes

(vi) Total length of distribution system (including extensions of 1972)

(i) 12,100ft. of 12"ϕ A.C. pipes
(ii) 25,000ft. of 10"ϕ A.C. pipes
(iii) 12,930ft. of 8"ϕ A.C. pipes
(iv) 82,148ft. of 6"ϕ A.C. pipes
(v) 620,423ft. of 4"ϕ A.C. pipes

(vii) (i) The total number of hydrants installed in 1972 was 19.
(ii) The total number of hydrants installed up to 31.12.72 was 847.

6.3.1.7 Limassol Water Board

Following an initial agreement with Government, the new scheme for the provision of 1.5 m.g. daily from Yermasoyia river valley was designed and orders for the necessary piping could be placed. Execution of this scheme started late in the year and it is hoped to be put into commission by the middle of next year. The maximum daily consumption reached the figure of 19,990 c.m.

Water requirements, however, could be met satisfactorily from existing sources and an uninterrupted supply could be maintained. From this Board's records it is collected:

(i) Total quantity of water supplied from our sources ... 5,071.705 c.m
(ii) Total quantity of water consumed, as registered by area meters and by water meters at boreholes 2 and 7 and at viagrex ..... 4,952,521 c.m
(iii) Maximum daily consumption in summer on 14.7.72..... 19.990 c.m.
(iv) Total number of consumers as at 31.12.72 17,927 No.
(v) (i) Extension of distribution system
Pipelines laid during 1972

	20.383'/4"
	890'/6"
	351'/8"
Total	21.624'

(ii) Total length of distribution system

	723.722'/4"
	98.471'/6"
	29.468'/8"
	27.000'/10"
Total	878.661'

(vi) Number of hydrants

(i)	installed in 1972	36
(ii)	total installed	960

6.3.1.8 Famagusta Water Board

As already mentioned part supplementation of this town's water supply was made through the Government Project. Requirements, however, could not be met and restrictions to the supply were imposed. Other activities of this Board are stated below :

Total quantity of water supplied

(i)	from Water Board Sources	922,904 c.m.
(ii)	delivered through Govt. Project	1,387,130 c.m.
	Total	2,310.034 c.m.

Total quantity of water consumed as registered by area meters	2,231.685 m^3
Maximum daily consumption	7.528 m^3
Total number of consumers as at 31.12.72	10.842

Extension of distribution system

Pipelines laid during 1972

4,150 ft. x 8" ϕ
9,940 ft. x 6" ϕ
28,316 ft. x 4" ϕ

Total length of distribution system

20,329 ft. x 8" ϕ	
85,001 ft. x 6" ϕ	
533,141 ft. x 4" ϕ	
Total	638,471 (or 121 miles)

Number of hydrants

(i)	installed in 1972	59
(ii)	total installed	833

6.3.1.9 Larnaca Water Board

Existing sources could hardly meet water requirements thus necessitating the finding of new sources urgently. Due to the prevailing dry season the use of Alethrico borehole No. 3/65 was considered advisable in order to keep the water supply of this town regular. It is noted that this borehole's water is fairly saline and for the time it was kept out of commission. Other data are given below :

(i) Water Supplied during the year 1972

1,659,680 c.m.

(ii) Water Consumed during the year 1972

1,659,680 c.m.

(iii) Maximum Summer Consumption

5990 c.m. per day

(iv) Total Number of Consumers at 31.12.72

4812, excluding Turkish consumers which are estimated to be 1000.

(v) (i) Extension of distribution system during the year 1972 in ft..

17,770	ft.,	of 4" ϕ
8,670	"	of 6" ϕ
3,470	"	of 8" ϕ
1,000	"	of 10" ϕ

(ii) The total length of distribution system is not available.

(vi) (i) Hydrants installed during the year 1972 : 58

(ii) Total number of hydrants installed within water supply area : 234

Greater Nicosia Scheme (including Morphou Bay Scheme)
Revenue and expenditure account for 1972

	Expenditure			Revenue	
(i)	Pumping charges	£ 18,194.485	(i)	Sale of water	£ 112,645.223
(ii)	Maintenance charges	3,921.601	(ii)	Connection fees	1,392.000
(iii)	Collection fees	19,513.304	(iii)	Usage of pipelines	2,212.000
(iv)	Morphou Running Expenses	38,641.337	(iv)	Other revenue	22,557.343
	Total	£ 80,270.727		Total	£ 138,806.566
(v)	Administration	4,000			
(vi)	Amortization (£1,656,000 x 5% interest over 40 years)	96,511			
	Grand Total	£ 180,781.727			

Note: (i) During 1972, water to the value of £ 58,821,250 was delivered to Nicosia Water Board but collection of this revenue was not possible. By the end of 1972, the total arrears of revenue in this respect have reached the amount of £72,544.900.

(ii) It is estimated that water to the value of £20,000 is supplied to Turks and this amount could not be collected due to abnormal political situation. The total amount due by the Turks (calculated at minimum) since 1964 has by now reached the figure of £200,000.

Famagusta Water Supply (Govt.Scheme)
Expenditure and revenue account for 1972

Expenditure

Pumping charges		
(i)	Attendants	£ 27,620.566
(ii)	Electricity and fuel	1,495.395
Maintenance		1,445,000
Total		£ 30;610.961

Revenue

Sale of water	£ 66.720

VII. DIVISION OF SMALL PROJECTS PLANNING

By

P. Pantelides
Head of Division

7.1 Introduction

This Division is dealing with the design and Planning of village water supply schemes throughout the island and smaller irrigation schemes, serving farming communities situated near the sources of supply.

Local Authorities concerned with these schemes are the Village Water Commission for Water Supply Schemes and the Village Irrigation Division and/or Association for Irrigation Schemes.

Because of the great number and the great demand for these projects an intricate and rather complex procedure has been evolved in the planning stages requiring more time to be spent by the Head of the Section on procedural rather than technical matters.

Overdevelopment of local water resources and continued drought has brought about an influx of applications from village communities requiring the solution of problems which could hardly be coped with the available technical staff and facilities. Several hundred such applications were in hand at the end of the year and there has been a constant pressure to produce an immediate solution to pertinent problems such as the depletion of local springs or supply boreholes.

It is realised, however, that problems emanating from unprecedented drought conditions like 1972-73, cannot be taken as a basis for planning, without the risk of unnecessary expenditure. On the other hand we cannot afford to spend too much time preparing schemes which will not be implemented because they cannot be economically justified.

7.1.2 Staff

There has been no change in the staff employed in the Division in spite of the need for expansion: one Superintendent of Works is in charge of the Division, two Senior Inspectors are in charge of Village Water Supplies and Irrigation Projects respectively and there are four technical teams consisting of one Inspector and one Technical Assistant for four combined districts in the island. Two Irrigation Engineers dealing with specific assignements had to be diverted elsewhere towards the end of the year.

7.2 Village Water Supplies

Definitions

We call "villages" all communities with "individual service systems" except the towns of Nicosia, Famagusta Limassol.

Total number of villages = 628 (including suburbs)
Supply Rate : Optimum 130 lt/head/day
Minimum 90 lt/head/day for
House - to - House System

Total Population : Approximately 400,000

For systems with public fountains the consumption rate is considerably lower, in the order of 60 lt/head/day in the hot months of the year.

7.2.1 Present Conditions

In all villages there is in operation a systematic pipe water supply and this was achieved in the early years of the establishment of the Republic.

It is noteworthly that the target aimed at by the former Colonial Administration had never gone beyond the pipe supplies with street fountains rated at 10 to 15 gallons per head per capita, but this target was never attained before the establishment of the Republic.

Rural Development under the Government's Development Program has brought about an increasing demand for house-to-house services, a fact which necessitated the up-rating of practically all supply systems carried out under back-dated standards.

A notable target under the Government's Development Program is the provision of house-meter service to all communities.

At the end of 1972 :	
Villages with house-to-house Service systems	No. 437 = 70% of total
Public fountains	No. 191 =30% of total
T o t a l	No. 628 =100%

More details are given on table as per list "A" and "B".

7.2.2 Supply Rate (1972)

In view of the continued drought we consider that all supply systems providing 90 lit/head/day and over in summer 1972 as satisfactory. Under such conditions the situation in Summer 1972 is set down on Table "C".

It is observed that the worst situation has occurred in the Paphos District, with only 22% of the house system as satisfactory and Famagusta with 31.6% satisfactory supplies. In Nicosia, Kyrenia, Limassol and Larnaca District the percentages of satisfactory supplies at or near 90 lit/head/day were 55.6%, 78.7%, 60.5% and 61.0% respectively.

7.2.3 Problems and Planning

Quite apart from conditions created by the exceptionally dry years and source depletion, the problem of rural water supplies consists essentially of finding new permanent sources which can be offered for supplementary water supply on regional bases rather than for individual villages.

In the planning stages of such projects we take in consideration the current trends of population increase, the rise in the standards of life, and the permanency of the sources offered for use; but in view of uncontrolled exploitation of water resources by the private sector, it is considered inadvisable to plan very far ahead in places where underground water sources were involved.

The more difficult problems have occurred in the Famagusta and Larnaca Districts where water supply boreholes have dropped to near extinction or chemically deteriorated and they cannot be readily replaced because of a general depletion of the underground water.

For solving the problem in the villages north of Famagusta in the Engomi - Trikomo - Boghaz area, we have prepared a scheme for supplementary supply from a borehole on the Kyrenia limestones near Tripimeni.

The problem of Voroklini - Livadhia and Aradippou has been temporarily solved with local boreholes but a long term solution of the village water supply problem in this particular region of depleted aquifer is being sought by connection with the Major Water Supply of Famagusta Town.

Further inland in the dry villages of Famagusta District a long-term solution of the problem is being sought by enlarging the peripheral conveyors and pumping installation of the "Mouzomenos Spilios" borehole in the area of Kythrea.

In Limassol District there is water shortage in Eftagonia and Prastio Kellaki, and in the Palodia, Paramytha, Spitali group of villages. In both cases the problem is being solved with local boreholes.

In Paphos District we are currently studying a regional scheme for supplimentary supply from boreholes in the Xeros River for villages situated below the 500 meter contour and supplementary supplies to the "Appides", "Ayia", "Papalouka" regional systems by pumping from the upper sources of the Xeros River.

7.3 Schemes Prepared in 1972

These are given on list "D" at a total cost of £485,044

The more notable schemes prepared in 1972 are the following:

(i) Revision of the Ypsonas Polemidhia Pumping System

Total cost £28,284 out of which £12,780 represented the value of works completed under the original proposals.

This scheme provides for pumping from a long-rated borehole in the Akrotiri aquifer and boostering to Ypsonas and Polemidhia at a maximum rate of 30 gallons/head/day up to 1980. On the way, the same borehole will serve the villages of Erimi and Kolossi whose individual supplies from maginal boreholes were depleted.

(ii) The Lapithos Water Supply Scheme from a new borehole at a total cost of £92,500 to supplement the present requirements as well as to cover new development areas in the coastal zones.

(iii) A regional scheme for Klirou-Kalo Khorio and Mitsero at a total cost of £63,500.

(iv) Ay. Theodoros - Alaminos - Skarinou

New supplementary supply scheme from a successful borehole near the village of Skarinou at a cost of £20,090.

7.4 Minor Irrigation Schemes

The Division prepared a list of schemes for inclusion in the 1973 Development Estimates but only 22 new schemes has been included at a total cost of £186,000. For some pumping schemes like Chrysokhou valley, Vitsada, Ay. Erini only part of the estimated cost was included in the estimates with a view to further allocations for completion in 1973.

A list of schemes ready for construction at the end of 1972 is given on List "E".

The more notable schemes prepared and submitted in 1972 are the following:

(i) Khrysokhou valley pumping scheme stage "A" estimated cost £40,000, postulating the use of Government boreholes in the gravels of Khrysokhou river, and irrigation of 450 dons of permanent crops and 214 dons seasonal crops.

(ii) Other pumping schemes from boreholes in various villages at a total cost of £100,000 to provide new irrigation to about 1000 don to permanent and/or vegetables.

(iii) A pumping scheme from Government and private boreholes and distribution system has been prepared for Pissouri at a cost of £75,000 but implementation is doubtful because of the uncertainty of the life of the boreholes.

7.5 Inter Departmental Committee

Schemes examined by the Committee and approved during the year are given on List "F".

Schemes pending with the District Agricultural Officers at the end of the year are given on list "G".

7.6 Western Messaoria Control Pumping Scheme

10 No. final plans for pumping irrigation divisions in the Morphou plain were prepared in 1972 for a total area of 1300 dons of existing citrus plantations and 500 dons seasonal crops.

27 No. preliminary plans were sent to the D.O. for the establishment of new irrigation divisions of a total area of 3000 dons. as per lists "H" and "I".

Village Water Supplies

"A"

Year	Villages with House-to-house distribution				Villages with Public Fountains			Villages without a pipe supply			Total of villages
	Completed year	Total No. of villages	villages %	Population %	Total No. of villages	villages %	Population %	Total No.of villages	villages %	Population %	
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

Village Water Supply
Villages with Public Fountains
1972

District	No. of villages	Greek		Turkish		Includes in 1973 Estimates			
		No. of villages	Population	No. of villages	Population	No. of villages	Population Greek	Remaining	Population Greek
Nicosia	53	27	6818	26	7,408	16	5,112	11	1,736
Kyrenia	10	4	421	6	1,472	2	198	2	223
Limassol	24	22	4630	2	365	7	2,657	15	1,973
Famagusta	24	1	422	23	6,901	1	422	-	-
Paphos	66	39	10073	27	5,416	12	3,327	27	6,751
Larnaca	14	4	1096	10	1,963	3	846	1	250
Total	191	97	23495	94	23,525	41	12,562	56	10,933

Note: (i) Population according to census 1960
village population 417,612 (including suburbs)

(ii) The population in the year 1969 according to constu (Town Planning Survey 1969) was
(a) 6 towns with suburbs 246.884
621 villages 413.397

Department of Water Development

Water Supply Situation at the end of 1972

District	Satisfactory piped supply (Supply rate 90 lit/head/day)								Unsatisfactory piped supply (Supply rate 90 lit/head/day								Total number of villages	Total population 1960
	Villages with house - to - house				Villages with fountains				Villages with house - to- house				Villages with fountains					
	No.	%	Population	%	No.	%	Population	%	No.	%	Population	%	No.	%	Population	%		
Nicosia	99	55.6	126,688	79.7	22	12.4	5,850	3.7	26	14.6	17,911	11.3	31	17.4	8,406	5.3	178	158,855
Kyrenia	37	78.7	25.754	93.6	3	6.4	870	3.2	-	-	-	-	7	14.9	893	3.2	47	25,517
Famagusta	31	31.6	27.554	34.6	4	11.1	1,296	1.6	43	43.9	44.738	56.2	20	20.4	6,027	7.6	98	79,615
Limassol	69	60.5	50,688	79.6	11	9.7	2,739	4.3	21	18.4	8,030	12.6	13	11.4	2,256	3.5	114	63,713
Paphos	29	22.0	18,624	37.9	26	19.7	6,076	12.4	37	28.0	14,958	30.5	40	30.3	9,418	19.2	132	49,076
Larnaca	36	61.0	31,916	82.2	1	1.7	117	0.3	9	15.3	3,861	9.9	13	22.0	2,942	7.6	59	38,836
Total	301	47.9	281,224	67.3	67	10.7	16,948	4.1	136	21.7	89,498	21.4	124	19.7	29,942	7.2	628	417,612

Water Supply - Schemes Prepared in 1972 and submitted to D.Os

Summary of List "D"

District	No. of Schemes	Estimated Cost £
Nicosia	11	91,365
Kyrenia	6	117,100
Famagusta	13	62,600
Limassol	14	71,894
Larnaca	3	51,090
Paphos	15	90,995
Total	62	485,044

List "D"

Water Supply - Schemes Prepared in 1972 and submitted to D.Os

Nicosia District

Ser. No.	Village	Nature of Scheme	Estimated cost £
1	Klirou) Kalon Khorio (Mitsero (	Regional scheme Additional supply from new B/H at Ayios Ioannis area	63,500
2	Philia	Additional storage and pumping the water to the hight place of the village	18,700
3	Argates	Supply water to the slaughter house	550
4	Palekythro	-do-	400
5	Ay.Varvara	-do-	330
6	Ay.Marina(X)	-do-	720
7	Myrtou	Extentions	300
8	K.Moni	-do-	600
9	K.Koutraphas	Additional storage and house to house	4,795
10	Lythrodhondas	Supply water to the slaughter house	820
11	Ay. Trimithios	Extentions	600
	Total		91,365

Kyrenia District

1	Ay. Amvrosios	Additional storage and improvements	12,800
2	Paleosophos	Additional storage	600
3	Karmi	Extentions	700
4	Kalogrea	Extentions	3,800
5	Lapithos	Additional storage and house to house	92,500
6	Ay. Georghios	Improvements	6,700
	Total		117,100

Famagusta District

Ser. No.	Village	Nature of Scheme	Estimated cost £
1	Boghaz	Additional Supply	3,600
2	Prastion) Gaidouras)	Additional supply	2,600
3	Yialousa	Improvements	200
4	Kondea	Additional supply, additional storage and house to house	22,600
5	Lefkoniko	Additional supply	2,500
6	Dherinia	Additional supply	4,500
7	Phrenaros	Additional supply	4,000
8	Kantara	Supply water to Kantara Castle	3,000
9	Marathovounos	Improvements	1,300
10	Vitsadha	Additional storage	3,800
11	Marathovounos	Extentions	3,800
12	Dhavlos	Additional supply, additional storage and house to house	10,700
13	Rizokarpaso	Extentions	600
	Total		£62,600

Limassol District

1	Malia	Excavation of spring	800
2.	Ay. Amvrosios	Additional storage and house to house	5,100
3	Apsiou	Additional storage and new conveyor	2,300
4	Ay.Constantinos	Additional storage and house to house	2,820
5	Yerasa	Additional storage and house to house	3,490
6	Ay. Dhemetrios	Additional supply, additional storage and house to house	6,360
7	Sotira	Additional supply	4,600
8	K.Platres	Improvements	600
9	Kalon Khorion	Additional supply and additional storage	5,400
10	Trimiklini	Additional supply from new spring	600
11	Ypsonas) Polemidhia) Erimi) Kolossi)	Additional supply	15,504
	C/F		47,574

Limassol District (Cont')

Ser. No.	Village	Nature of scheme	Estimated cost £
	B/F		47,574
12	Phini	Additional storage and house to house	12,620
13	Kolossi	Additional storage and laying new conveyor	10,000
14	Tzergez	supply water from Zakaki village	1,700
	Total		71,894

Larnaca District

1	Aradhippou	Additional supply, additional storage and extentions	30,000
2	Layia	Additional storage and house to house	1,000
3	Ay.Theodhoros) Alaminos) Skarinou)	Additional supply	20,090
	Total		51,090

Paphos District

1	Asproyia	Additional storage and house to house	3,300
2	Simou	Additional storage and house to house	5,900
3	Skoulli	-do-	2,440
4	K. Akourdalia	-do-	1,850
5	Dhroushia	-do-	5,230
6	Ay.Marina) Nea Dhimmata)	Additional supply and additional storage	4,900
7	Timi	Additional supply	5,300
8	Amarketi	-do-	7,500
9	Ay.Marina (Kel.)	Additional storage and house to house	2,820
10	P.Panayia	Additional storage and improvements	18,400
11	Goudhi	Additional storage and house to house	4,120
12	Armou	Additional supply house to house	12,000
13	Pretori	Additional storage and house to house	5,600
14	Emba	Additional storage and extentions	7,900
15	Lemona	Add.storage and house to house	3,360
	Total		90,995

LIST OF SMALL IRRIGATION SCHEMES (Ready for construction at the end of 1972)

Nicosia District

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	105/1963	Pera Politiko	Division	Pedieos	Diversion groyne & Intake channel for flood irrig.	5,000	1/5	-	450	-
2	36/42	Ergates	Associat.	Kourtoujis	Pipeline and ext. of distrib. channels	7,700	48%	93	266	190 dons winter
3	42/1948	Apliki	"	Kalogyros Tourkou	Irrig. Tank and Distrib.works	1,900		31	9	
4	41/39	Katokopia	"	Ktirka	Lining of canals	9,900		143	465	
5	127/40/98/IV	Kalopanayiotis	Division	-	Distrib.works	9,720	1/3	133	-	
6	39/44	Vyzakia	Division	-	Lining of canals	11,200	1/3	-	140	
7	63/52	Meniko-Akaki	"	Afxenti-Riatikon	"	21,500	1/4	-	500	4000 dons winter
*8	127/40/39	Palekhori	Division	Pera Avlaki Halkomatas	Irrig.tank and Distr. works	3,150	1/3	31	-	
9	42/42	Pera	Division	Fassera	Lining of canals	6,000	1/3	130	700	
*10	88/52	Pharmakas	Accoc.	Koskinas	Conveyor pipeline	2,000	44%	?	?	
*11	51/54/IV	Peristerona	Division	-	Lining of canals	10,000	?	?	?	
12	33/43/9	Astromeritis Klirou	Assoc.	Laoura	Lining of canals	4,700	40%	30	185	
13	127/40/107	Askas	Assoc.	-	Repairs to existing works	270	?	30	-	
14	63/44	Aredhiou	Division	-	Repairs etc	600	?	?	?	
15	123/40/A1	Exometochi	Assoc.	within village	Flood protection works	2,300	?	-	-	
16	25/42/II	Neochorio	Assoc.	Alakatia	Flood protection works	620	-	-	-	
*17	22/39	Galata	Division	Esso Galata	Expl.works	6,000	1/3	-	-	
*18	28/40/I	Pakhyammos	Division	Avgusta	Weir and Distr.works	700 (rev. £12,300)	1/3	-	24 early veget.	

Nicosia District (Cont')

Ser. No.	W.D.D. Reference	Village	Division of Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib.	Irrigation Perm. don.	Irrigation Seas. don.	Remarks
*19	106/1970	Mosphilli	Division	-	Pumping scheme and distr.pipes	7,000	1/3	45	20	
*20	127/40/96/III	Pedhoulas	"	-	Distr. works	11,000	1/3	40	-	
21	127/40/174	Linou	"	Linopsas	Lining of canals	16,000	1/3	120	200	
22	30/46/II	Phlasou	"	Ay.Epiphanitis	"	17,000	1/3	120	200	
23	43/50	Evrykhou	"	-	"	12,500	1/3	470	330	
24	30/46	Phlasou Evrykhou	"	Kousouliotis	"	10,000	1/3	130	700	
25	86/53	Tembria Korakou	"	Esso Dhimna	"	8,000	1/3	160	300	
26	62/67	Korakou	"	Esso Dhimna	"	17,000	1/3	300	100	
27	62/67	Korakou Phlasou Linou	"	Shelloshis	"	14,000	1/3	53	250	
28	127/40/118	Kalliana	"	Neron tis Tsappas	"	5,000	1/3	150	-	
29	61/66	Katydhata	"	Dhimna Janis and Mylos	"	11,000	1/3	470	230	
30	127/40/25/III	Kakopetria	"	Frangiko Daoudidhes Kouphoelies	Distr.channels and pipelines	?	?			

Kyrenia District

*1	55/51/III	Lapithos	Associat.	Kephalovrysos	Lining of canals	12,500	1/3	45	-	
*2	78/41/III	Vasillia	Associat.	Paleokastro	Distrib. pipes	1,400	60%	-	10	
*3	61/45	Ay.Irini	Division	-	Pumping scheme	21,070	1/3	61	-	

LIST OF SMALL IRRIGATION SCHEMES

Limassol District

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	127/40/49/36	Kyperounda	Associat.	Frakti	Exc.of spring and distr.pipes	1,750		7	8	
2	127/40/49/55	"	"	Livadhi tis Messis	Irrig.tank and distr. pipes	1,650	44%	22	18	
3	127/40/49/48	"	"	Appis	Distr.pipes	800		12	-	
4	127/40/49/II	"	"	Dhiala	Irrig.tank and distrib.pipes	900	1/3	12	-	
5	127/40/49/47	"	"	Khalospitia	"	1,800	-	15	-	
6	127/40/49/II	"	"	Vasiliko	Distr.pipes	620	40%	9	5	
7	127/40/134/2	Pelendria	Division	Sarakinos	"	630	1/3	17	-	
*8	61/42	Silikou	"	Lavrania	Lining of canals and general improvements	3,460	1/3	73	-	
9	127/40/23	Omodhos	"	Pighadhi	Irrig.tank and distrib.pipes	1,350	1/3	7	8	
10	127/40/52/III	Ay.Ioannis (Agros)	"	Angoulos	Distr.channels	1,160	1/3	12	-	
11	"	"	Associat.	Kephalovrysos	Distr.works	1,700	42%	16	9	
12	42/43/III	Phini	Division	Dhimma tou Mylou	Distr.works	11,300	1/3	371	-	
13	127/40/165/2	Tris Elies	Division	Drakoundas	Ext.of distrib. works	7,200	1/3	180	-	
14	127/40/59/II	Louvaras		Tsoukkallas	Irrig.tank and Distrib.pipes	800		6	4	
15	45/44/2	Pyrgos	"	Alavrovrysi	Distr. works	5,700	1/4	-	80	
16	"	"	"	Dhimma tis Reginas	"	4,600	1/4	-	300	
*17	91/45	Moniatis	"	-	Distrib.works	13,100	1/3	25	-	
*18	31/45/I	Prodhromos	"	-	Conv.add.water to reservoir	9,000	1/3			
*19	98/53	Pissouri	Division	-	Pumping scheme	50,000	1/3	?	?	

LIST OF SMALL IRRIGATION SCHEMES

Paphos District

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		Khrysokhou valley scheme	Division	Ghoudhi Skoulli Kholi villages	Pumping scheme	40,000	1/3	450	214	
*2		Polis(Khr.)	"	-	Pumping Install.	3,000	1/3			
*3		Anargetti	"	-	Pumping scheme and Distr. pipes	4,200	1/3			
4	56/61	Ay.Marinoudha	Associat.	-	Distr.pipes	850				
5	65/62	Khoulou	Division	Kartavines	Pumping scheme and distr. pipes	4,000	1/3	30	18	
6	127/40/142	Episkopi	"	-	Flood protect.works	1,400				
*7	127/40/94	Nata	"	Dhiala	Constr.of tank and distr.pipes	1,600	1/3		20	
*8	97/1944	Nea Dhimmata	"	Symvoules	Replac. of pipes	2,450	1/3			
*9	100/44	Peyia	"	-	Pumping scheme	17,500	1/3	110	160	
+10	99/54	Arghaka	Associat.	Ay.Varvara	Replacement of pipes	2,700	1/3			

Famagusta District

*1	32/41/III	Vitsadha	Division	-	Pumping scheme	17,000	1/3	38	157	
*2	127/40/34	Ayios Andronikos	Associat.	-	Distr. pipes	2,200	1/3	-	17	

LIST OF SMALL IRRIGATION SCHEMES
Larnaca District

Ser. No.	W.D.D. Reference	Village	Division or Associat.	Locality	Nature of proposed works	Estimated cost £	Village contrib. %	Irrigation		Remarks
								Perm. don.	Seas. don.	
*1	45/38/A3	Kalavassos	Division	Kopetra Syrmata	Pumping scheme	13,250	1/3	-	240	
*2	58/45	Mari	Division	-	Pumping scheme	11,100	1/3	-	37	
*3	76/63	Skarinou	Division	-	Pumping scheme	8,300	1/3	-	58	

"List "F"1

List of schemes approved by the Inter-Departmental Committee in 1972

1. Nata (Dhiala)
2. Kilani
3. Lapithos (Kephalovrysos)
4. Nikitari
5. Erghates (Kourtoujis)
6. Pedhoulas
7. Mesana
8. Ay. Theodhoros (Soleas)
9. Kakopetria (Apotheri)
10. Vitsadha
11. Phlasou
12. Ay. Andronikos
13. Ay. Marinoudha
14. Khrysokhou valley
15. Peyia
16. Moniatis

List "F"2

List of schemes not approved by the Inter-Departmental Committee in 1972

1. Neokhorio (Kythreas)
2. Palekythro

List "G"

List of small irrigation scheme submitted to District Agricultural Officers for study in 1972

Nicosia and Kyrenia District

Ser. No.	Village	Nature of work	Remarks
1.	Kambos (Tsakkistra) (Grafkion)	Improvement Works	Existing irrigation works
2.	Palekhori (Maroullena)		
3.	Orounda (Ormithari-Matsari)	Lining of canals	

List "G" 1

List of small irrigation schemes submitted to District Agricultural Officers for study in 1972

Limassol District

Ser. No.	Village	Nature of work	Remarks
1.	Apsiou	Distribution works	
2.	Dhrymes (Sykameri)	Distribution works	
3.	Ay. Theodhoros (Lois)	Distribution works	
4.	Kapilio (Xylouriko)	Distribution works	
5.	Trimiklini (Zenonas)	Distribution works	
6.	Agros (Enetikos)	Distribution works	
7.	Agros (Pano Yetonia)	Distribution works	
8.	Kato Amiandos (Fournia)	Distribution works	
9.	Malia (Trezena)	Distribution works	
10.	Khandria (Avlakon)	Distribution works	

List "G" - 2

List of small irrigation schemes submitted to District Agricultural Officers for study in 1972

Paphos District

Ser. No.	Village	Nature of works	Remarks
1.	Kritou-Marottou (Vrysi tou Khoriou)	Distribution works	
2.	Inia (Mega Pigadi)	-do-	
3.	Ay. Marinoudha	-do-	
4.	Mamonia	Pumping scheme	
5.	Mamonia-Phasoula	Lining of canals	
6.	Mesoyi (Mana tou nerou)	Distribution works	
7.	Episkopi (Asprokremmos)	Extension of canals	
8.	Peyia	Pumping scheme	

List "G" - 3

List of small irrigation schemes submitted to District Agricultural Officers for study in 1972

Larnaca District

1.	Voroklini	Pumping scheme	

List "H"

Irrigation Division in Morphou area, for which final plans have been prepared by W.D.D. and sent to D.O. in 1972

Ser. No.	File No.	Village	Name of Irrigation Division	Area commanded in don.		Drg. No.
				citrus	seasonal	
1.	WM33/69	Kato Zodhia	Xalona No.2	180	10	PS/IR/29
2.	GEM2/64/109/A	Argaki	Platolourka	140	20	PS/IR/30
3.	WM33/68	Katokopia	Katzelos No.1	140	65	PS/IR/31
4.	WM266/68	Morphou	Lekanes	153	14	PS/IR/32
5.	WM41/68	Kato Zodhia	Kakkourtas	69	91	PS/IR/33
6.	GEM2/64/109/A	Kato Zodhia	Stephania No.2	197	10	PS/IR/34
7.	WM13/72	Peristerona	Katzelos	141	74	PS/IR/35
8.	WM55/69	Pano Zodhia	Dhromos tou Koutrapha	80	52	PS/IR/36
9.	WM38/71	Morphou	Kallinikos	170	2	PS/IR/39
10.	WM43/68	Kato Zodhia	Asprokremmos	30	157	PS/IR/40
	Total			1300	495	

List "I"

Irrigation Division in Morphou area for which preliminary plans have been prepared by W.D.D. and sent to D.O. in 1972

Ser. No.	File No.	Village	Name of irrigation Division	Area commanded in don.		Remarks
				citrus	seasonal.	
1.	WM46/71	Pendayia	Ammos	220	46	
2.	WM34/69	Prastio	Zapitis	75	120	
3.	70/67	"	Akritas	48	110	
4.	M.322/66	Syrianokhori	Kokkinoyi	168	44	
5.	WM47/71	Morphou	Kolokashies	114	49	
6.		"	Toumazos	145	-	
7.	WM80/69	Kato Zodhia	Kannakoudhes No.2	130	40	
8.	WM118/70	"	Anephani No.2	115	40	
9.	WM73/71	"	Aloupotrypes	133	9	
10.	WM44/69	"	Kannakoudhes No.1	100	80	
11.	WM68/72	"	Ayios Georghios	117	2	
12.	WM19/72	Pano Zodhia	Melissia	45	110	
13.	WM15/72	"	Komitis	79	52	
14.	WM53/67	Katokopia	Rodhamia	90	58	
15.	WM72/71	"	Mazeri	3	140	
16.		"	Grammi	165	40	
17.	WM187/68	Katokopia	Vorines	156	67	
18.	WM28/72	"	Krakas	105	70	
19.	WM60/72	"	Toumba	24	117	
20.	WM55/71	Argaki	Potamos	166	36	
21.	WM276/68	"	Argaki No.4	178	26	
22.		"	Chomateros	110	10	
23.		"	Pano Chomateros	120	25	
24.	WM72/70	"	Karkotika	78	40	
25.	WM6/71	"	Chomateros	142	13	
26.	WM7/72	"	Athasi	104	26	
27.	82/7/AT	Peristerona	Katzelos	90	200	
	Total			3 020	1 560	

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 and Paphos Regions, 2 monthly paid Technical Assistants, 3 daily paid Technical Assistants, 2 hourly paid Technical Assistants and one 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 in the region.

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 observations measurements and maintenance:

(i) 22 stream gauging stations equipped with automatic water level recorders (4 of them have been removed during the year). Also 4 automatic water level recorders are installed on an equal number of B/Hs in Akrotiri Fassouri area, for temporary observations.

(ii) 4 rainfall observing stations.

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 553 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 November 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 142 observing boreholes.

Also 1069 spring discharges were gauged volumetrically or by current meter.

8.1.5 Chemical analyses

A total number of 890 water samples were taken from springs, wells/boreholes and streams and sent to the Government Laboratory for chemical analysis.

In addition to the above 830 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

142 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 1430 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

39 applications for drilling of wells or boreholes in the Special Measures Law and conservation areas and 22 applications in the non conservation area were investigated and submitted to the District Officer Limassol, while 39 applications for new citrus plantations permits were examined and submitted to the sub-committee, for citrus plantation Limassol.

Also 18 applications for quarries permits, investigated and submitted to Nicosia Head Office.

In addition to the above 80 several cases in the special measures law, examined and submitted to the District Officer Limassol.

8.1.9 Plotting of new wells and boreholes

A total number of 54 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, 8 water meters were installed on an equal number of boreholes in Akrotiri-Phassouri area, raising the total number to 396 mean-while 13 of them have been removed.

8.1.11 Maintenance of Dams

Routine maintenance and inspection of major dams in Limassol and Paphos Regions and their distribution system was carried out by the Regional Officer.

8.2 Paphos Sub-Regional Office

8.2.1 General

Paphos Sub-Regional Office comes under Limassol regional office.

At the end of the year the staff of Paphos Sub-Regional Office was composed of 3 monthly paid Technical Assistants, 2 daily paid Technical Assistants, 4 hourly paid employees, one daily female typist, and one hourly female draughtswoman.

The above personnel was engaged on the collections of hydrological and hydrogeological data as well as for maintenance and operation of the dams in the region.

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) 12 stream gauging stations equipped with automatic water level recorders.

(ii) 1 rainfall observing station

(iii) 1 water level recorder on B/H 2671 recording the fluctuation of the water table in Dhiarizos lower catchment.

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 481 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 626 spring discharges were gauged volumetrically or by current meter.

8.2.5 Chemical Analyses

A total number of 985 samples of stream and ground water were taken and sent to the Government Laboratory for Chemical Analysis.

306 samples of ground water taken from observation well/boreholes during March and November were analysed by the Paphos Sub-Regional Office for chloride content.

8.2.6 Suspended Sediment Analyses

A total number of 26 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 2370 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 343 applications for well sinking permits were investigated and reports submitted to the District Officer Paphos, while 30 applications for citrus plantations permits, and 15 applications for quarries, were examined and reports submitted to the District Engineer Limassol-Paphos.

8.3 Morphou Sub-Regional Office

8.3.1 General

By the end of the year the staff of the Sub-Regional Office was composed of one Inspector of Works (Mr. A.K. Nicolaides) as the Head of the office, one monthly paid Technical Assistant, seven daily paid Technical Assistant and two regular employees. The above personnel was engaged on the collection of Hydrological and Hydrogeological data in the Morphou Sub-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) 24 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 320 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 180 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, 750 spring discharges were gauged. 50 springs were gauged once-a-month, 25 springs twice-a-year and 70 springs once in a year.

8.3.5 Questioning

The routine questionaire was carried out during the summer months on 924 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, 1320 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, 400 samples of ground water taken from observation wells/boreholes during March and November were analysed by the Morphou Sub-Regional Office for chloride content.

8.3.7 Bacteriological Analysis

60 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

40 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 812 applications for well sinking and 150 cases for citrus plantations were investigated and reports were submitted to the District Officer Nicosia.

8.3.10 Plotting and Levelling of new Boreholes

A total number of 65 new legal and illegal boreholes were plotted on map and necessary details entered into the appropriate register. Bench marks were established on top of 87 boreholes.

8.3.11 Water Meters

During the year, 26 water meters were installed on an equal number of boreholes in Morphou area raising the total number to 639.

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 I, (C.Andreou) one Inspector of Works(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 in Famagusta Region.

8.4.2 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 observation measurements and maintenances:

(i) Six stream gauging stations equipped with automatic water level recorders(Paralimni : Outfall of Lake. Liopetri-Kolopannes, Kharangas, Melini and Laris).

(ii) Three rainfall observing stations (rainfall station at Phrenaros, rainfall station upstream of Laris Gauging Station, Rainfall Station and at 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 purpose 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 1000 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 measurement 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 72 samples of water, were taken monthly from boreholes, wells, springs and streams, and sent to the Government Laboratory for chemical analysis.

741 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

234 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 17881 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 1545 applications for sinking and covering permits of wells/boreholes in the conservation area as well as 46 applications 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 268 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, 5 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 483.

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.