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REPUBLIC OF CYPRUS

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MINISTRY OF AGRICULTURE & NATURAL RESOURCES

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WATER DEVELOPMENT DEPARTMENT

# ANNUAL REPORT 1985

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Director

Nicosia, September 1988



WATER DEVELOPMENT DEPARTMENT  
ANNUAL REPORT 1985

Abbreviations

m	metre
mm	millimetre
MCM	Million cubic metres
m <sup>3</sup>	Cubic metres
ha	Hectare
WDD	Water Development Dept.
£	Cyprus pound

Conversion factors

Donum	= 0.134	Hectares
	= 0.3306	Acres
	= 14,400	Sq. feet
	= 1,340	Sq. metres
Hectare	= 7.4627	Donums
Acre	= 3.0248	Donums

In 1985 the value of the Cyprus £ on average (daily basis) was:-

\$ .....	1.6396
£ st .....	1.2670
DM .....	4.7897
Drachma.....	226.9051

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## I GENERAL

### Introduction

The most significant activities of the Department during 1985 were:

The continuation of construction on three of our major water development projects namely the Southern Conveyor Project and the Khrysokhou Irrigation Project which have entered their second year of construction and the Vasilikos-Pendaskinos Project (VPP) which was in its final stages of construction with most of its components-Kalavassos Dam, Dhypotamos Dam, Tokhni PS and Kornos Treatment Plant - having been commissioned during the year. The inauguration of VPP was carried out by the President of the Republic Mr. Spyros Kyprianou in June 1985. Feasibility studies of major projects were initiated during the year for the Karyotis Project and the Krasokhoria Project. Karyotis Project aims at conveying surplus water from Karyotis river for the water supply of Nicosia. The study of this project was undertaken by a Russian Consulting Organisation. Preliminary evaluations were completed for the Krasokhoria Integrated Rural Development Project.

During 1985 the work of the Department was confined to the southern part of the Island due to the continuing occupation of northern Cyprus by the invading Turkish troops which since the summer of 1974 has created a situation allowing no access, or contact with the northern parts of the Island bar for communication through the good offices of the UN peace keeping force for the unified water supply of Nicosia.

Southern Conveyor Project.

- The construction of Kouris Dam, the main water source of the Southern Conveyor Project (SCP) has progressed smoothly throughout



1985. The expenditure incurred up to the end of 1985 for Kouris Dam reached the amount of £8,968,066.

- Construction works for the SCP Main Conveyor, commenced in October 1985 by the joint venture Cybarco-Shand against a contract sum of £6,157,031.
- Tenders were awarded for various supply contracts for the SCP Kokkinokhoria Irrigation Area (KIA).
- Tenders were invited for the construction of Akhna Dam.
- Redesign of the KIA main distribution network, was undertaken by the Water Development Department.
- Redesign of the KIA balancing reservoirs and the central distribution reservoirs was undertaken by the Water Development Department jointly with Sir William Halcrow & Partners.

#### Khrysokhou Irrigation Project

- During the year under review construction of Evretou Dam which is the main water source of Khrysokhou Irrigation Project (KIP) continued satisfactorily with total expenditure up to the end of 1985 reaching £7,104,000.
- Tenders were invited for the supply of materials for the irrigation networks and for the construction of farm access roads.
- Contracts were signed for the supply of DI pipes & fittings for the main conveyor.
- For the installation of the main conveyor and the construction of ponds tender documents were completed by the end of the year 1985.

#### Expenditure

The level of construction works expenditure of the Department for 1985 was £22,462,514 compared to £18,844,155 for 1984. The total expenditure of the Department during 1985 was £27,009,180 out of a total budget of £34,358,439.

#### BRIEF DESCRIPTION OF PROJECTS

##### Major Projects Under Construction

Vasilikos-Pendaskinos Project (Final stages of construction. See also Chapter VIII/I)

The Vasilikos-Pendaskinos Project (VPP) is located in the southern part of Cyprus between Vasilikos and Pendaskinos rivers approx. 50 km south of Nicosia and some 40 km east of Limassol. The basic objective of the Vasilikos-Pendaskinos Project is the development of the surface water resources of the region and their use for the agricultural development of the area as well as for the augmentation of the domestic water supply of other areas, particularly for Nicosia, Larnaca and Famagusta.

The main components of the project are:

- Kalavastos Dam on Vasilikos river, having a capacity of 17 million cubic meters (MCM) of water,
- Dhypotamos Dam on Pendaskinos river, having a capacity of 15 MCM,
- A diversion system to convey the excess flows of Maroni river to the Dhypotamos Dam reservoir,
- A conveyance and distribution system for irrigation from Kalavastos Dam comprising, main conveyor, break pressure tank, and pipeline networks for the Vasilikos and Maroni irrigation areas,
- A conveyance and distribution system for irrigation from Dhypotamos Dam comprising main conveyor, break pressure tank and pipeline networks for the Pendaskinos irrigation area,
- A conveyance system comprising main conveyor (common with that from Kalavastos Dam up to the break pressure tank), pumping station at Tokhni and balancing reservoir at Khirokitia to convey water from Kalavastos Dam to the Khirokitia Water Treatment Plant,
- A water treatment plant, reservoirs and pumping station at Kornos for the Water Supply of Nicosia and
- A conveyor from Skarinou to Lakatamia reservoir Nicosia which was completed in Jan. 1982 and has been under operation since. This work which is known as Nicosia Water Supply Scheme Phase I, includes also the Dhypotamos Pumping Station, the Stavrovouni Balancing Reservoir and a Break Pressure Tank at Nisou.

Approximately half the quantity of water cropped by the VPP will be allocated per year for the irrigation mainly of citrus and vegetables. The remaining quantity will be allocated for the augmentation of the domestic water supply of Nicosia, Larnaca and Famagusta, several villages, refugee estates and tourist installations.

The agricultural development of the project will be mainly in 3 areas.

- The Vasilikos area of land belonging to Kalavastos, Mari, Zyyi, Tokhni and Psematismenos,
- The Pendaskinos area of land belonging to Ayios Theodoros and Skarinou and
- The Maroni area of land belonging to the homonymous village.

Land consolidation has been carried out in three areas of the project namely Maroni, Kalavastos-Tokhni and Zyyi, Psematismenos-Maroni.



The Agricultural Research Institute has set up an Agricultural Research Station in the project area to carry out research on varieties of plants to be cultivated and experiments on cultivation and irrigation methods.

The land consolidation scheme includes the construction of farm roads. Agricultural Extension Services of the Department of Agriculture will be based at the VPP operation control centre in the project offices already built at Khirokitia Treatment Works.

In order to cover part of the foreign exchange component of the cost of the project, Government has secured three loans. One from the World Bank for an amount of \$11 million, a second one for KD 2.5 million from the Kuwait Fund for Arab Economic Development and the third from the European Investment Bank for 8.3 million ECU's. The three loans are used for a parallel financing of the project, that is financing of separate components of the project, and are worth in total about £14.2 million Cyprus Pounds.

The foreign exchange component of the cost of Phase I was financed by a DM10 million loan (=approx. £1.9 million) secured in 1981 from Kreditanstalt Fur Wiederaufbau of West Germany who have also financed the construction of Lefkara Dam in the early 1970's. The overall project cost, including Phase I is about £27 million Cyprus Pounds.

#### Southern Conveyor Project (See also Chapters VIII/3 & 4)

The basic objective of the Southern Conveyor Project (SCP) is to collect and store surplus water and convey it by means of a regional water carrier for use in areas where the water is most needed.

The SCP will promote irrigated farming development in the south coastal region between Limassol and Famagusta that would benefit most from the Project and in addition it will meet the future domestic and industrial water demands up to the year 2010 for the towns of Limassol, Larnaca, Famagusta and Nicosia and numerous village communities, as well as for the needs of the tourist industry.

The Project is divided in two phases:

The main components of the Phase 1 of the Project are:

- Kouris Dam: This 115 MCM capacity dam is the main water storage component and is designed to provide seasonal and interannual storage of the flows of Kouris River and its tributaries. Such storage, by balancing the variable inflows will permit a steady and reliable supply to the project benefit areas via the Main Conveyor. The Kouris Dam, of zoned earthfill embankment construction will be around 110 m high. The 5 km long reservoir will have a surface area of 360 ha. Construction work on Kouris Dam started in mid 1984.
- Main Conveyor: This 110 km long gravity pipeline of diameters ranging from 1400 mm down to 800 mm will convey the stored water upto Akhna reservoir.



The installation of the main conveyor commenced in 1985. At the end of 1983 through to the beginning of 1984 the Construction Division of the Department laid a length of 2.5 km of the main conveyor at various points of the pipeline route to enable the construction of road works and the erection of pylons by the Electricity Authority.

- Akhna Reservoir: A 16 m high earthfill embankment dam it will retain 5.8 MCM of water conveyed from Kouris Dam enabling the reservoir to provide balancing storage in the Kokkinokhoria area. Water will be pumped to the nearby irrigation areas at times of peak irrigation demand to supplement flows in the main conveyor and thus reduce the size of pipeline otherwise required. Construction of Akhna Dam is scheduled to start in 1986.
- Kokkinokhoria Distribution Network will cover an area of 5125 ha. The construction of the Project begun in 1984, with the construction of Kouris Dam.

The cost of Phase 1 of the Project is estimated to reach the amount of £95 million.

Phase 2 includes the diversion of water from Dhiarizos river to Kouris Dam reservoir, two water treatment plants (one for Limassol and one at Tersephanou for Nicosia and Larnaca WS) and irrigation distribution networks for Akrotiri, Kiti, Mazotos and Parekklissha covering a total area of 4335 ha.

#### Khrysokhou Irrigation Project (See also Chapter VIII/2)

The Khrysokhou Irrigation Project (KIP) will develop the water resources of the north western part of Cyprus. When all three phases of the project will be completed it will irrigate 4200 ha net.

The first phase includes the construction of Evretou Dam of 25 MCM capacity on the Stavros tis Psokas river, near Evretou village, and the irrigation of 2000 ha (net) of land in the Khrysokhou valley (mainly from the dam to the coast), including an area of 150 ha in the Sarama valley. Irrigation will be done by gravity except for Sarama valley where water will be pumped. A main conveyor of maximum diameter 900 mm will feed 4 overnight storage ponds through a break pressure tank. From there water will be fed to the farm hydrants via asbestos cement pipes and then to the fields via plastic pipes. Each field will have its own outlet and water meter, with 2 to 3 atmospheres available pressure.

Construction of Evretou Dam started in January 1984, and it is estimated to cost about £9 million. It will be completed in 1987 with the first water impoundment expected during the wet season 1986-1987. The dam is of earth-rockfill type with clay core.

The final designs of the irrigation networks and conveyor were completed by the end of 1984 and Tenders for supply materials were awarded during 1985 and construction is expected to start in 1986.



In some areas the network will be ready for the irrigation season of 1987 to take advantage to the first impoundment of water in the dam.

Land consolidation will be applied in about 250 ha of the area as the rest has a high percentage of Turkish Cypriot property and was therefore excluded.

In addition to the irrigation network, farm roads will be constructed to serve almost all the fields.

The overall cost of the first phase is about £20 million including the cost of on-farm systems and a groundwater scheme that will extract water from the Khrysokhou river aquifer. The World Bank has financed the 1st phase with a loan of \$16 million.

The second phase includes the extension of the irrigated area from Limni mines to Pomos, adding another 1000 ha net. This is achieved by extending the conveyor, and connecting it to the three existing dams of the area (Argaka, Ayia Marina, Pomos), and by diverting winter flows of three rivers (Magounda, Yialia and Livadhi) into Evretou Dam. Decision has been taken in 1985 as to the completion of the final designs of the first part of Phase II i.e. the connection of Argaka Dam with Evretou Dam.

The third phase includes the construction of Ezousas Dam on the Ezousas river between Ayia and Kannaviou, a rockfill dam of 8 MCM capacity. Water will be conveyed by pipeline to the areas of Polemi, Stroumbi and Yioliou mainly, to irrigate 1000 ha net of land. Another 200 ha will be irrigated from groundwater in the upper Khrysokhou valley.

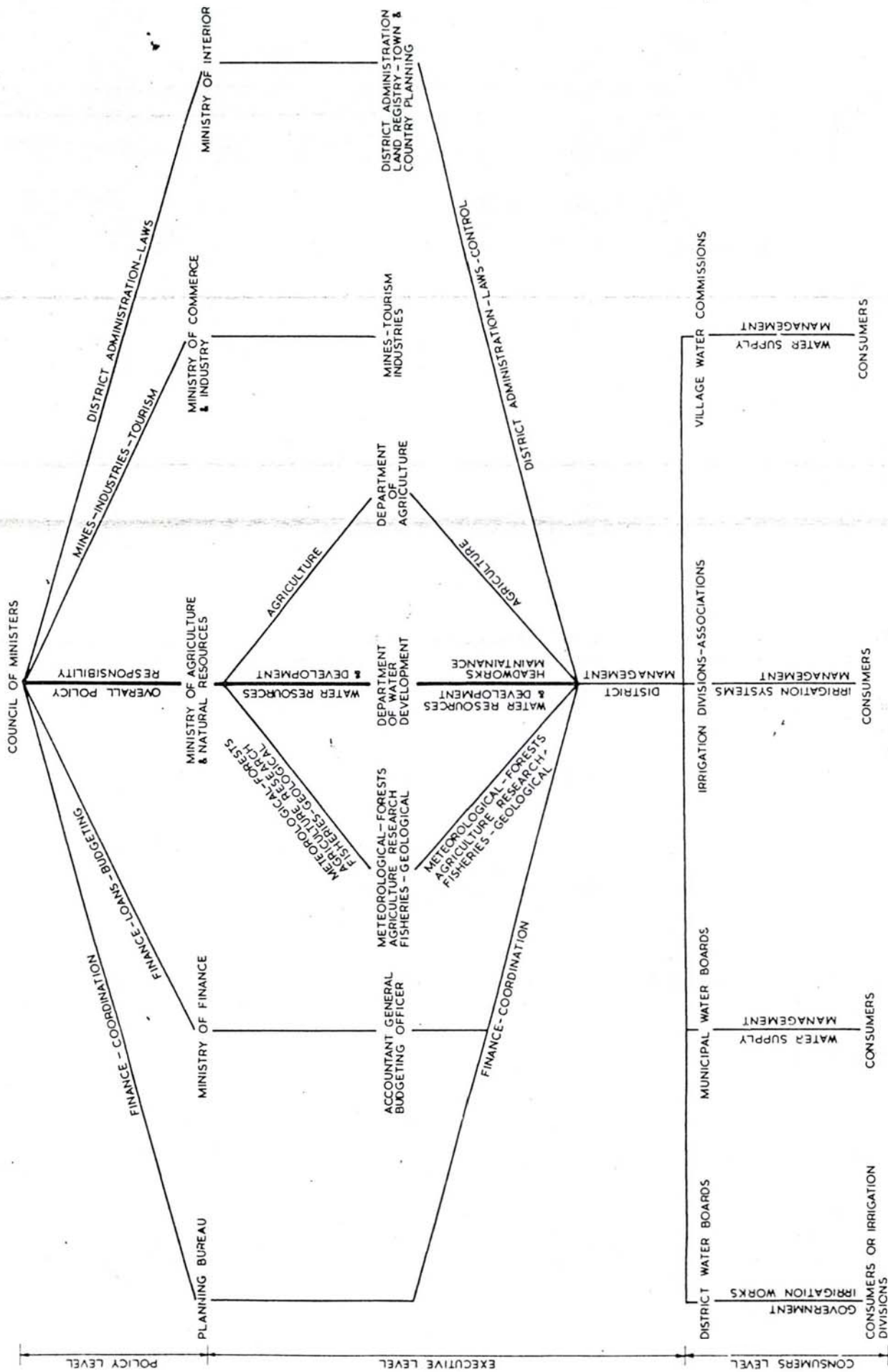
The overall project cost is about £40 million at current prices and is expected to provide work for 4000 people and increase the farm income of the area by 8 times. Crops to be cultivated include citrus and avocado, early and late vegetables, nuts, olives, and early table grapes. The area is most suited for early crops due to its mild climate and most produce will be export orientated.

## DEPARTMENTAL ORGANIZATION

### The Water Development Department

The Department of Water Development, Ministry of Agriculture and Natural Resources, is responsible for the Government's overall policy on water resources, planning, design and construction on the Island. It also cooperates in the management of water resources and water development projects together with other departments and ministries.

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. As from 1982 the Department undertakes also the design and construction of sewerage and sewage disposal works.



WATER DEVELOPMENT - ORGANIZATION CHART



The Government institutional set up for water resources conservation and development and the role of the Department is shown on page I-7. The Departmental Organization is shown on page I-9 and is made up of:

The Division of Water Resources which groups together all services required for the collection and interpretation of hydrological and hydrogeological data both for ground and surface water and control of groundwater extraction.

The Division of Hydrology which is responsible for the evaluation of the surface and groundwater resources and their present and future management.

The Division of Planning which deals with the preparation of reconnaissance and feasibility studies prior to the detailed design of major projects. The works for planning include field investigations for hydraulic structures, laboratory testing for these structures, water use studies, hydrological evaluations, evaluation of benefits, technoeconomic studies as well as engineering geology problems. Systems analysis and mathematical modelling techniques with the help of electronic computer are widely used in these studies.

The Division of Design which deals with the preparation of detailed designs and contract documents and specifications required for major projects after feasibility stage.

The Division of Rural Projects Planning which deals with the planning and designing of rural irrigation and domestic water supply projects and sewage disposal schemes which are of a rather routine nature and do not need elaborate planning and design procedure.

The Division of Construction which is responsible for all construction work whether carried out by direct labour or by contract.

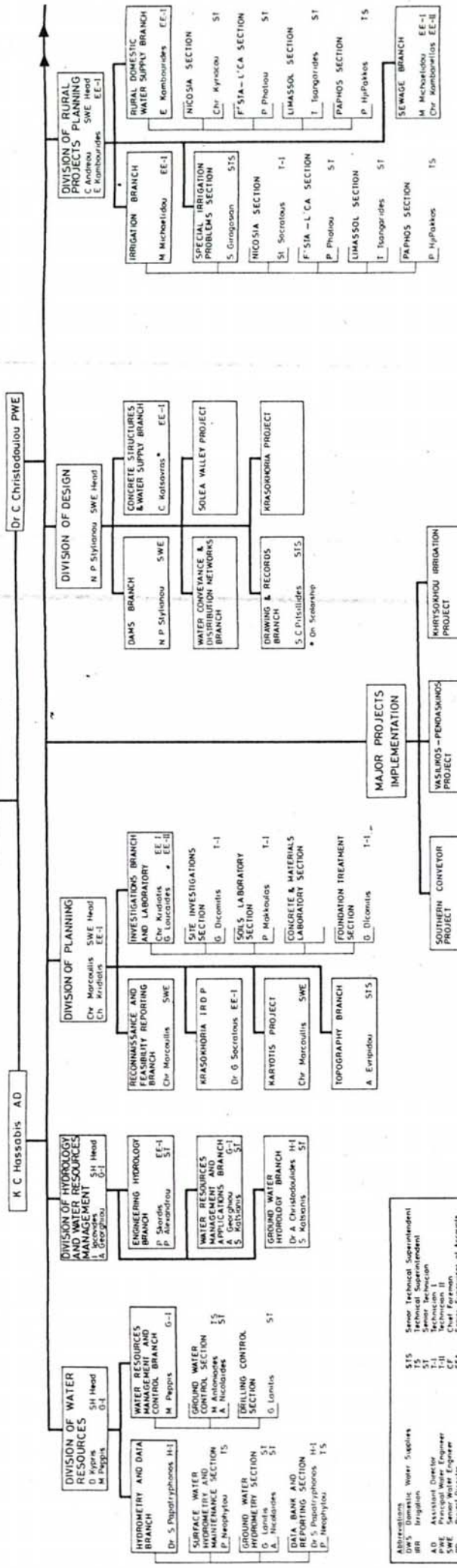
The Division of Operation and Maintenance (Town Water Supply) which controls the administration, operation and maintenance of Government Town Water Supply schemes and Rural Regional Water Supply schemes.

The Division of Operation and Maintenance (Irrigation) which deals with the management, operation and maintenance of Government irrigation works.

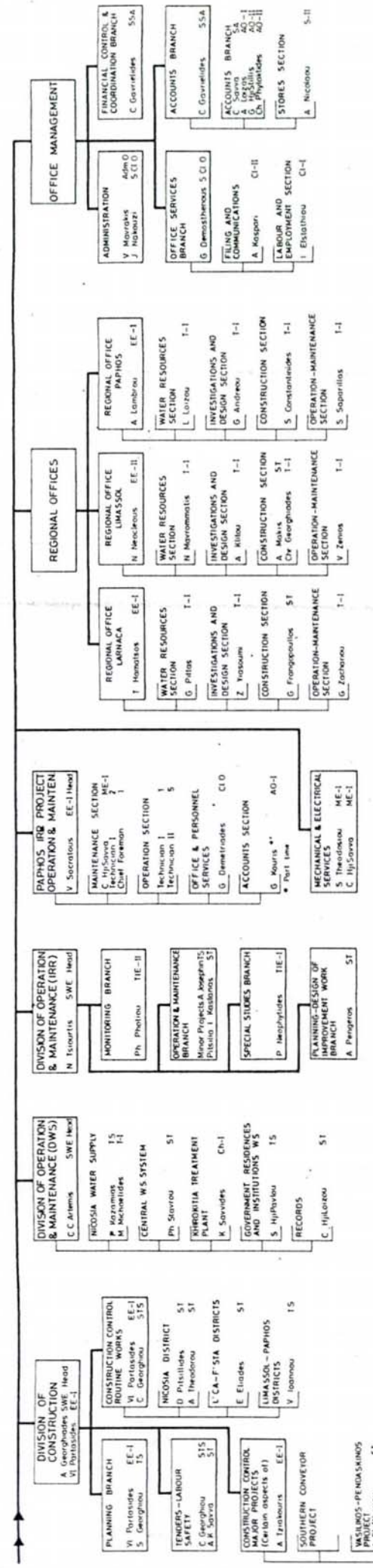
#### Regional Offices

Due to the occupation of northern Cyprus by Turkish troops, there are only three regional offices in operation, i.e. Famagusta-Larnaca, Limassol and Paphos. The regional offices are mostly responsible for the collection of water resources records and the design and supervision of construction for routine projects. They are involved also in certain aspects of operation and maintenance of works in their respective regions as well as in investigations for major projects. The Limassol Regional Office continued in 1985 the construction of irrigation networks by direct labour for the VPP project.

C ST LYTRAS  
Director



- Abbreviations:**
- IR Irrigation
  - AD Assistant Director
  - PWE Principal Water Engineer
  - SWE Senior Water Engineer
  - CP Chief Project Manager
  - SA Supervisor of Accounts
  - Admin-0 Administrative Officer
  - EE-1 Executive Engineer - I
  - AD-1 Accounting Officer - I
  - ME-1 Mechanical Engineer - I
  - G-1 Geologist
  - H1 Hydrologist
  - Ch-II Chemical II
  - S15 Senior Technical Superintendent
  - T5 Technician
  - T-1 Technical
  - CP Chief Foreman
  - SA Supervisor of Accounts
  - Admin-0 Administrative Officer
  - AD-1 Accounting Officer - I
  - G-1 Geologist
  - H1 Hydrologist
  - Ch-II Chemical II



WATER DEVELOPMENT DEPARTMENT-ORGANIZATION CHART 31.12.1985

Dr G. BM/G/N/A



TECHNICAL STAFF OF WDD ON 31.12.1985

DRG No BM/G/219

TECHNICAL STAFF		D	AD	PWESWE	SH	EE	ME	Geo	H	CH	TIE	STS	TS	ST	T	CF	ACF	F	EI.E	SE	TOTAL	REFERENCE
1	Permanent Ordinary Staff	1	1	1	6	2	15	1	2	2		4	8	22	73	4	9	40			191	D Director
2	Permanent Development Staff						27	3	2	2	2	4	3	6	17	129	3	11	17	1	227	AD Assistant Director
3	Casual Staff													74							74	PWE Principal Water Engineer
																						SWE Senior Water Engineer
																						SH Senior Hydrogeologist
																						EE Executive Engineer
																						ME Mechanical Engineer
																						Geo Geologist
																						H Hydrologist
																						CH Chemist
																						TIE Topographer Irrigation Eng.
																						STS Senior Tech. Superintendent
																						TS Technical Superintendent
																						ST Senior Technician
																						T Technician
																						CF Chief Foreman
																						ACF Assistant Chief Foreman
																						F Foreman
																						EI.E Electrical Engineer
																						SE Sanitary Engineer
																						Missing since 1974 invasion
																						On scholarship
DISTRIBUTION OF STAFF																						
4	DIRECTORATE	1	1	1																		3
	i Water Resources Management					1			1	1		2	2	19				1				27
	ii Hydrology					1		1	1			2	5									11
	iii Planning					1		5	1		1	1	1	38		1						48
	iv Design					1					1			19								21
	v Construction					1		2			1	2	8	17	1	5	5					42
	vi Rural Projects Planning					1		3			1	1	3	3								12
	vii Operation & Maintenance-DWS					1						2	2	2	2	3						11
	viii Operation & Maintenance-Irrig.					1					2	1	2	3	1							10
	i Paphos Irrigation Project (PIP) O&M									1				8	1							11
	ii Southern Conveyor Project (SCP)							10		1		2	21	1	1							37
	iii Vasilikos - Pendaskinos Project (VPP)							5					4									9
	iv Khrysokhou Irrigation Project (KIP)							7					14					1				22
	i Regional Office, Famagusta-Larnaca							1				1	11		1	1						15
	ii Regional Office, Limassol							1				1	23	1	4	15						45
	iii Regional Office, Paphos							1														33
	i Mechanical and Electrical Services							1				2	2	2	1	5						11
8	Services																					
	<small>Note: Five Executive Engineers, two Senior Technicians and eight Technicians were transferred to Limassol Regional Office, are posted at Kouris Dam but are listed under SCP on this table</small>																					
9	Various Postings																					4
10	Vacancies																					
TOTAL NUMBERS		1	1	1	6	2	42	4	2	4	2	4	7	14	39	276	7	20	57	1	2	492



The Office Management Division is responsible for the office services, accounts, labour, personnel and stores. Also a financial control and co-ordination branch is included which deals with financial aspects and control of expenditure.

All legal matters concerning the day to day operation of the Department of Water Development are being referred to the Legal Adviser of the Ministry of Agriculture & Natural Resources for scrutinization, advice and/or action.

#### FOREIGN TECHNICAL ASSISTANCE

The following sections of work were dealt with during the year.

##### United Nations

Technical assistance received from United Nations during 1985 was:

##### Experts

T E H Sabben-Clare FAO expert, continued his services with us throughout the year as the Project Manager of the Vasilikos-Pendaskinos Project.

#### CONSULTANTS EMPLOYED BY THE DEPARTMENT

The following consulting firms were employed by the Department for the design and supervision of various components of projects.

SOGREAH in association with Hydroconsult, Nicosia for the design and supervision of construction of Kouris Dam, Southern Conveyor Project,

Sir William Halcrow and Partners, Swindon, England in association with Balfours, London for design, contract documents and supervision of construction of the Southern Conveyor Project together with the SCP team of WDD staff,

Rofe Kennard and Lapworth jointly with Wallace Evans and Partners UK in association with C Chr Ioannides, Nicosia for the detail design, contract documents and supervision of construction of all engineering components of the Vasilikos-Pendaskinos Project,

Sir William Halcrow and Partners in association with A Prastitis and Associates, Nicosia for the detail design and supervision of construction of Evretou Dam, KIP.

Rofe Kennard & Lapworth in association with C Chr Ioannides were appointed as consulting engineers for the feasibility and design of the Platys and Xylourikos Dams of the Krasokhoria Project in August 1985.

Consultancy contract for the preparation of the feasibility study on utilization of the Karyotis river runoff to supply potable water to Nicosia was signed between the Government of the Republic of Cyprus and the Union of Soviet Socialist Republics late in 1984.

## SUMMARY OF ACTIVITIES

### Water Resources

The collection and evaluation of hydrological data continued through 1985 covering also to the requirements of the major projects.

The general conclusion obtained from the study of 61 river flow gauging stations is that the flow in most of them was well below normal. Groundwater recharge was again poor this year and a general drop in the static water level of all important aquifers was observed.

The hydrometeorological situation given here refers to the southern part of the Island, as the northern part is still under the occupation of Turkish troops and no such data are available to us.

The precipitation during the hydrometeorological year 1984-1985 averaged 495.7 mm which is 93% of normal. The rainfall was below normal at almost all places ranging between 80% and 100% of normal.

The maximum amount of rainfall in a 24-hour period was 126 mm recorded by an autographic raingauge on 4th November 1984 at Aradhippou rainfall station in Larnaca.

The first snowfall occurred on Mount Olympus, the highest peak of Troodos mountain range, on the 12th December 1984 and the last snowfall on the 5th April, 1985.

The air temperature was slightly below normal. The extreme maximum temperature was 41.5°C reported by Nicosia town Climatological Station on the 26th August 1985 and the extreme minimum temperature was -7.5°C reported at Amiandos on the 27th February 1985.

The maximum annual evaporation measured from a USWB pan was 2100 mm reported by Larnaca Airport Synoptic Station and the minimum annual evaporation was 1434 mm at Prodhromos.

### Hydrology

The Division of Hydrology and Water Resources Management which was established in 1982, continued in 1985 the formulation of methodology and processing of hydrological and hydrogeological data with the aim of providing the Department with the basic information about the water resources of the island so that decisions could be made on the exploitation, additional development and allocation for use of these resources.

Appraisal of the exploitation and development of water resources and its consequences as to quantity and quality as well as management and conjunctive use is carried out through the latest techniques including radioisotopes and mathematical models.



Some highlighted activities of the Division during 1985 were:

- Updating of the Kouris river hydrology, and studies in connection with the dam operation in conjunction with Akrotiri aquifer,
- Hydrologic input data was provided to the consultants carrying out the feasibility study for Platys and Xylourikos dam sites of the Krasokhoria Project,
- Improvement of methods of collection and examination of hydrologic data with the assistance and the financial support of the United Nations,
- Hydrologic data of the Karyotis, Atsas, Elea, Peristerona and Marathasa rivers were provided to the consultants for the Karyotis Project,
- Statistical analysis of the rainfall in Cyprus for the evaluation of drought and flood frequencies,
- Study of the Gypsum aquifer at Maroni,
- Use of environmental radioisotopes in the Kouris Delta for assessing the recharge due to Kouris River. In addition to this study of the conjunctive use of the Yermasoyia aquifer with the dam with finance by the IAEA.
- Monitoring and trend evaluation of water levels use and sea-intrusion in the Akrotiri, Yermasoyia, Parekklisha, Kiti and Kokkinokhoria aquifers,
- Management and operation of the Kouris Delta Emergency Scheme and releases of water from the Yermasoyia Dam for recharge of the aquifer which supplies water for domestic purposes of Limassol and neighboring villages.

### Planning and Design of Projects

During the year under review planning and design was concentrated on the two new major projects i.e. the Krasokhoria Integrated Rural Development Project and the Karyotis Project, both initiated during 1984.

For Krasokhoria Integrated Rural Development project the preliminary study to determine the technically and economically feasible works to be included in the project was completed in 1985 and the feasibility study for the earth ponds and the networks was undertaken by the department while for the dams Consulting Engineers were engaged.

The feasibility study for the Karyotis Project was undertaken by Soviet Consultants, the first stage of which is expected to be completed early in 1987.

In addition to these major projects several other smaller irrigation projects were studied either at reconnaissance or



feasibility stage. Geotechnical investigations were undertaken for the Platys and Xylourikos damsites and Kouklia pond included in the Krasokhoria Project, and for Atsas and Peristerona rivers of the Karyotis Project and for boreholes for Vasilikos-Pendaskinos and Khrysokhou Projects.

The Southern Conveyor Project and the Khrysokhou Irrigation Project have entered the implementation stage as from mid 1984 and therefore are not examined here any longer, except for covering the needs for further geotechnical investigations and topographic surveys if necessary. Never-the-less the Design Division head was involved in the preparation of tender documents for the construction of the main conveyor and the irrigation distribution system as well as the tenders for the supply of pipes and fitting for the distribution network while the Khrysokhou project staff prepared the construction drawings and specifications which were checked at HQs.

### Construction of Projects

Construction expenditure of the Department during 1985 reached the amount of £27,508,431 against £18,905,999 for 1984 (See table VII-1 under DIVISION OF CONSTRUCTION).

Vasilikos-Pendaskinos Project (VPP) features second on the construction expenditure for 1985 with £5,837,459.

The Dhyptomamos Dam construction progressed very well and impounding started on 11th January 1985. The embankment, the diversion and all ancillary works were completed and the whole site was looking very tidy. The expenditure reached the amount of £657,824 for 1985 and £4,350,863 up to the end of 1985.

Works on Kalavastos dam concentrated almost wholly on finishing all the auxiliary works around the site as the main structure was completed and impounding water started on 2nd November 1984. The expenditure reached the amount of £757,236 for 1985 and £5,975,433 upto the end of 1985.

The Maroni Diversion scheme was completed on time. The expenditure during the year reached the figure of £513,684. Total expenditure upto the end of 1985 was £1,226,566.

Most of the equipment for mechanical and electrical plant for the VPP pumping stations have been placed in position, while the Tokhni Pumping Station was commissioned during April 1985 pumping Kalavastos Dam water to Khirokitia.

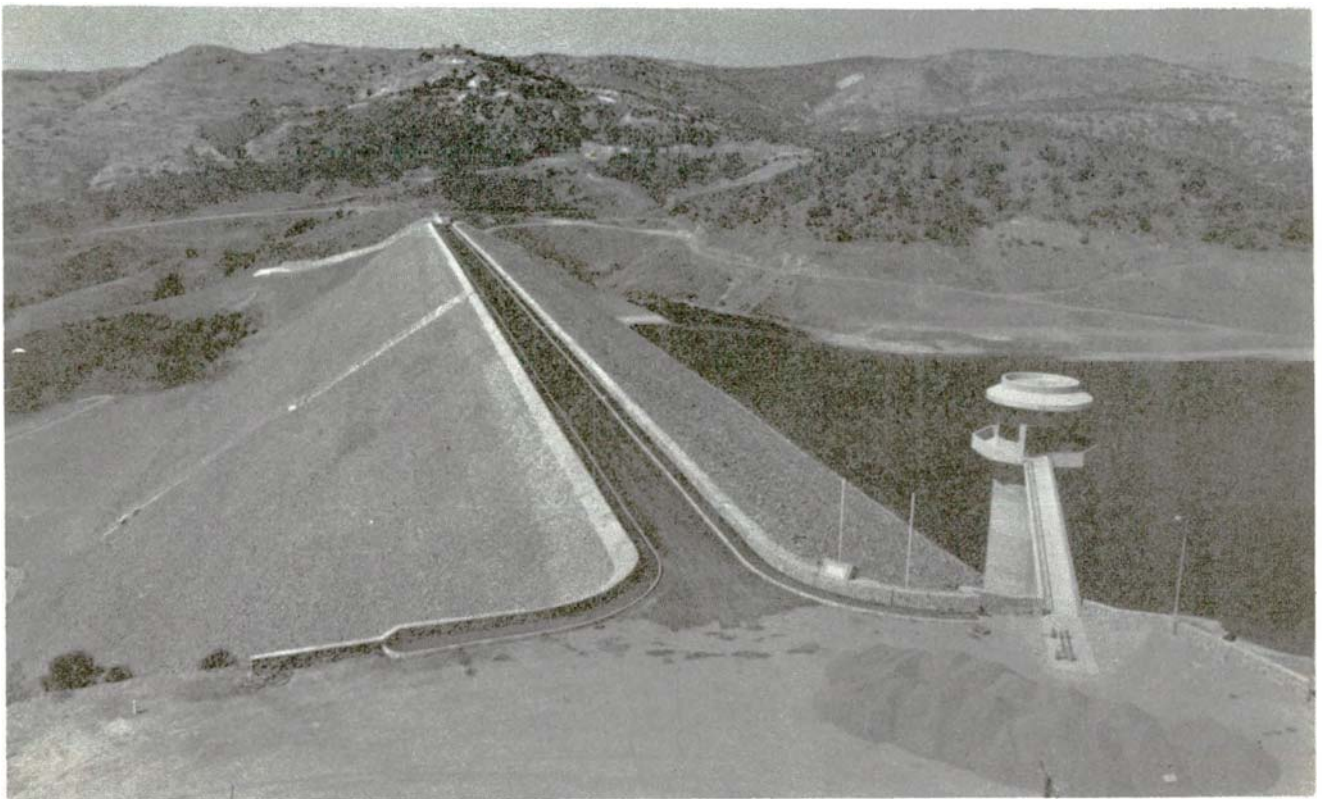
For Kornos Treatment Plant, the pumps and pipework were all erected and the generator and surge vessels placed in position. The commissioning trial period for the plant started in December 1985.

The Kalavastos-Khirokitia conveyance system was put into use since April 1985.





Kalavassos Dam from the air. WDD Photo C23EN-16(28.6.86).



Dhypotamos Dam. WDD Photo C35EN-3 (3.9.85)



Pendaskinos irrigation network was substantially completed by the end of December 1985.

Pipelaying for Vasilikos/Maroni irrigation network which started in 1984, proceeded satisfactorily.

The Khrysokhou Irrigation Project (KIP) Phase I. Work on Evretou Dam continued throughout 1985. The actual expenditure during the year reached the total sum of £3,366,341. Cumulative expenditure on Evretou Dam upto the end of 1985 was £7,156,926.

The remaining parts of Phase I of KIP i.e. the Installation of Irrigation Networks and construction of Farm Roads (KC2), the Installation of Main Conveyor and Construction of Ponds (KC3) and 5 supply contracts for which tender documents were prepared, tenders were invited, and awards were made or awards were pending during the year.

The Southern Conveyor Project (SCP) entered the implementation stage in 1984 and during the year 1985 an amount of £9,459,821 was spent mostly on Kouris Dam.

Construction work on the 110 km long main conveyor started in October 1985. Work on the construction of Kouris Dam progressed according to the approved programme. The diversion tunnel and the intake shaft were excavated and temporary access roads were constructed. Rock excavation works for the core foundation, dam shoulders above elevation 150 m and the perimetral gallery were completed while the excavations on both abutments and spillway continued throughout the year. Grouting on the left abutment and cofferdam were completed.

#### Routine Domestic WS & Irrigation Schemes

Last but not least a total sum of £1,370,909 was spent on the construction of domestic water supply schemes for towns, villages, and refugee estates and a sum of £759,128 for minor irrigation schemes and up keep of major irrigation projects.

It must be mentioned here that £944,957 was spent for construction of waterworks for other government departments, the private sector and from deposits of village authorities.

#### **Operation and Maintenance-Domestic Water Supply**

The year 1985 was the fourth consecutive year of drought. The 1984-85 winter season, was again very poor in rainfall with a result that the volume of water impounded in the dams was limited and the aquifers were depleted further which had a adverse effect on the yield of existing water supply sources.

The Department of Water Development is responsible for the operation and maintenance of all sources of water supply for Nicosia including the conveyance of the water to the service reservoirs at the outskirts of the town. The water is sold in bulk to the Nicosia Water Board at the service reservoirs. The Nicosia Water Board undertakes the distribution of water within the area of supply. This division of responsibility has been in force since early 1980 when by decision of the Council of Ministers, the Nicosia Water Board extended its Area of Supply to cover the area of the Greater Nicosia Scheme.



The total quantity of water produced by the Nicosia Water Supply System in 1985 was 11.283 MCM out of which 9.760 MCM came from government sources, 1.114 MCM was purchased from private sources and 0.409 MCM was the yield of Nicosia Water Commission Sources. Included in the government sources is a quantity of 2,687 MCM produced by the 1982-84 emergency schemes BHs. Of the total production, the quantity of water delivered to the Nicosia service reservoirs was 10.633 MCM. The remaining 0.602 MCM was partly consumed en-route by a number of villages, camps and industries connected to the system and partly unaccounted for. The total quantity of water delivered to the Nicosia Water Board service reservoirs was 10.633 MCM and compared to the unrestricted demand of the town which is estimated for 1985 at 13.45 MCM per annum, there was a deficit of 2.82 MCM per annum and restrictions on the hours of supply to Nicosia town were imposed only for a short period in the summer from 24.6.1985 to 19.8.1985 and provided 24 hours supply every 48 hours. The total expenditure during 1985 for the operation and maintenance of all sources and conveyance systems supplying Nicosia town was £946,993 and the revenue generated from the sale of water was £1,533,110 including outstanding accounts.

Water continued to be supplied to the Turkish sector of Nicosia and the occupied town of Famagusta although no payment is being received for the supply.

The Department managed, operated and maintained also the Central Water Supply System which includes the Khirokitia Treatment Works, the Lefkara Dam, the Yermasoyia Dam and Kalavastos Dam (as from April 1985), as its main sources of water, Vasilikos Subsurface Dam and a number of boreholes at Khirokitia, Alethriko, Skarinou, Klavdhia, as well as the Lefkara-Khirokitia, Khirokitia-Famagusta, Dhypotamos-Nicosia and Kalavastos-Khirokitia conveyors.

The Central Water Supply System supplies water to Nicosia, Famagusta and Larnaca towns and a number of villages and Refugee Housing Estates in the Districts of Nicosia, Larnaca and Famagusta.

The total quantity of water produced by the system was 9.55 MCM. The quantity of water drawn from Yermasoyia, Lefkara and Kalavastos Dams was 2.65, 1.90 and 3.46 MCM respectively (net of losses at the treatment works). The total expenditure for the operation and maintenance of the system (excluding Khirokitia-Nicosia pipeline) during the year was £675,548 and the revenue generated £1,576,391 (including outstanding accounts).

The town of Larnaca received 2.79 MCM of water from the Central Water Supply System and the production of its own and leased sources was 0.69 MCM totalling 3.49 MCM. This quantity could meet the increased demand of the town and the Water Board of Larnaca did not have to impose restrictions on the supply.

The Water Board of Limassol controls both the sources of supply and the distribution system of the town. Despite the drought the water supply demand was met satisfactorily and the town enjoyed a regular supply throughout the year except of the high areas of the town for which consumption was interrupted during the peak hours.



DAMS CONSTRUCTED UP TO 1960

No	DAM	TYPE	HT 1000m <sup>3</sup>	YEAR
1	Kouklia	Earth	6	1900
2	Lymbia*	Gravity	5	18 1945
3	Lythrodhonda	Gravity	11	32 1945
4	Kalokharion(KI)	Gravity	9	82 1947
5	Akrounda	Gravity	7	23 1947
6	Golfini	Gravity	11	23 1947
7	Petra	Gravity	9	32 1948
8	Petra	Gravity	9	32 1951
9	Lythrodhonda	Gravity	10	32 1952
10	Kafizes	Gravity	23	113 1953
11	Ayios Loucas	Earth	3	45 1955
12	Gypsas	Earth	3	100 1955
13	Kandou	Gravity	15	34 1956
14	Perapadhi	Gravity	22	55 1956
15	Pyrgos	Gravity	22	285 1957
16	Trimiklini	Gravity	33	340 1958
Total Storage Capacity 6.174 m <sup>3</sup> x 10 <sup>6</sup>				

MAJOR DAM PROJECTS FROM 1960-70

No	DAM	TYPE	HT 1000m <sup>3</sup>	YEAR
17	Prodhromos	Earth	10	122 1962
18	Morphou	Earth	13	1,879 1962
19	Lefka	Gravity	35	368 1962
20	Geunylli	Earth	15	1,045 1962
21	Althalassa	Earth	18	791 1962
22	Kanli Keuy	Earth	19	1,113 1963
23	Argaka	Rockfill	41	1,150 1964
24	Mia Milia	Earth	22	355 1964
25	Ovgos	Earth	16	845 1964
26	Kiri	Earth	22	1,614 1964
27	Agros	Earth	26	99 1964
28	Liopetri	Earth	18	340 1964
29	Palemidhia	Earth	45	3,864 1965
30	Ayia Marina	Rockfill	33	311 1965
31	Kalopanayiotis	Earth	40	391 1966
32	Mavrokolymbos	Earth	45	2,180 1966
33	Pamos	Rockfill	38	859 1966
34	Yermastoyia	Earth	49	13,600 1968
35	Syngariss	Earth	7	1,115 1968
Total Storage Capacity 32,041 m <sup>3</sup> x 10 <sup>6</sup>				

MAJOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT 1000m <sup>3</sup>	YEAR
36	Ayios Yeoryios	Earth	6	90 1962
37	F'via Antiflood	Earth	8	165 1963
38	Ayios Nikolaos	Earth	2	1,365 1964
39	Paralimni Lake	Earth	3	4,345 1964
40	Fresh Water Lake	Earth	1	1,95 1966
41	Makrasyka	Earth	4	90 1967
42	Akhna (Mesonia)	Earth	4	130 1968
43	Morphou spread- ding grounds	Earth	5	100 1968
44	Ormidhia	Earth	7	140 1969
45	Vryssoules	Earth	7	140 1969
46	Protolapas	Earth	6	90 1970
Total Storage Capacity 8,275 m <sup>3</sup> x 10 <sup>6</sup>				

HT refers to height in meters from foundation

YEAR is the year of completion

Phrenaros (6) means six small dams in Phrenaros area

\*Inundated by New Lymbia Dam See ref. No 69

MINOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT 1000m <sup>3</sup>	YEAR
47	Solira	Earth	8	45 1962
48	Panayia (F)	Earth	7	45 1962
49	Paralimni (45)	Earth	5	115 1963
50	Ayia Napa (7)	Earth	8	55 1963
51	F'sta Recharge	Earth	5	50 1963
52	Phrenaros (6)	Earth	5	115 1964
53	Dherynia	Earth	6	23 1964
54	Phrenaros (3)	Earth	7	45 1966
55	Avgorou (7)	Earth	3	68 1966
56	Kondea (2)	Earth	5	82 1966
57	Xylophaghou (4)	Earth	7	86 1966
58	Solira (4)	Earth	5	32 1966
59	Lysi	Earth	7	1967
60	Ay. Yeoryios (9)	Earth	3	68 1967
61	Ay. Epiklitos (6)	Earth	6	34 1968
62	Akanthou (6)	Earth	6	45 1968
63	Akhna (3)	Earth	4	40 1968
64	Xyloymbou (5)	Earth	5	50 1969
Total Storage Capacity 1,075 m <sup>3</sup> x 10 <sup>6</sup>				

MAJOR DAM PROJECTS FROM 1971-80

No	DAM	TYPE	HT 1000m <sup>3</sup>	YEAR
65	Lefkara	Rockfill	71	13,850 1973
66	Massari Recharge Dam	Earth	15	2,273 1973
67	Palekharri-Kambi	Gravity	33	620 1973
68	Arakapas	Gravity	23	129 1975
69	New Lymbia	Gravity	12	220 1977
70	Ayii Vavatsinias	Arch	14	53 1980
71	Ayii Vavatsinias	Earth	10	55 1980
72	Ephthalgona No 1	Earth	10	92 1980
73	Khandria	Earth	10	70 1980
74	Melini	Earth	10	59 1980
75	Pelendria	Earth	10	123 1980
Total Storage Capacity 17,544 m <sup>3</sup> x 10 <sup>6</sup>				

MAJOR DAM PROJECTS FROM 1981-90

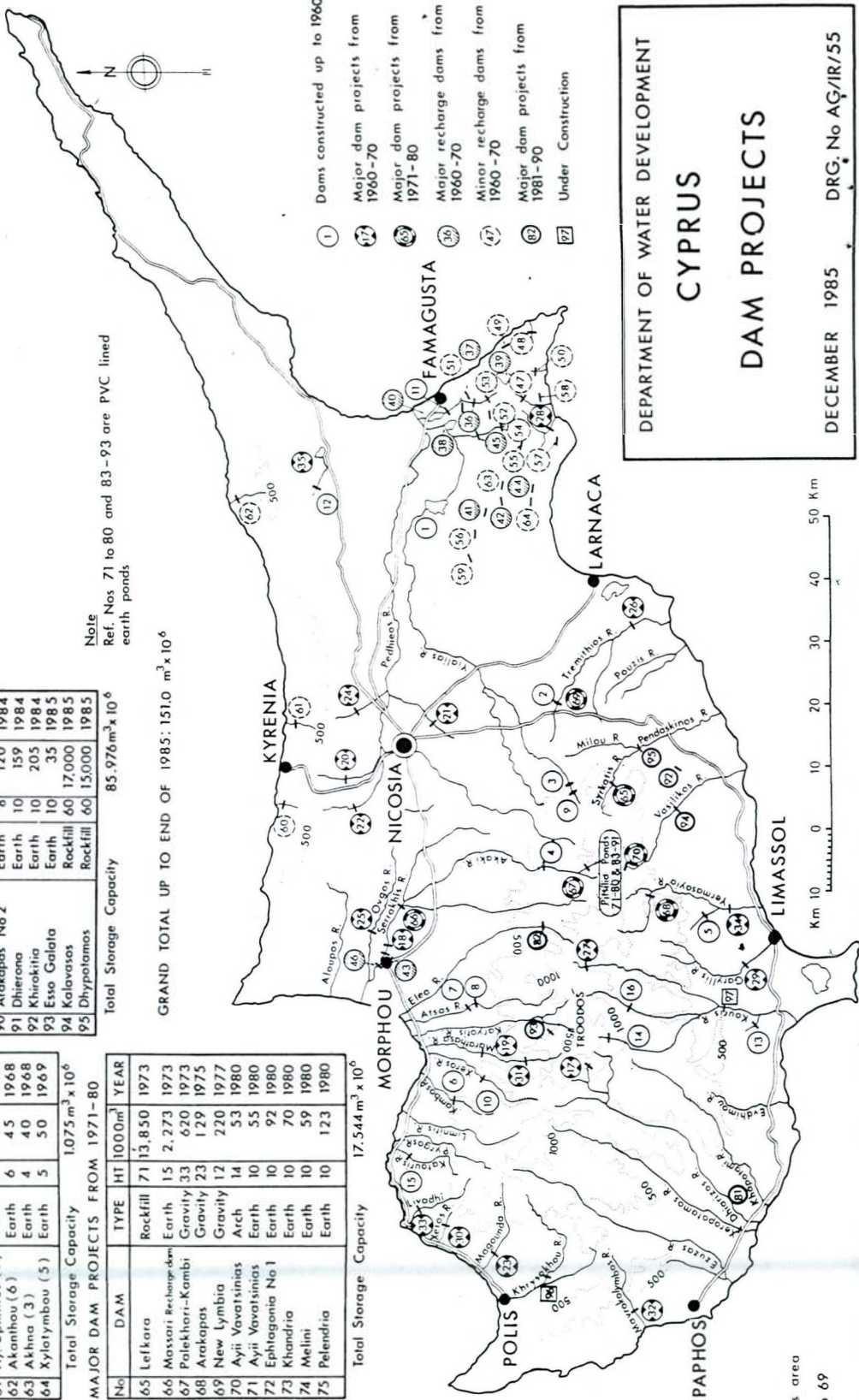
No	DAM	TYPE	HT 1000m <sup>3</sup>	YEAR
76	Ephthalgona No 3	Earth	10	65 1981
77	Akrapou-Ephthalgona	Earth	9	132 1981
78	Kato Mylos	Earth	10	104 1981
79	Ephthalgona No 2	Earth	8	127 1982
80	Arakapas	Earth	10	192 1982
81	Asprokremmos	Earth	53	51,000 1982
82	Xylotatos	Rockfill	42	1,250 1982
83	Agrihdia	Earth	10	59 1983
84	Kyperounda	Earth	10	270 1983
85	Lagoudhera	Earth	10	71 1983
86	Ora	Earth	10	62 1983
87	Ayii Vavatsinias No 2	Earth	10	43 1984
88	Pharmakas No 1	Earth	10	21 1984
89	Pharmakas No 2	Earth	10	61 1984
90	Arakapas No 2	Earth	8	120 1984
91	Dhieronna	Earth	10	159 1984
92	Khirkitia	Earth	10	205 1984
93	Esso Galata	Earth	10	35 1985
94	Kalavassos	Rockfill	60	17,000 1985
95	Dhyptolamos	Rockfill	60	15,000 1985
Total Storage Capacity 85,976 m <sup>3</sup> x 10 <sup>6</sup>				

GRAND TOTAL UP TO END OF 1985: 151.0 m<sup>3</sup> x 10<sup>6</sup>

Note  
Ref. Nos 71 to 80 and 83-93 are PVC lined earth ponds

UNDER CONSTRUCTION

No	DAM	TYPE	HT 1000m <sup>3</sup>	YEAR
96	Evretou	Rockfill	70	25,000 1987
97	Kouris	Rockfill	110	115,000 1988
Total Storage Capacity 140,000 m <sup>3</sup> x 10 <sup>6</sup>				



DEPARTMENT OF WATER DEVELOPMENT  
CYPRUS  
DAM PROJECTS  
DECEMBER 1985  
DRG. No AG/IR/55



The total quantity of water produced from all sources during 1985 was 8.49 MCM.

Paphos Water Supply comes under the direct control of the Municipality. Due to carrying capacity limitations of the main conveyor of the town, the water supply of the town was augmented from Paphos Lower Villages Water Supply Scheme by 0.92 MCM. The total quantity of water available to the town during the year was 1.54 MCM which could not meet the increased demand and restrictions on the supply had to be introduced during the summer months.

#### **Operation and Maintenance Irrigation Works**

The management of major irrigation works is done either by the WDD or by the government waterworks committees as the case may be whilst the management of small irrigation and village water supply schemes is done by the district administration and local committees.

In the year under review the total water available in all dams and from the boreholes or river diversions in Cyprus, in the Government controlled areas, amounted to 74.21 MCM. From this quantity 31.50 MCM were used for the irrigation of 59,480 donums, 8.81 MCM were used for domestic water supplies, 3.76 MCM were used for recharge, 0.98 MCM seeped through or below the dams and 4.83 MCM were lost as evaporation. The remaining 24.34 MCM were retained in the dams as over annual storage.

Water available for utilization from Government projects reached the figure of 68.97 MCM. Out of this only 39.70 MCM were utilized, 27.14 MCM for irrigation 8.81 MCM for domestic water supply and 3.76 MCM for recharge. Irrigation water was utilized on 51,100 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes cereals and olives. The gross income from the sale of water amounted to £895,386. The total operation, maintenance and energy cost amounted to £770,662 and the net income to the Government was £124,723. The O&M expenses breakdown is as follows: Operation, £150,216, Maintenance £239,661 and energy cost £380,785.

Water available for utilization from contributory schemes was 5.26 MCM out of which 4.30 MCM were used for the irrigation of 8,380 donums.

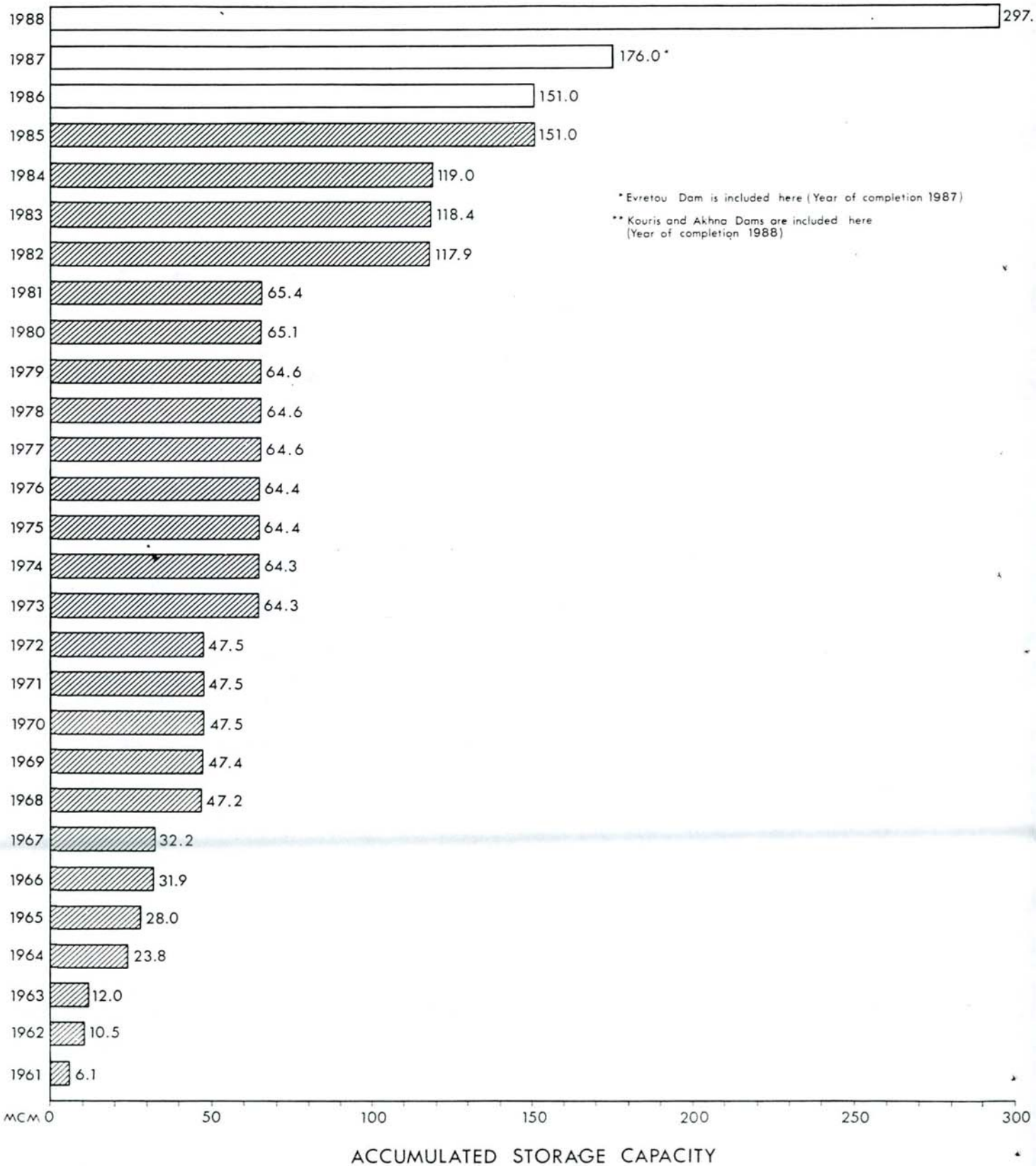
Water available for utilization from contributory schemes of the Pitsilia Integrated Rural Development Project was 2.44 MCM out of which 2.0 MCM were used for irrigation of 3,672 donums of land.

Recharge works in the Government controlled areas represent only 14% of the total recharge capacity available in Cyprus and no water was collected for the year under review.

The Regional Offices after the 1974 Turkish invasion are confined to Larnaca-Famagusta, Limassol and Paphos.

DEPARTMENT OF WATER DEVELOPMENT  
**PROGRESS IN DAM CONSTRUCTION**

AG/IR/57





In these Regional Offices the main works carried out are:

Hydrological measurements, collection of engineering data, operation and maintenance of projects, investigations and planning for small projects and control of construction work. The regional offices are also involved with major projects in their relative districts.

#### Legal Adviser

As from 1st February 1985 the legal adviser posted to WDD HQs was transferred to the Ministry of Agriculture and Natural Resources

#### MEMBERSHIP OF WDD TO INTERNATIONAL ORGANISATIONS.

The Water Development Department represents Cyprus on a national level on a number of International Organisations through committees chaired by the Director. Such committees exist for the:

- International Hydrological Program (IHP).
- International Atomic Energy Agency (IAEA).
- The National Action Committee for the International Drinking Water Supply and Sanitation Decade (IDWSSD).
- International Commission on Large Dams (ICOLD).
- International Commission on Irrigation and Drainage (ICID)
- International Water Supply Association (IWSA).

#### MEETINGS OF THE DIRECTOR WITH THE STAFF ETC.

Several meetings were held during the year under the chairmanship of the Director with the Heads of the various Divisions, Regional Engineers 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, ARI, the Geological Survey Department, Meteorological Office, Fisheries Department, the District Administrations and the Advisory Committee for the Southern Conveyor Project were also held during the year.

Meetings were also held with the Panel of Experts for Dams, (appointed according to IBRD requirement) the IBRD missions, the Kuwait Fund and the European Investment Bank.

# REGISTER OF DAMS IN CYPRUS

1      2      3      4      5      6      7      8      9      10      11      12      13      14      15      16      17      18      19

S E R No	NAME OF DAM	YEAR OF COMPLETION	LOCATION			TYPE OF DAM	POSITION AND NATURE OF SEALING ELEMENT	FOUNDA- TION	HEIGHT ABOVE LOWEST FOUN- DATION (m)	LENGTH OF CREST (m)	VOLUME CONTENT OF DAM (10 <sup>3</sup> /m <sup>3</sup> )	GROSS CAPACITY OF RESERVOIR - AREA (10 <sup>3</sup> /m <sup>2</sup> )	P U R P O S E	MAXIMUM DIS- CHARGE CAPACITY OF SPILL- WAYS (m <sup>3</sup> /s)	TYPE OF SPILL- WAYS	OWNER	ENGINEERING BY	CONSTRUCTION BY	S E R No	
			RIVER	NEAREST CITY	STATE PROVINCE OR COUNTRY															
1	KAFIZES	1953	Keros	Limassol	Nicosia	PG	R	23	27	4	113	I	54	L	Leika Irr. Div.	W D D	W D D	1		
2	KANDOU	1956	Kouris	Limassol	Limassol	PG	R	15	53	2	34	I	59	L	Kandou Irr. Div.	W D D	W D D	2		
3	PERAPEDHI	1956	Kouris	Limassol	Limassol	PG	R	22	62	4	55	I	107	L	Perapedhi Irr. Div.	W D D	W D D	3		
4	PYRGOS	1957	Kabouris	Nicosia	Nicosia	PG	R	22	66	5	12	I	125	L	Pyrgos Irr. Div.	W D D	W D D	4		
5	TRIMIKLINI	1958	Kouris	Limassol	Limassol	PG	R	33	76	6	285	I	30	L	Trimiklini Irr. Div.	W D D	W D D	5		
6	ATHALASSA	1962	Pedheos	Nicosia	Nicosia	TE	R/S	18	447	103	791	I	48	L	Government	W D D	W D D	6		
7	GEUNVELLI	1962	Pedheos	Nicosia	Nicosia	TE	R/S	15	254	50	230	I	173	L	Geunyelli Irr. Div.	W D D	W D D	7		
8	LEFKA	1962	Marathasa	Nicosia	Nicosia	PG	R	35	149	11	276	I	246	L	Leika Irr. Div.	W D D	W D D	8		
9	MORPHOU	1962	Serakhis	Nicosia	Nicosia	TE	S	13	1436	206	45	I	764	L	Morphou Irr. Div.	W D D	W D D	9		
10	PRODRHOMOS	1962	off stream	Limassol	Limassol	TE	R/S	10	756	73	1979	I	—	L	Prodrhromos Irr. Div.	W D D	W D D	10		
11	KANLI KEUY	1963	Pedheos	Nicosia	Nicosia	TE	R/S	19	311	47	1113	I	116	L	Kanli Keuy Irr. Div.	W D D	W D D	11		
12	AGROS	1964	Kouris	Limassol	Limassol	TE	R	26	180	61	390	I	6	L	Agros Irr. Div.	W D D	W D D	12		
13	ARGAKA	1964	Magounda	Paphos	Paphos	ER	R	41	173	138	15	I	280	L	Government	Howard Humphreys & Sons of U K	W D D	W D D	13	
14	KITI	1964	Tremithos	Larnaca	Larnaca	TE	S	22	990	183	107	I	602	L	Government	Il Nuovo Castoro of Italy	W D D	W D D	14	
15	LIOPETRI	1964	Polamos	Famagusta	Famagusta	TE	S	18	579	50	1614	R	150	L	Liopetri Irr. Div.	W D D	W D D	15		
16	MIA MILEA	1964	Pedheos	Nicosia	Nicosia	TE	R/S	22	140	54	355	I	24	L	Mia Milea Irr. Div.	W D D	W D D	16		
17	OVGOS	1964	Serrakhis	Nicosia	Nicosia	TE	S	16	745	130	68	I	786	L	Morphou Irr. Div.	W D D	W D D	17		
18	AYIA MARINA	1965	Keros	Paphos	Paphos	ER	R	33	142	61	260	I	161	L	Ayia Marina Irr. Div.	Energoprojekt of Yugoslavia	Med. Constr. Greece - G P Zachariades Cyprus	W D D	W D D	18
19	POLEMIDHIA	1965	Garyllis	Limassol	Limassol	TE	R/S	45	196	215	33	I	581	L	Government	Energoprojekt of Yugoslavia	Mowlem & Ridgway of U K	W D D	W D D	19
20	KALOPANAYIOTIS	1966	Marathasa	Nicosia	Nicosia	TE	R	40	137	156	110	I	207	L	Government	Howard Humphreys & Sons of U K	W D D	W D D	20	
21	MAVROKOLYMBOS	1966	Mavrokolymbos	Paphos	Paphos	TE	R/S	45	528	267	2180	I	340	L	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	W D D	W D D	21
22	POMOS	1966	Livadi	Paphos	Paphos	ER	R	38	302	153	175	I	300	L	Pomos Irr. Div.	Energoprojekt of Yugoslavia	Med. Constr. Greece - G P Zachariades Cyprus	W D D	W D D	22
23	YERMASOYIA	1968	Yermasoyia	Limassol	Limassol	TE	R	49	409	539	83	I	850	V	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	W D D	W D D	23
24	LEFKARA	1973	Syrkalis	Larnaca	Larnaca	ER	R	74	240	820	1100	S/I	316	L	Famagusta Water Board & Lefkara Irr. Div.	Howard Humphreys & Sons of U K	L Fairclough U K & MEDCON Cyprus	W D D	W D D	24
25	MASARI	1973	Serrakhis	Nicosia	Nicosia	TE	S	15	929	245	13850	I	622	V	Government	Howard Humphreys & Sons of U K	W D D	W D D	25	



# REGISTER OF DAMS IN CYPRUS

19

S E R. No.	NAME OF DAM	YEAR OF COMPLETION	LOCATION			TYPE AND NATURE OF SEALING ELEMENT	FOUN- DATION	HEIGHT ABOVE LOWEST FOUN- DATION (m)	LENGTH OF CREST (m)	VOLUME OF DAM CONTENT (10 <sup>3</sup> /m <sup>3</sup> )	GROSS CAPACITY OF RESERVOIR AREA (10 <sup>3</sup> /m <sup>3</sup> )	P U R P O S E	MAXIMUM DIS- CHARGE CAPACITY OF SPILL- WAYS (m <sup>3</sup> /s)	TYPE OF SPILL- WAYS	OWNER	ENGINEERING BY	CONSTRUCTION BY	S E R. No.
			RIVER	NEAREST CITY	STATE PROVINCE OR COUNTRY													
26	PALEKHORI KAMBI	1973	Nicosia	Nicosia	Nicosia	PG	R	33	131	27	620	I	65	L	Government & Palekhori Irr. Div.	W D D	J & P Cyprus	26
27	ARAKAPAS	1975	Limassol	Limassol	Limassol	PG	R	23	97	10	110	I	205	L	Arakapas Irr. Div.	W D D	W D D	27
28	AYII VAVAT SINIAS No1	1980	Larnaca	Larnaca	Larnaca	TE	S	17	125	32	20	I			Palambella - Mospiti mouth Irr. Div.	W D D	Iacovou Bros., Cyprus	28
29	EPHTAGONIA No1	1980	Limassol	Limassol	Limassol	TE	S	16	390	46	55	I			Kokkinoyia Irr. Div.	W D D	Iacovou Bros., Cyprus	29
30	KHANDRIA	1980	Limassol	Limassol	Limassol	TE	S	35	82	41	11	I			Kambos Iou Paphiti Irr. Div.	W D D	CYBARCO Ltd.	30
31	MELINI	1980	Larnaca	Limassol	Larnaca	TE	S	22	116	32	59	I			Melini Irr. Div.	W D D	Iacovou Bros., Cyprus	31
32	PELENDRIA	1980	Limassol	Limassol	Limassol	TE	S	18	229	59	13	I			Ammos Irr. Div.	W D D	FYSCO, Cyprus	32
33	AKAPNOU - EPHTAGONIA	1981	Limassol	Limassol	Limassol	TE	S	18	280	67	21	I			Akapnou - Ephtagonia Irr. Div.	W D D	Iacovou Bros., Cyprus	33
34	AYII VAVAT SINIAS	1981	Larnaca	Larnaca	Larnaca	VA	R	19	58	2	24	I			Palambella - Mospiti mouth Irr. Div.	W D D	W D D	34
35	KATO MYLOS	1981	Limassol	Limassol	Limassol	TE	S	23	240	41	53	I			Valera Irr. Div.	W D D	Phoenix Constructions, Cyprus	35
36	AGRIDHIA	1982	Limassol	Limassol	Limassol	TE	S	18	119	25	12	I			Kladhos Irr. Div.	W D D	Iacovou Bros., Cyprus	36
37	ASPROKREMMOS	1982	Paphos	Paphos	Paphos	TE	R/S	56	700	2097	51000	I	1484	L	Government	Sir M MacDonald & Partners U K	Joint Venture J & P and MEDCON, Cyprus	37
38	KYPEROUNDA	1982	Limassol	Limassol	Limassol	TE	S	27	172	94	2590	I			Phterika Irr. Div.	W D D	Iacovou Bros., Cyprus	38
39	XYLIATOS	1982	Nicosia	Nicosia	Nicosia	ER	R	42	155	240	36	I	100	L	Government	W D D	General Construction Co Cyprus	39
40	LAGOUDHERA	C1983	Nicosia	Nicosia	Nicosia	TE	S	36	123	63	1250	I			Akousa Irr. Div.	W D D	Joint Venture Phoenix Constr. & KYKON, Cyprus	40
41	AYII VAVAT SINIAS No2	C1983	Larnaca	Larnaca	Larnaca	TE	S	25	130	30	43	I			Pelatia - Palovato Irr. Div.	W D D		41
42	DHIERONA	C1983	Limassol	Limassol	Larnaca	TE	S	24	167	59	9	I			Dhiastera Irr. Div.	W D D		42
43	KHIROKITIA	C1983	Larnaca	Larnaca	Larnaca	TE	S	16	460	95	27	I			Irr. Div. to be set up	W D D		43
44	DHYPTAMOS	C1985	Larnaca	Larnaca	Larnaca	ER	R	49	390	1090	15000	S/I	1130	L	Government	Rofe, Kennard & Lapworth & W Evans & Partners, U K		44
45	KALAVASOS	C1985	Larnaca	Larnaca	Larnaca	ER	R	57	482	*700	17000	I/S	1268	L	Government	Rofe, Kennard & Lapworth & W Evans & Partners, U K		45
46											875							46
47																		47
48																		48
49																		49
50																		50

## FINANCE EXPENDITURE AND REVENUE

During the year 1985 the total actual expenditure by the Department from WDD budgeted and other non-budgeted votes amounted to £27,009,180 out of a total budget of £34,358,439.

This is again a record expenditure made since the creation of this Department.

The general picture is as follows:

TABLE I-1  
GENERAL BUDGET-EXPENDITURE FIGURES FOR 1985

Description	Budget £	Expenditure £
a. WDD Development Estimates		
Govt. £27,722,014		21 953 640
including loans )		
Loan: 1,055,127		648 375
Total .....	28 777 141	<u>£22 602 015</u>
b. WDD Ordinary Estimates .....	4 018 834	3 515 876
c. Non-budgeted votes for Pitsi- lia Project, refugee housing estates, works for other Government Departments, private developers and village deposits .....	<u>1 562 464</u>	<u>891 289</u>
Total .....	£34 358 439	£27 009 180.

The level of construction works carried out during 1985 was again an all time record expenditure amounting to £22,462,514 from WDD and other votes

See table V-1 under CONSTRUCTION DIVISION

The largest single item of expenditure was major waterworks' Southern Conveyor Project at £9,498,025.

### Loan Proceeds

Description of loans	Amount withdrawn during 1985 £
- Loan No. 1658/5 CY (IBRD) US\$9,910,000 for VPP .....	3 403 626
- Loan No. 158 KUWAIT FUND KD2,500,000 for VPP .....	1 885 474
- Loan No. 1.1572.00 EUROPEAN INVEST. BANK ECU9,000,000 FOR VPP .....	312 810
- Loan No. 2279 CY (IBRD) US\$ 16,000,000 for KIP .....	<u>2 734 262</u>
Total withdrawn during 1985 (In Cyprus pounds)	£8 836 172



## Revenue

A sum of £2,915,904 was collected during the year 1985 as revenue mainly from the sale of water for Nicosia and Famagusta Water Supplies and Paphos Irrigation Project (See table I-5).

TABLE I-2  
EXPENDITURE FOR THE YEAR 1985

Ser. No.	Description	Government Contr.		Village Contr.	Total
		Ordinary	Development	(Loans)	
		£	£	£	£
<b>A WDD Votes</b>					
1	Administration . . . . .	1 210 139	921 584	-	2 131 723
2	Greater Nicosia WS scheme running expenses	735 881	-	-	735 881
3	Nicosia-Larnaca-Famagusta, Central WS system (formerly styled Famagusta WS scheme)	886 661	-	-	886 661
4	Regional village WS schemes running expenses	74 902	-	-	74 902
5	Irrigation, drainage and dams . . . . .	583 232	19 905 803	204 318	20 693 353
6	Town water supplies . . . .	-	258 036	-	258 036
7	Village water supplies . . .	-	508 180	444 057	952 237
8	Government residences and institutions water supply . . . . .	-	73 331	-	73 331
9	Drilling & prospecting . . .	14 397	-	-	14 397
10	Hydrology . . . . .	-	157 815	-	157 815
11	Surveys & investigations . .	-	97 820	-	97 820
12	Purchase of machinery and equipment . . . . .	-	20 623	-	20 623
13	Stores . . . . .	10 664	-	-	10 664
14	Others . . . . .	-	-	-	-
15	Save water campaign . . . .	-	10 448	-	10 448
	<b>Total . . . . .</b>	<b>£3 515 876</b>	<b>£21 953 640</b>	<b>£648 375</b>	<b>£26 117 891</b>

## B Non-budgeted Votes

	£
1 Pitsilia Project . . . . .	29 668
2 Refugee housing estates . . . . .	52 883
3 Works for other Government Departments . . . . .	549 649
4 Works for private developers . . . . .	190 252
5 Works through village deposits . . . . .	68 837
<b>Total . . . . .</b>	<b>£891 289</b>
<b>Grand total . . . . .</b>	<b>£27 009 180</b>

TABLE I-2 (Cont.)

## (i) Breakdown of Administration Expenditure

	Ordinary £	Development £	Total £
1 Personal emoluments .....	1 142 383	689 960	1 832 343
2 Casual technical assistance .....	-	159 742	159 742
3 Travelling .....	11 959	60 945	72 904
4 M'ce & operation of motor transport .....	10 881	-	10 881
5a Office expenses .....	34 332	7 555	41 887
5b Purchase of drawing materials ...	-	3 382	3 382
6 Government water supply .....	10 584	-	10 584
Total .....	£1 210 139	£921 584	£2 131 723

(ii) Breakdown of Irrigation  
Drainage and Dams Expenditure

	Government £	Village £	Total £
1 Minor irrigation works .....	356 059	157 749	513 808
2 Consultants fees .....	6 051	-	6 051
3 Major waterworks Paphos .....	201 708	-	201 708
4 Major waterworks Vasilikos- Pendaskinos .....	5 837 459	-	5 837 459
5 Major waterworks Southern Conveyor .....	9 498 025	-	9 498 025
6 Major waterworks Khrysokhou .....	3 776 820	-	3 776 820
7 Other major waterworks .....	198 751	46 569	245 320
8 M'ce of dams & distribution system	583 230	-	583 230
9 River training .....	4 271	-	4 271
10 Major waterworks Karyotis .....	26 660	-	26 660
Total .....	£20 489 034	£204 318	£20 693 352

TABLE I-3  
WDD ORDINARY BUDGET  
STATEMENT OF MONTHLY EXPENDITURE FOR THE YEAR 1985

## Head 20A Water Development

1985 Approved .....	£
Add Special warrants .....	3 991 082
	27 752
Total .....	£4 018 834

Month	Monthly expenditure £	Cumulative expenditure £	%
January .....	128 293	128 293	3.19
February .....	331 558	459 851	11.44
March .....	229 313	689 164	17.14
April .....	186 757	875 921	21.79
May .....	369 779	1 245 700	30.99



TABLE I-3 (Cont.)

Month	Monthly expenditure £	Cumulative expenditure £	%
June .....	279 372	1 525 072	37.94
July .....	273 558	1 798 630	44.75
August .....	234 193	2 032 823	50.58
September .....	334 918	2 367 741	58.91
October .....	299 136	2 666 877	66.35
November .....	295 170	2 962 047	73.70
December .....	553 829	3 515 876	87.40
Summary			
	£		%
Amount approved .....	4 018 834		100
Less actual expenditure ..	3 515 876		87.48
Balance .....	£ 502 958		12.52

TABLE I-4

## WDD DEVELOPMENT BUDGET

## STATEMENT OF MONTHLY EXPENDITURE FOR THE YEAR 1985

(Not including village loans)

Head 2D Water Development

1985 Approved .....	22 005 401
Add Special warrants .....	5 716 613
Total .....	£27 722 014

Month	Monthly expenditure £	Cumulative expenditure £	%
January .....	1 127 140	1 127 140	4.06
February .....	1 529 533	2 656 673	9.58
March .....	1 817 988	4 474 661	16.14
April .....	1 065 424	5 540 085	19.98
May .....	1 287 798	6 827 883	24.62
June .....	1 474 638	8 302 521	29.94
July .....	2 108 255	10 410 776	37.55
August .....	1 932 822	12 343 598	44.52
September .....	2 290 803	14 634 401	52.78
October .....	1 440 771	16 075 172	57.98
November .....	2 059 177	18 134 349	65.41
December .....	3 819 292	21 953 641	79.20

## Summary

	£		%
Amount approved .....	27 722 014		100
Less actual expenditure ..	21 953 641		79.20
Balance .....	5 768 373		20.80

TABLE I-5  
 STATEMENT OF REVENUE COLLECTED  
 DURING THE YEAR 1985

Description	£
Drilling charges .....	390
Nicosia water supply .....	1 226 752
Paphos Irrigation scheme .....	509 432
Main WS system	
Nicosia-Larnaca-Famagusta .....	1 022 319
Paphos Lower village water supplies .	31 780
Khrysokhou Irrigation Scheme .....	20 116
Other fees .....	94 888
Xyliatos Irrigation scheme .....	10 227
Total .....	<u>£2 915 904</u>



STAFF MATTERS

Appointments

During the period under review the following were appointed to the post as indicated:

Maroulla Constantinou to the permanent (Ord.) post of Clerk 2nd Grade, General Clerical Staff as from 1 January 1985.

Panayiotis Raftis as messenger on a casual basis as from 11 February 1985.

Christodoulos Demetriou as Clerk 2nd Grade, General Clerical Staff, on a casual basis as from 10 May 1985 to the District Office of WDD Paphos.

The following to the permanent (Ord.) post of Stenographer 2nd Grade, General Clerical Staff with effect from 15 September 1985.

Christiana Phani                      Kyveli Panayiotou

Christos Phanartzis to the permanent (Ord.) post of Hydrologist 2nd Grade on probation as from 1 November 1985.

The following to the post of Technician 2nd Grade on a casual basis with effect from 1st October 1985.

Nicos Tokkaris	Yiannakis Charalambous	Solon Kyprou
Efstathios Efstathiou	Michael Aristodemou	Nicos A Nicolaou
George Kissopodas	Michalakis Kaouros	Christina Demetriou
Constantinous Lambrides	Charalambos Larkos	Andreas Charalambous
Costakis Araklitis	Stavros Naoum	Marios Pagonis
Evgenios Charalambous	Vasos Yiorkas	Antonis Hanoullis
Christos Kounnis	George Ioannou	Soteres Orthodoxou
Kyriacos D Iacovou	Aristodemos Pittas	Andreas Theodosiou
Anastasia Della	Nicos Neophytou	Constantinos Christoforou
Kyriacos Nicolaidis	Michael Katsouras	Yiannakis Marcou
Christodoulos Constantinou	Androulla Stavrou	Andreas Constantinou
Kyriacos Tsiaoukkas	Costakis Pelopidas	Ioannis Panayi
Chrystalla Christodoulou	Petros Petrou	Michalis Pamboris
Marios Masouris	Panayiotis Zaros	Marios Michael
Eleni Kyriacou	Koulla Pitta	Sophia Potamitou
Xanthos Christodoulides	Achilleas Christou	Phivos Kyriacou
Louiza Parouti	Ioannis Kolokotronis	Kyriacos Michael
George Economou	Anna Constantinou	Arestis Chr Aresti
Andreas Kaizer	George Kouppis	Charalambos Ioannou
George Tsouris	Yiannoulla Ioannou	Costas Constantinou
Antonis Vyras	Charalambos Phylactou	Themis Angastiniotis
Antonis Ellinas	George A Charalambous	George Leonidou
Spyros HjiYiacoumi	Nicos K Nicolaou	Michael Karaiskakis
Kypros Efthvoulou	Pavlos Kkolas	Charalambos Neocleous
Charalambos Koutsioupis	George Antoniou	Nicos A Nicolaou
Michael Chr Michael	Christakis Alkiviades	

The following on probation to the Permanent (Ord.) post of Telephone Operator, General Clerical Staff as from 8 November 1985.

Eleni G Demetriou                      Charalambos Christou

The following on probation to the permanent (Ord.) post of Executive Engineer 2nd Grade as from 8 November 1985.

Anthoulla Symeou Siamma	Ioannis Eracleous	Andreas Demetriou
Michael Televantos	Pavlos Neophytides	Zoe HjiVasiliou
George Loucaides	Nicolas Christofides	

Panayiotis Stelikos on probation to the permanent (Ord.) post of Messenger General Clerical Staff as from 8 November 1985.

The following on probation to the permanent (Ord.) post of Clerk 2nd Grade, General Clerical Staff as from 8 November 1985.

Soteroulla Flouri	Artemisia Kapellidou	Karmella Frangiskou
Thelma Frangeskou	Maroulla Droushiotou	Kalliopi Loutsiou
Panayiota Spyrou	Tasoulla Joseph	Maria Mitsidou
Lambidona Kkouti		

The following on probation to the permanent development post of Technician 2nd Grade as from 8 November 1985.

Elias Kanonistis	Eleni Pisti	Eleni Pentaliotou
Odysseas Odysseos	Chrysanthos Chrysanthou	Agathi HjiPanteli
Joseph Pekris	Christakis Nicolaou	Aggela Skouroupathi
Phedros Rousis	Antonakis Chrostodoulou	Marios Terzis

The following on probation to the permanent (Ord.) post of Technician 2nd Grade as from 8 November 1985.

Charalambos Paroutis	Sofoclis Pereas	Photios Christodoulou
George Pantelides	Nicos Zenonos	Kyriaki Nicolaou
Frixos Papouris	Demetris Symeou	Tasos Magou
Lambros Christou	Costakis Christofi	Takis Aspris
Michael Poumpouris	Theotokis Theophanous	George I Christodoulou
George D Georghiou	George S Christodoulou	Panayiotis Kitsis
Ioannis Papadopoullos	Andreas Avgousti	Andreas Kouppis
Moysis Michaelides	Costas Papiasiantis	Andreas HjiKleovoulou
Kyriacos Pittakas	Chrystalla Ioannidou	Eleni Toumba
Charalambos Makrides	Ivi Pavlidou	Aristotelis Antoniou
Michalakis Vasiliou	Evgenia Parpouna	Androulla Sofocleous
George HjiIoannou	Georghia Lambriandidou	

#### ACTING APPOINTMENTS

Kyprianos Hassabis as Acting Director for the period between 15.7.85 - 3.8.85.

#### Promotions

The following were promoted as follows:

Vassos Socratous to the permanent (Dev.) post of Executive Engineer Class I with effect from 15 February 1985.

Frosso Germanou to the Permanent (Ord.) post of Executive Engineer Class I with effect from 15 February 1984.





#### Retirements

Takis Olymbios Assistant Chief Foreman with effect from 1 January 1985.

Costas Charalambous Chief Foreman with effect from 1 February 1985.

Ioannis Mintzides Technician 1st Grade with effect from 1 1 March 1985.

Panayiotis Lazarou Foreman with effect from 1 April 1985.

Michael HjiConstantinou Chief Foreman with effect from 1 April 1985.

Andreas Ioannides Chief Foreman with effect from 1 May 1985.

Andreas Florides Assistant Chief Foreman with effect from 1 June 1985.

Andreas Kyriakides Foreman with effect from 1 June 1985.

Neoclis Ioannou Chief Foreman with effect from 1 June 1985.

Andreas Koutsoullis Foreman with effect from 1 September 1985.

George Iordanous Foreman with effect from 1 December 1985.

#### Transfers

Stavros Aletras Executive Engineer Class II to Regional Office Limassol for Kouris Dam with effect from 14 January 1985.

Charalambos Kyriakides Legal Adviser to the Ministry of Agriculture and Natural Resources with effect from 1 February 1985.

Constantia HjiDemetriou Clerk 2nd Grade General Clerical Staff to Accountant General's Office with effect from 7 January 1985.

Petros Makkoulas Technician 1st Grade to the District Office Limassol for Kouris Dam with effect from 2 April 1985.

Andriani Eliadou Kokkoni Accounting Officer 3rd Grade to the Official Receiver and Registrar's Office with effect from 26 March 1985.

Charalambos Phylactides Accounting Officer to this Department from Fire Service with effect from 2 April 1985.

Chryso Lambrinou Clerk 2nd Grade, on a casual basis, General Clerical Staff to the Agricultural Department with effect from 13 May 1985.

Melani Botsari Clerk 2nd Grade, General Clerical Staff to this Department from Agricultural Department with effect from 13 May 1985.

Maroulla Constantinou Clerk 2nd Grade, General Clerical Staff to the Social Insurance Department District Office Paphos with effect from 10 May 1985.

Panayiotis Kitsis Technician 2nd Grade, on a casual basis from Khrysokhou Irrigation Project to District Office of WDD Paphos with effect from 1 March 1985.



Charalambos Paroutis Technician 2nd Grade, on a casual basis, from Khrysokhou Irrigation Project to Limassol District Office for Kouris Dam with effect from 1 June 1985.

Joseph Karoglanian Senior Technician from Nicosia Offices to District Office Limassol for Kouris Dam with effect from 1 August 1985.

Vassos Mavrakis Administrative Officer 1st Grade to this Department from Cyprus Productivity Centre with effect from 26 August 1985.

Christoforos Georgiades Administrative Officer from this Department to Public Administration and Personnel Services with effect from 9 September 1985.

Andreas Aristides Clerical Officer from this Department to Customs and Excise Department with effect from 6 September 1985.

Evgenia Panpouna Ivi Pavlidhou  
Technicians 2nd Grade, on a casual basis, to Nicosia Offices from Limassol District Office with effect from 9 September 1985.

Christodoulos Artemis Senior Water Engineer to this Department from Ministry of Agriculture and Natural Resources with effect from 16 September 1985.

Demos Mytillineos Accounting Officer II from this Department to Lands and Surveys Department with effect from 16 October 1985.

George HjiStylli Accounting Officer II to this Department from Lands and Surveys Department with effect from 16 October 1985.

Chrysanthos Chrysanthou Technician 2nd Grade on a casual basis from Vasilikos Pendaskinos Project to Limassol District Office of WDD for Kouris Dam with effect from 7 November 1985.

Panayiotis Skordis Executive Engineer Class I to Nicosia Offices from the WDD Polis Khrysokhou Offices with effect from 1 December 1985.

#### Secondments

Andriani Nicolaou Technician 1st Grade for special duties as from 2 April 1985.

Christodoulos Artemis Senior Water Engineer. His secondment to the Ministry of Agriculture and Natural Resources for special duties was terminated as from 16 September 1985.

#### Conferences and Duty Abroad

K Hassabis, Assistant Director, visited Lausanne, Switzerland, between 18 June 1985 - 28 June 1985 to participate to the 53rd Executive Meeting and 15th Congress on International Commission on Large Dams.

Dr C A Christodoulou, Principal Water Engineer, visited Lausanne, Switzerland, between 23 June 1985 - 29 June 1985 to participate to the 15th Congress on International Commission on Large Dams.

S Theodosiou, Mechanical Engineer I, visited Metalna, Yugoslavia between 13 February 1985 - 15 February 1985 for Inspection Electromechanical Equipment for Kouris Dam.

S Theodosiou, Mechanical Engineer I, visited Grenoble, France, between 24 March 1985 - 29 March 1985 for discussions with Sogreah about Kouris Hydroelectric Power station.

S Theodosiou, Mechanical Engineer I, visited Curacao N.A. between 22 April 1985 - 26 April 1985 to participate to the Interregional Seminar on Non-Conventional Water Resources Use in Developing Countries.

N Stylianou, Senior Water Engineer, visited Denver Colorado, USA, between 21 April 1985 - 3 May 1985 to participate to the International Seminar on Safety Evaluation of Existing Dams.

C Kridiotis, Executive Engineer 1st Grade, visited France between 21 April 1985 - 12 May 1985 to attend a training programme within the framework of the BRGM Collaboration Programme on the Geotechnical Properties of Leese Sediments on the Larnaca - Limassol Area.

C St Lytras, Director, visited Marceille, France between 28 March 1985 - 30 March 1985, to attend the Meeting of the Board of Directors of the Mediterranean Water Institute.

C St Lytras, Director, visited Greece between 17 March 1985 - 23 March 1985 according to the provisions of the bilateral Agreement between the Ministries of Agriculture and Natural Resources of Greece and Cyprus.

Iacovos Iacovides, Senior Hydrogeologist, visited Yugoslavia between 28 January 1985 - 29 January 1985 to attend the Meeting for the Water Resources Development of Islands and Isolated Coastal Areas in the Mediterranean.

Christodoulos Artemis, Senior Water Engineer

Vlasis Partasides

visited Zaragoza, Spain, between 13 February 1985 - 17 February 1985 to participate to the International Exhibition Water Machinery.

Iacovos Iacovides, Senior Hydrogeologist, visited Venice between 10 June 1985 - 14 June 1985 to participate to the Workshop on Treatment and Discharge of Industrial Waste Waters in the Mediterranean Area.

C Andreou, Senior Water Engineer, visited Israel between 26 May 1985 - 2 June 1985, to study the Recycling of Treated Effluents.

Iacovos Iacovides, Senior Hydrogeologist, visited Cambridge, UK, between 10 September 1985 - 11 September 1985 to participate to the Meeting for the International Hydrogeological Map of Europe.

Vlasis Partasides, Executive Engineer 1st Grade, visited London between 23 September 1985 - 25 September 1985 to attend the Fidic Constructions Contract lessons.

N Stylianou, Senior Water Engineer, visited Yugoslavia to participate to the Seminar on the Design of Civil Structures in the Seismic Regions organized by Yugoslavia and UNESCO between 22 September 1985 - 7 October 1985.



Christos Ioannou, Hydrologist 1st Grade, visited London between 1 September 1985 - 14 September 1985 to quantify the physical properties of a new type of stream gauging weir developed by him at the Leeds University.

Elias Kambourides, Executive Engineer 1st Grade, visited London between 15 July 1985 - 27 July 1985 to negotiate the proposed agreement with Thames Water Authority to undertake the monitoring of Leakage detection system for the Water Boards of Cyprus.

K Hassabis, Assistant Director  
E Kambourides, Executive Engineer I  
visited London and Reading between 29 September 1985 - 10 October 1985 to attend management awareness exercise association with monitoring and control of unaccounted for water in water supply distribution systems.

#### Scholarships

D Patsalides, Executive Engineer I has been granted a scholarship by the UK Government under its Technical Co-operation Programme between 13 June 1985 - 23 August 1985, to attend a course on Management of Large Scale Projects.

C HjiSavvas, Mechanical Engineer II has been granted a scholarship between 2 October 1985 - 30 October 1985 offered by the Italian Government to attend a course on Minihydropower Generation at the SIES Rome.

P Scordis, Executive Engineer I has been granted a scholarship between 27 October 1985 - 26 November 1985 offered by China and UNESCO to attend a course on Reservoir Sedimentation.

Maria Zachariou, Executive Engineer I who has been granted a scholarship in Water and Waste Engineering to obtain an MSc degree completed her studies and resumed her duties on 1 October 1985.

## II DIVISION OF WATER RESOURCES

by  
D C Kypris  
Senior Hydrogeologist  
Head of Division

### General

During 1985 again no hydrological data could be collected by this Department in the Northern part of Cyprus still occupied for the eleventh year by the Turkish troops and approximately amounting to 40% of the Cyprus land. So the behaviour of both surface runoff and groundwater bodies could not be followed or recorded in the Northern part of the country during the year under examination.

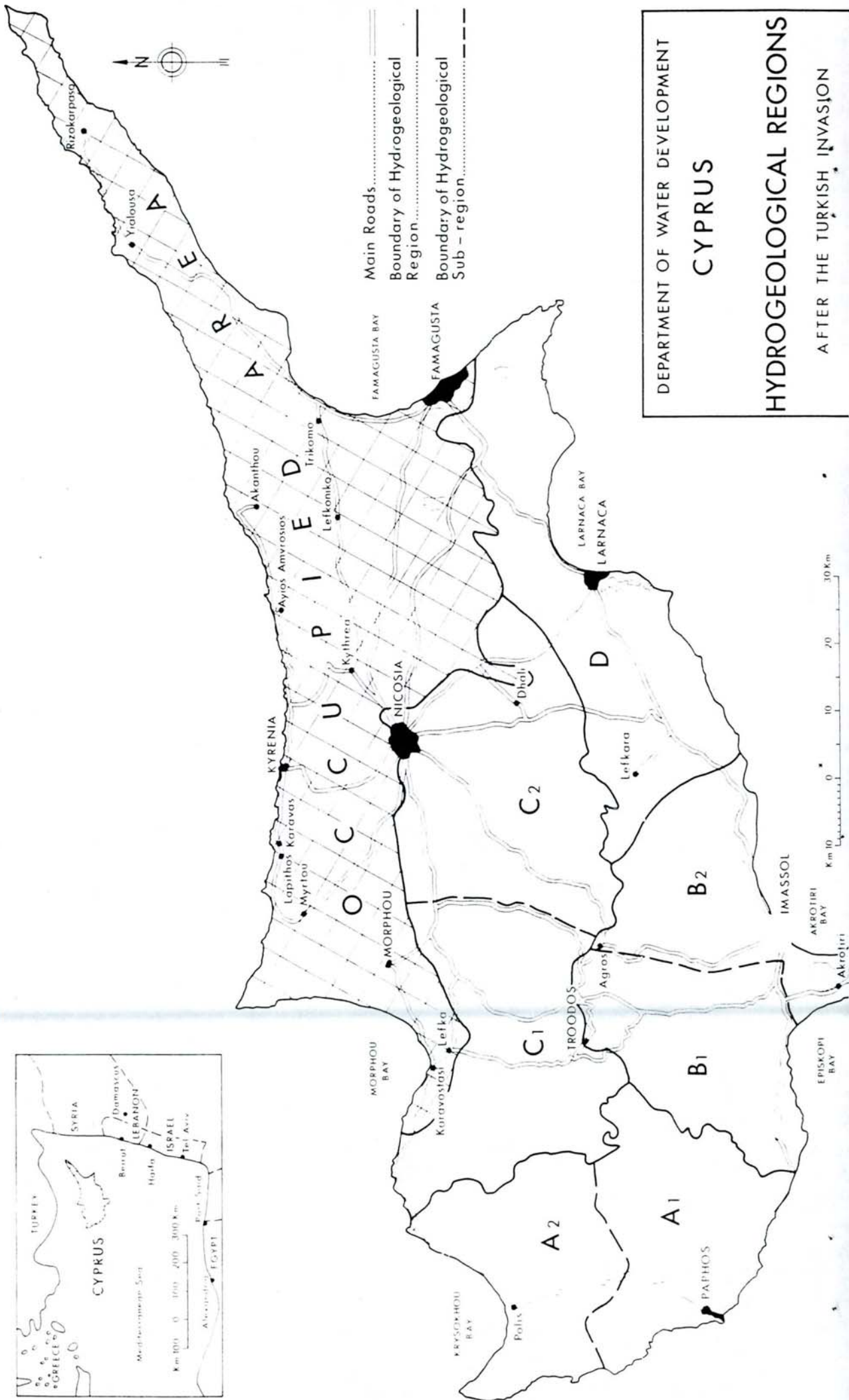
### INTRODUCTION

The main tasks assigned to the Division of Water Resources are the collection and processing of Hydrological and Hydrogeological data, regarding both ground and surface water, to deal with hydrogeological problems as connected with the planning and execution of water works projects, to carry out auxiliary drilling operations, to control groundwater extraction and use and monitor water quality for the purposes of both pollution control and advising on water supply problems.

Cyprus has been divided into eleven hydrogeological regions based on both hydrogeological and administrative criteria, which were followed for reasons of better control on the collection of hydrogeological data and thorough hydrogeological studies, until July 1974 when the Turkish invasion occurred. For the year under examination since the Turkish troops are still occupying part of Cyprus, a new arrangement is followed as on map page II-2.

During 1985, D C Kypris, Senior Hydrogeologist, was the Head of the Division. M Peppis, Geologist Class I, was the Assistant Head, the Head of the Drilling Permits and Water Control Branch and he acted also as the chairman of the specially formed advisory committee for the issue of well permits. Dr St. Papatryphonos, Hydrologist I was the Head of Hydrometry Branch.





DEPARTMENT OF WATER DEVELOPMENT  
**CYPRUS**  
**HYDROGEOLOGICAL REGIONS**  
 AFTER THE TURKISH INVASION

## DRILLING OPERATIONS

Drilling operations 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:

- Cleaning of five existing boreholes
- Drilling of four boreholes. One of them was observation borehole at Episkopi and three for the recharge of the gypsum aquifer at Maroni. Total penetrated depth 172m.
- Removal of a number of pumps stuck or broken in boreholes.

## TEST PUMPING

In order that the Department will be in a position to express views on the water supply sources proposed to be used for the division of land into building plots or the erection of hotels, industries or other establishments, it undertakes to carry out pumping tests the results of which are communicated to the appropriate authorities.

Pumping tests are also carried out for Government works.

During 1985, 70 test pumpings were carried out as follows:-

- 11 for division of land with total hours pumped..... 203
- 57 for building permits with total hours pumped..... 215
- 2 for town and village water supplies with total hours pumped..... 28

## METEOROLOGICAL SUMMARY FOR THE HYDROMETEOROLOGICAL YEAR 1984-1985

As it is not possible for the Meteorological Service of the Republic of Cyprus to obtain measurements of various meteorological elements in the Northern part of the island because it is occupied by Turkish troops, the data given below relate to the weather experienced in the southern part of the island during the hydrometeorological year 1984-1985.

### Precipitation

The yearly total precipitation averaged over the part of the island under Government control during the hydrometeorological year October 1984 - September 1985 was 495.7 mm which is 93% of normal (Normal is considered the average rainfall over the southern part of the island during the period 1951-80). Annual average rainfall over Cyprus is given on page II-6.

The total precipitation amounts during the period were lower than normal in most areas and ranged mainly between 80% and 100% of normal. Isohyetal map of Cyprus for the year is given on page II-7.

As regards the monthly distribution of precipitation, it was above normal only in November and below normal in all the remaining months.

The following table, and graphical representation giving the incidence of rainfall during the hydrometeorological year 1984-1985, illustrates the situation:



TABLE II-1  
INCIDENCE OF RAINFALL DURING THE HYDROMETEOROLOGICAL YEAR 1984-1985

Months	Rainfall (in mm)	Rainfall (in inches)	Percentage of yearly total	Percentage of monthly normal
October	4.6	0.18	0.9	13
November	166.4	6.55	33.6	340
December	77.5	3.05	15.6	59
January	102.5	4.04	20.7	85
February	69.3	2.73	14.0	88
March	41.8	1.65	8.4	67
April	18.3	0.72	3.7	78
May	7.4	0.29	1.5	39
June	2.6	0.10	0.5	44
July	0.1	Trace	0	6
August	0.8	0.03	0.2	57
September	4.4	0.17	0.9	66
Totals	495.7	19.51	100.0	-

Note: Yearly total as percentage of yearly normal: 93%

The maximum amount of rainfall in a 24-hour period during the hydrometeorological year was 126.0 mm, reported on the 4th November 1984 by Aradhippou rainfall station in Larnaca.

The first snowfall occurred on the higher places of Troodos range on the 12th December 1984 which is one week beyond the median date for the first snowfall in Cyprus. Subsequent snowfalls occurred during the ensuing months till April. The last one occurred on the 5th April 1985 which is close to the median date for the last snowfall in Cyprus.

Hail occurred in the period from October 1984 to February 1985 and in April, May, June and September 1985.

#### Temperature

During the hydrometeorological year 1984-1985 as a whole air temperature was slightly below normal. In particular, monthly mean temperatures were lower than normal in November, December, February, March and July; they were higher than normal in October, January, April, May, August and September and around normal in June.

The extreme maximum and minimum air temperatures recorded during the hydrometeorological year under review were as follows:

TABLE II-2  
INCIDENCE OF MAXIMUM AND MINIMUM TEMPERATURES 1984-1985

Station	Extreme maximum temperature and date	Extreme minimum temperature and date
Nicosia.....	41.5 26th August	-2.3 1st March
Limassol.....	39.0 12th June & 24th August	-1.0 27th February
Larnaca Airport...	37.6 24th August	-0.9 27th February
Paphos Airport....	35.6 23rd May	-0.2 27th February
Panayia Bridge....	40.4 16th August	-4.4 26th February
Saittas.....	39.5 13th & 25th August	-3.5 26th & 27th February

TABLE II-2

## INCIDENCE OF MAXIMUM AND MINIMUM TEMPERATURES 1984-1985 (cont.)

Amiandos.....	33.0	14th August	-7.5	27th February
Prodhromos.....	33.5	16th August	-7.0	6th, 26th, 27th February
Stavros.....	37.8	31st July	-4.3	27th February
Kornos.....	39.9	13th August	-2.6	28th February
Platania.....	35.7	13th August	-6.5	27th February
Phasouri.....	37.5	24th August	-2.6	27th February

## Evaporation

Monthly total evaporation (in mm) measured from United States Weather Bureau (U.S.W.B.) class "A" pan during the hydrometeorological year 1984-1985 at selected stations is given below:

TABLE II-3

## MONTHLY EVAPORATION FROM CLASS "A" PAN IN mm

Station	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Total
Nicosia.....	147	51	41	28	50	96	152	212	265	308	260	194	1804
Paralimni.....	183	70	84	54	71	121	141	226	265	324	304	233	2076
Larnaca Airport	181	96	91	63	89	134	175	215	259	313	261	223	2100
Saittas.....	158	50	52	41	52	100	143	177	227	276	242	190	1708
Akhelia.....	169	100	73	65	75	108	136	211	259	260	265	219	1940
Yermasoyia.....	152	70	58	48	61	101	142	189	232	279	247	206	1785
Polemihia.....	170	68	59	59	70	98	149	191	247	291	258	222	1882
Prodhromos.....	125	48	19	22	21	63	128	157	208	254	239	150	1434

## SURFACE WATER

## Permanent Stream Gauging Stations

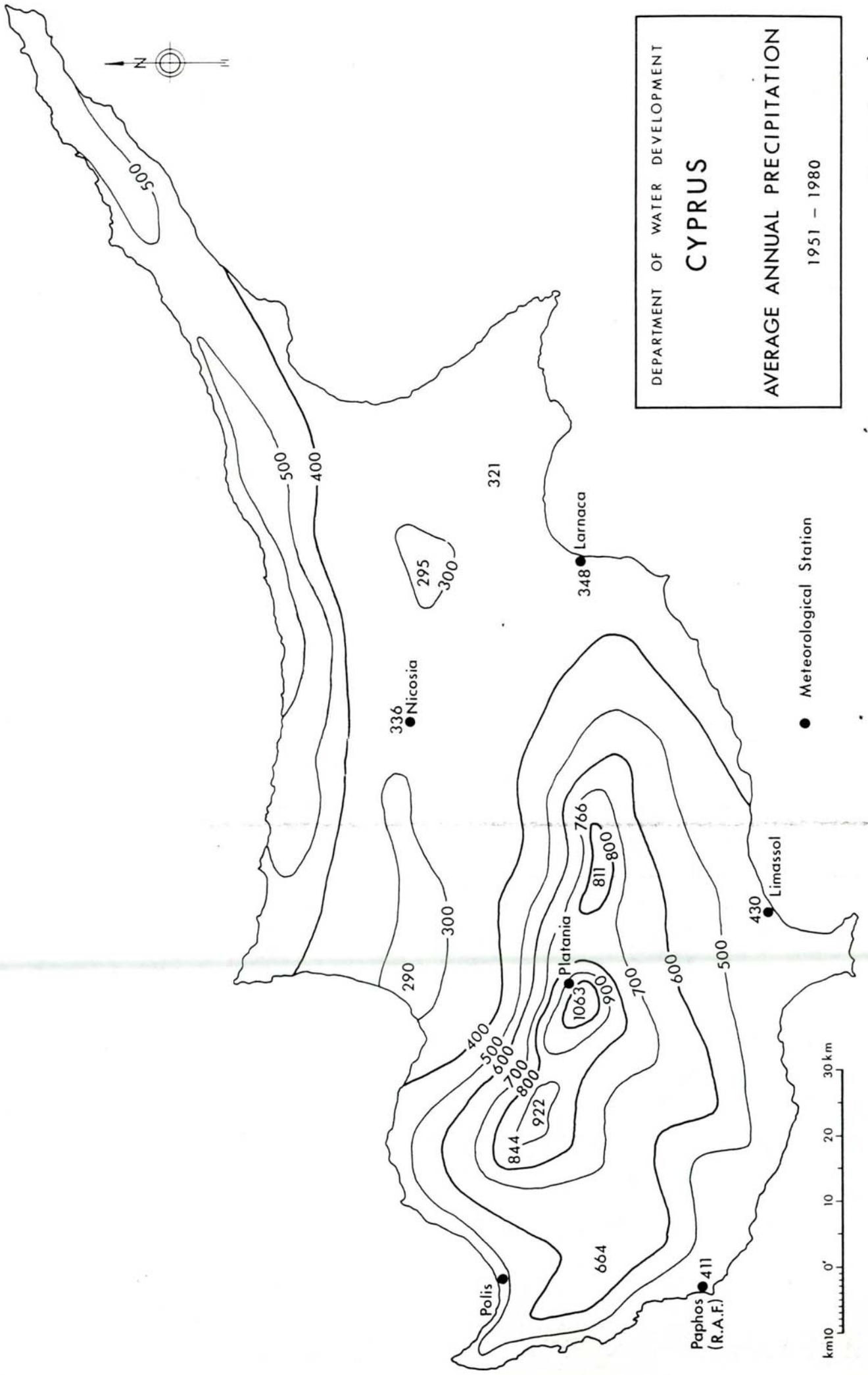
On important streams at selected places, permanent flow gauging stations equipped with automatic water level recorders have been established for the purpose of calculating the quantity of water flowing through each station. All these stations have to be inspected regularly i.e. every week, fortnight or month for the purpose of checking and maintenance of equipment, change of charts, velocity measurements of flowing water with current meter for calibration purposes, etc. During the wet season the visits are more frequent for high flow measurements and sampling for suspended sediment and chemical analysis. The condition of float wells and weirs is also checked and cleaned when necessary.

Out of all our stations only 61 could be regularly inspected because, in the northern part of the island we have not been able to attend any flow gauging stations, due to the presence of the Turkish invasion troops, still occupying almost 40% of Cyprus for the tenth year now.

The general conclusion obtained from the study of this years records of the above flow gauging stations, is that the flow of most of them was below normal because of the low precipitation of December, January, February and March.

The annual flow of some selected flow gauging stations are presented in table II-4





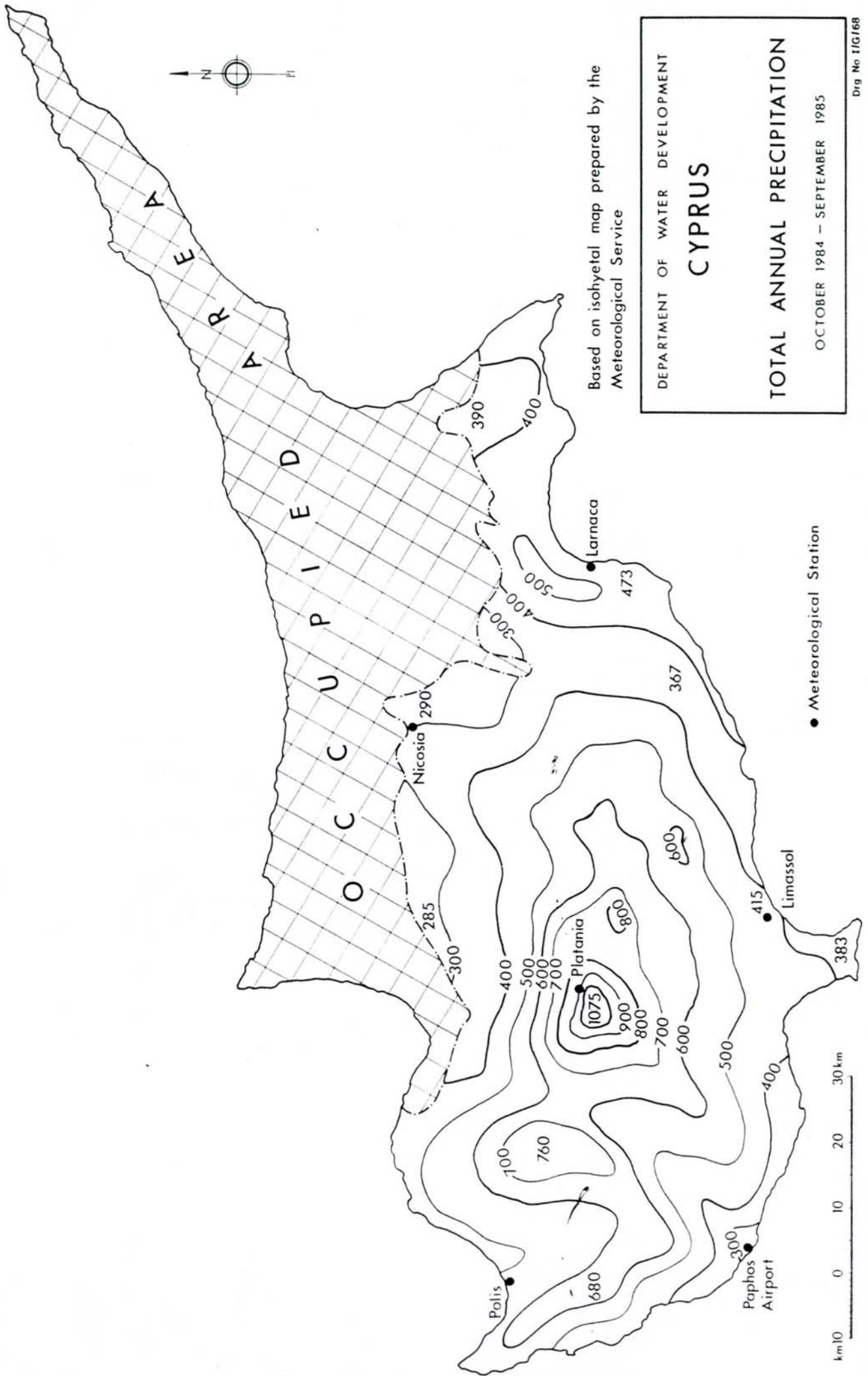
DEPARTMENT OF WATER DEVELOPMENT

## CYPRUS

AVERAGE ANNUAL PRECIPITATION  
1951 - 1980

● Meteorological Station

km 10 0' 10 20 30 km



Based on isohyetal map prepared by the  
 Meteorological Service

DEPARTMENT OF WATER DEVELOPMENT  
**CYPRUS**  
**TOTAL ANNUAL PRECIPITATION**  
 OCTOBER 1984 - SEPTEMBER 1985

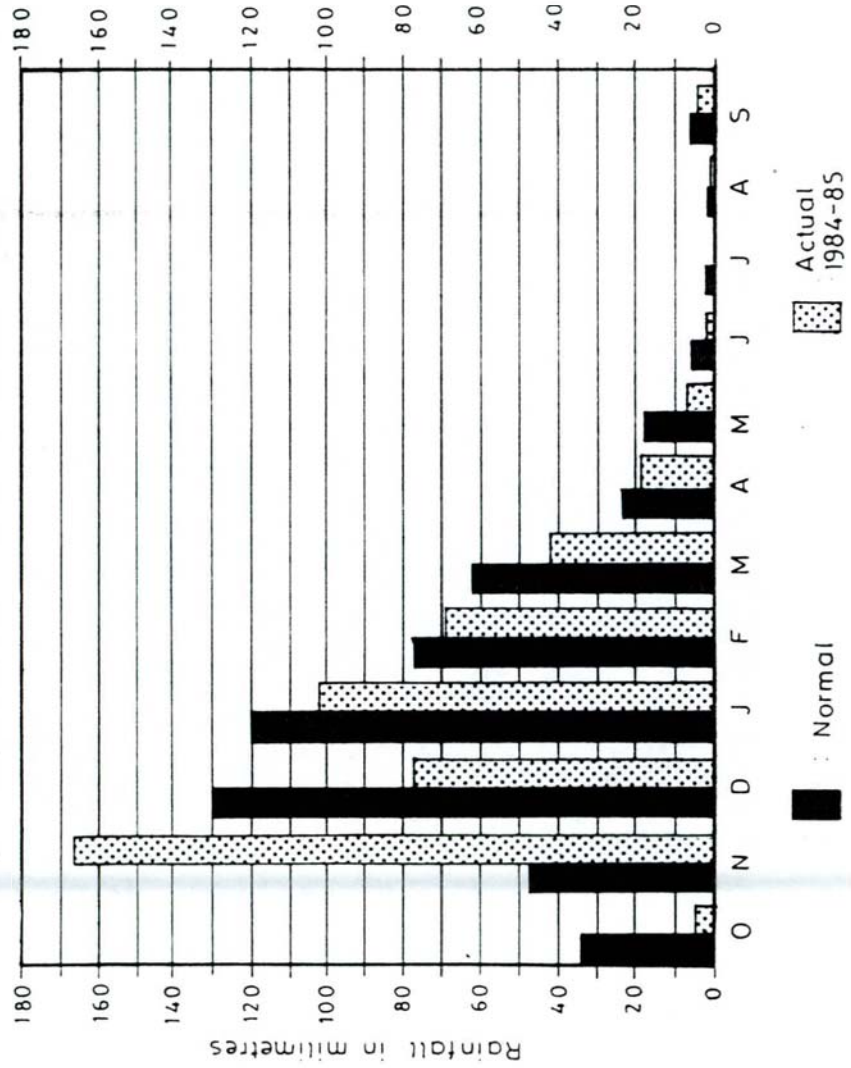
● Meteorological Station

km 0 10 20 30

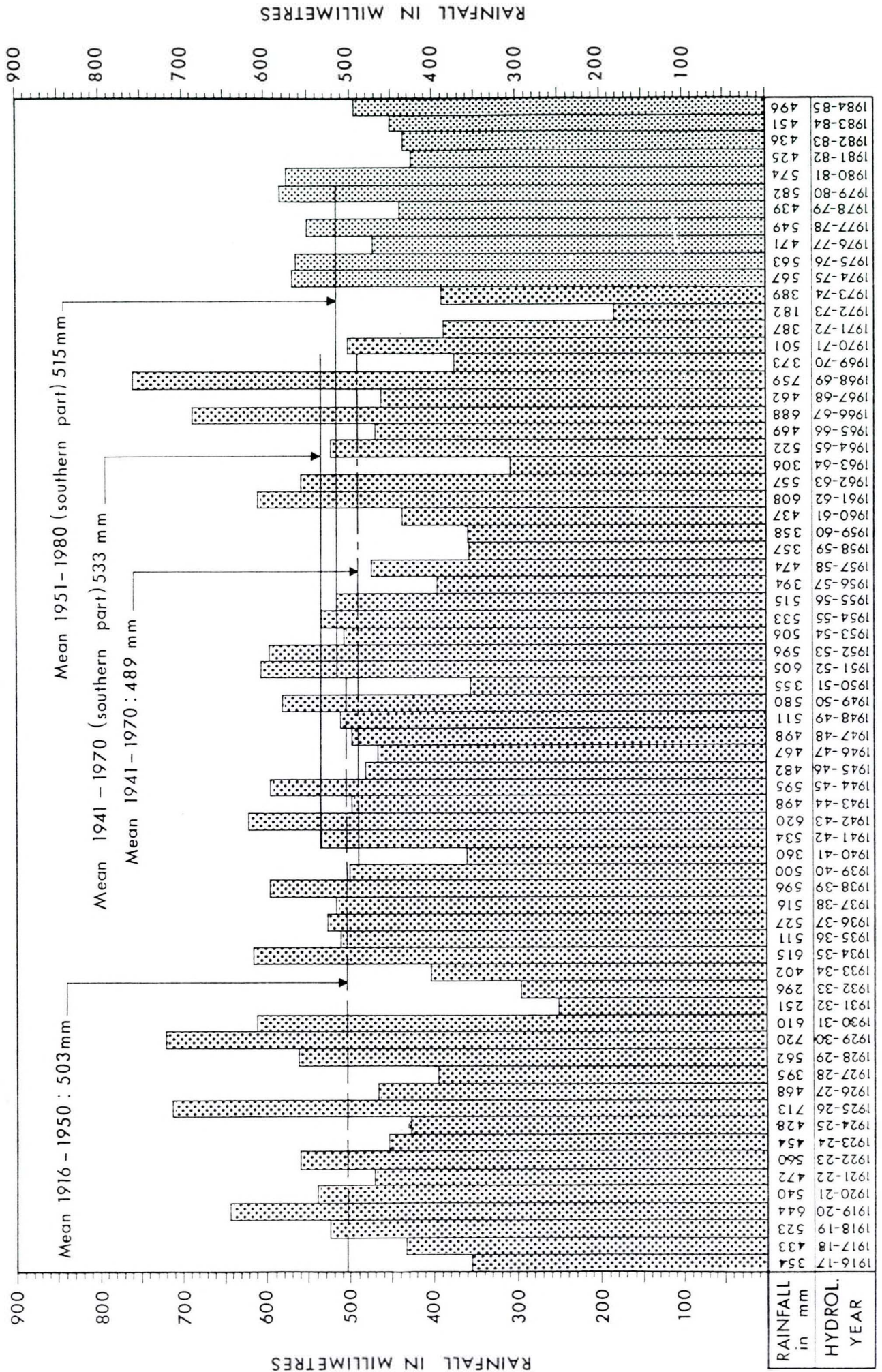
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GRAPHICAL PRESENTATION  
OF INCIDENCE OF RAINFALL 1984-1985



# ANNUAL AVERAGE RAINFALL OF CYPRUS 1916 - 1985



Note: Annual average as from 1974 - 75 refers to southern part of Cyprus only



TABLE II-4

DISCHARGE OF SELECTED STREAMS AS CALCULATED AT SELECTED FLOW GAUGING STATIONS FOR THE YEAR 1984-1985

Ser. No.	Station	Stream	Location	Annual flow 10 m
1	1-2-7-90	Dhiarizos	Kouklia	20.0
2	2-2-8-95	Khrysokhou	Coast	9.4
3	2-8-3-10	Limnitis	Saw Mill	8.6
4	3-3-1-70	Ay. Nikolaos	Kakopetria	9.4
5	3-3-3-95	Karyotis	Evrykhou	9.5
6	3-5-4-40	Elea	Vyzakia	4.9
7	3-7-1-50	Peristerona	Panayia Br.	12.2
8	3-7-3-90	Akaki	Malounda	9.8
9	6-1-1-80	Ay. Onoufrios	Kambia	1.6
10	6-1-1-85	Pedhieos	Kambia	3.6
11	6-5-3-15	Yialias	Nisou	2.7
12	8-4-5-30	Tremithios	Klavdhia	0.1
13	8-9-5-40	Vasilikos	U/S Kalavastos Dam	6.6
14	9-2-3-85	Yermasoyia	U/S Yermasoyia Dam	14.5
15	9-6-2-90	Kryos	U/S Kouris Dam	5.3
16	9-6-4-90	Kouris	U/S Kouris Dam	17.5
17	9-6-7-70	Limnitis	Khalassa	16.0

## Repairs and Improvements to Existing Flow Gauging Stations

During the year, repairs/improvements were carried out on the following flow gauging stations.

Yermasoyia River near Phinikaria. Repairs to the apron of the station which has been undermined.

Dhiarizos river near Kouklia. Repairs to the apron of the station which has been undermined.

Elea river near Vizakia. Repairs to the apron.

Livadhi river upstream of Pomos Dam: Alterations to the invert of the Station by the construction of a half "V" shaped structure 5m wide slope 1:10.

Platania river near kakopetria. Alterations to the invert of the station by the construction of a "V" shaped structure 6m wide slope 1:10.

## Flood Discharges

As the rainfall during the hydrological year under review was below normal no remarkable floods occurred. The most noteworthy, however, were recorded on the following flow gauging stations.

Aradhippou river near Aradhippou about 20 m<sup>3</sup>/s on the 1st November 1984. Its watershed area is 53 km<sup>2</sup>.

Tremithos river near Ayia Anna about 17.5 m<sup>3</sup>/s on the 29th May 1985. Its watershed area is 94 km<sup>2</sup>.

Zyghos river near Khalassa about 20 m<sup>3</sup>/s on the 4th November 1984. Its watershed area is 120 km<sup>2</sup>.

Mylou river near Kornos about 12.5 m<sup>3</sup>/s on the 14th February 1985. Its watershed area is 32 km<sup>2</sup>.

Ezousas river near Moronero about 12.5 m<sup>3</sup>/s on the 18th January 1985. Its watershed area is 180 km<sup>2</sup>.

Dhiarizos river near Koukليا about 12 m<sup>3</sup>/s on the 19th January 1985. Its watershed area is 260 km<sup>2</sup>.

Peristerona river near Panayia Br. F.S. about 12 m<sup>3</sup>/s on the 18th January 1985. Its watershed area is 77 km<sup>2</sup>.

Yermasoyia river near Phinikaria about 11 m<sup>3</sup>/s on the 18th January 1985. its watershed area is 110 km<sup>2</sup>.

Pedhieos river near Kambia about 6 m<sup>3</sup>/s on the 18th January 1985. Its watershed area is 29 km<sup>2</sup>.

#### Inflow of Water in Dams

During 1985 out of 72 most important Dams and Ponds in Cyprus which were under regular observations in the past, only 55 could be observed as the remaining are situated in the northern part of the island which is still under Turkish occupation.

The water accumulated in the 55 dams under regular observations was very low because of the low precipitation during the hydrological year under review; the maximum volume accumulated was 61.500 MCM or 48.83% of the total capacity of these dams which is 126 MCM. Out of these dams 38, the smaller ones overflowed, most of them in January, February and March Analytically the situation is shown in table on pages II-20,21.

#### Spring Discharges

Most of the springs and minor streams are gauged on a routine basis while a number of them are gauged for a short period after the request of another Departmental Division.

During the hydrological year 1984-85, 1938 spring and minor stream discharges were taken on 129 springs and minor streams; 600 discharges were taken on 50 springs which are under regular monthly observations and 1338 discharges were taken on 79 springs and minor streams for a certain period at various intervals.

As the rainfall during the hydrological year under review was below normal for the fourth successive year most of the springs maintained a low flow during the whole year.

#### GROUND WATER

##### Ground Water 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. It is unfortunate that most of our maps with the well location and other information were destroyed by fire, during the events of 1974, or lost in the area occupied by the Turkish troops. So, during the year under review, the plotting of boreholes/wells and the collection of other hydrological information continued in the free areas, where hydrological work was being carried out before. The area during the



current year where such work has been carried out was 3,012 km (see map on page II-22). The springs wells/boreholes which were on register at the end of 1985 were 28,940.

The new areas brought under hydrological observation during the year have an extent of about 46 square kilometers. A number of 176 wells/boreholes and srpings werer plotted or replotted in this area with their relative information recorded. A supplementary plotting was also carried out in the areas already covered for 1414 new wells/boreholes.

Through the Hydrological Surveys all wells/boreholes, springs and chain-of-wells are registered and plotted on maps. A dense network of observation boreholes, is being levelled. 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. In areas where more detailed information is necessary, a network has been established of observation boreholes where monthly or bimonthly measurements are taken. The number of observation boreholes monitored twice during 1985 is 1,547 and, every month or fortnight 530.

For the purpose of establishing the quantity of water pumped from our aquifers a questioning program is carried out once a year, through which information from our farmers is sought as regards the extent and type of plantations, the irrigation system used and other relative information from which the amount of water used is determined, crosschecked wherever possible from water meter readings, or electricity meter readings, and pump output. It has been established through questioning that during 1985 12,560 wells/boreholes and springs were in use in our most important irrigating areas.

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.

During 1985 the number of groundwater samples from observation boreholes analysed for Cl was 2,156.

As regards groundwater situation, in the most important aquifers a general drop of the water table was noted but in some others a slight rise, particularly in March. Details may be seen in the table of selected observation boreholes.

TABLE II-5  
SELECTED OBSERVATION BOREHOLES

Serial No.	Hydr. No.	Village	Water Level increase (+) or decrease (-)					
			March 1984	November 1984	March 1985	November 1985	March 1984-85	November 1984-85
56/56	192	Liopetri.....	+ 0.38	+ 0.32	- 2.42	- 1.13	- 2.80	-1.45
20/63	1516	Paralimni....	+ 18.98	Blocked	+ 20.03	+ 19.86	+ 1.05	-
22/63	1518	" .....	+ 6.06	+ 6.09	+ 6.13	filled in	+ 0.07	-
51/51	774	Phrenaros....	+ 0.12	+ 0.76	+ 0.26	- 0.16	+ 0.14	-0.92
79/56	975	" .....	+ 8.01	+ 8.28	+ 8.30	+ 8.21	+ 0.29	-0.07
88/54	24	Kolossi.....	+ 2.05	- 0.10	+ 2.05	- 0.50	0.00	-0.40
51/63	813	Limassol.....	+ 1.33	+ 0.78	+ 1.18	+ 0.98	- 0.15	+0.20
45/63	811	Zakaki.....	+ 0.83	+ 0.33	+ 0.80	+ 0.43	- 0.03	+0.10
107/61	17	Yermasoyia...	+ 1.38	+ 2.57	+ 2.86	+ 0.32	+ 1.48	-2.25
180/59	8	" .....	+ 18.64	+ 14.45	+ 19.47	+ 14.20	+ 0.83	-0.25
134/59	27	" .....	+ 0.12	+ 1.78	+ 1.96	- 0.71	+ 1.84	-2.49

TABLE II -5  
SELECTED OBSERVATION BOREHOLES (cont.)

161/50	180	K. Trimithia.	+185.73	+186.06	+186.49	+186.17	+ 0.76	+0.11
90/50	106	"	+191.00	+190.85	+190.73	+190.54	- 0.27	-0.31
125/60	15	Episkopi.....	+ 22.81	+ 21.53	+ 22.91	+ 20.41	+ 0.10	-1.12
EB 94/70	1236	Akrotiri.....	+ 0.66	+ 0.01	+ 1.46	- 0.34	+ 0.80	-0.35
P.B. 12	2671	Kouklia.....	+ 1.50	+ 1.19	+ 1.40	+ 1.78	- 0.10	+0.19
P.B. 17	2673	Akhelia.....	+ 6.87	+ 5.62	+ 6.92	+ 4.52	+ 0.05	-1.10

#### Control and Conservation of Ground Water

The Advisory Committee for the issue of well permits established by the Ministry of Agriculture and Natural Resources operated this year with Mr M Peppis, as chairman on behalf of the Director of Water Development Department. Representatives of the Directors of Geological Survey and Agriculture Departments are members of this committee, whose task is to advise the Director of Water Development Department on matters related to well sinking permits. At the meetings, the District Engineer of the district where applications were to be examined, participated.

The committee performed during 1985, 36 meeting and examined 2974 applications sent to the Director, WDD by the District Officers, as follows:-

Water Supply (Special Measures) Law areas.....	422
Water Conservation areas.....	2 138
Non Water Conservation areas.....	414

#### Water Conservation Areas (Wells Law Cap 351)

An area is declared as a Water Conservation Area, when the exploitation of its water resources is such, that it may affect the quantity or quality of the water of that area.

On map on page II-23 the areas which have been declared as "Water Conservation Areas" under the wells Law Cap 351 are shown. Particulars of these areas are also shown on the following table.

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.

#### Water Supply (Special Measures) Law 32/64

The major aquifers of Western Mesaoria 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. The Paphos coastal area and the paphos Major river valleys, which will be covered by the Paphos Irrigation Project, have also been covered by that Law in 1974 and 1975.

The areas covered by this Law shown on map page II-23 and particulars given in the table below.

For the above areas:-



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

TABLE II -6

WATER CONSERVATION AREAS

Ser No	Water Conservation Area	Order No	Date	Cazette No	Date
1	Kokkinotrimithia-Ayii Trimithias, Paleometokho, Mammari.....	556	31.10.51	3584	31.10.51
2	Nicosia.....	556	31.10.51	3584	31.10.51
3	Tersephanou-Klavdhia.....	376	18. 8.52	3639	27. 8.52
4	Laxia.....	374	18. 8.52	3639	27. 8.52
5	F'sta, Phrenaros, Paralimni, Ormidhia, Xylotymbou, Pergamos, Koukλια, Avgorou etc.....	164	3. 3.56	3924	8. 3.56
6	Akrotiri, Phasouri, etc.....	165	3. 3.56	3924	8. 3.56
7	Morphou, Syrianokhori, Prastio, Nikitas, Elea, Pendayia.....	1052	30.10.56	3995	8.11.56
8	Dhali, Potamia.....	1194	29.11.56	4008	6.12.56
9	Ayios Andronikos, etc.....	916	26. 9.57	4081	3.10.57
10	Morphou, Peristerona, Astromeritis, Akaki etc.....	314	3. 5.58	4133	15. 5.58
11	Vasilia, Lapithos, Kyrenia, Ayios Epiktitos, etc.....	245	28. 4.59	4228	30. 4.59
12	Makedonitissa, etc.....	544	16.11.59	4277	26.11.59
13	Moni, Pyrgos.....	226	27. 7.61	75	27. 7.61
14	Yermasoyia.....	443	8.12.61	112	8.12.61
15	Dhiorios (Djipi Loc.).....	324	21. 6.62	163	21. 6.62
16	Yialia, Ayia Marina, Argaka, Polis....	359	7. 7.62	168	7. 7.62
17	Yialias River (Potamia, Dhali, Nisou, Mathiati).....	189	25. 4.63	245	25. 4.63
18	Kiti, Pervolia, Meneou, Dromolaxia....	50	28. 1.65	384	28. 1.65
19	Koukλια, Anarita, Timi, Akhelia.....	529	26. 8.65	435	26. 8.65
20	Lapathos, Gypsos.....	545	9. 9.65	438	9. 9.65
21	Moni (Extension).....	642	14.10.65	444	14.10.65
22	Lakatamia, Dheftera, Anayia, Pera etc.	744	21.11.65	453	25.11.65
23	Ayia Erini.....	280	19. 5.66	499	2. 6.66
24	Paramali, Evdhimou.....	SBA 68	29. 7.67	212	29. 7.67
25	Lysi, Kondea.....	776	7. 9.67	599	22. 9.67
26	Akanthou.....	777	7. 9.67	599	22. 9.67
27	Pergamos (Extension).....	889	19.10.67	606	3.11.67
28	Ayios Avrosios.....	890	19.10.67	606	3.11.67
29	Kyrenia Range Limestone Mass.....	817	7.11.68	693	22.11.68
30	Vasilikos, Xeropotamos.....	862	28.11.68	697	13.12.68
31	Yeroskipos, Konia, Ktima, Peyia.....	741	4. 9.69	748	19. 9.69
32	Karavostasi, Peristeronari.....	50	29.12.69	771	16. 1.70
33	Yeri.....	75	8. 1.70	773	23. 1.70
34	Neokhorio, Androlikou.....	845	14.10.71	904	29.10.71
35	Yiolou, Loukrounou, Skoulli.....	845	14.10.71	904	29.10.71
36	Pissouri, Evdhimou.....	576	10. 8.72	958	25. 8.72
37	Kormakitis, Myrtou, Dhiorios.....	851	7.12.72	979	15.12.72

TABLE II-6  
WATER CONSERVATION AREAS (cont.)

38	Akanthou (Extension).....	288	15.11.73	1054	30.11.73
39	Ayios Ioannis (Malounda).....	307	25.11.74	1158	25.11.74
40	Kambos Chakistra.....	-	-	1180	4. 4.75
41	Parekklisha.....	206	23.10.75	1233	7.11.75
42	L'ssol-Paphos-L'ca Extension pf W. Conservation areas.....	215	30. 9.77	1429	3. 3.78

TABLE II -7  
WATER SUPPLY (SPECIAL MEASURES) LAW AREAS

Ser No	Area	Order No	Date	Cazette No	Date
1	Western Mesaoria (Pendayia-Morphou Kokkinotrimithia).....	-	-	331	9. 7.64
2	Akrotiri peninsula.....	-	-	331	9. 7.64
3	South-Eastern Mesaoria (F'sta - Paralimni-Ormidhia-Akhna), later with draw.....	-	-	331	9. 7.64
4	Potami.....	89	12. 2.66	479	24. 2.66
5	Dhiarizos River.....	196	23. 5.74	1104	21. 6.74
6	Xeropotamos River.....	196	23. 5.74	1104	21. 6.74
7	Ezouzas River.....	196	23. 5.74	1104	21. 6.74
8	Peyia-Aspros River (Ext. of Yeroskipos Peyia W C A West of Peyia village).....	196	23. 5.74	1104	21. 6.74
9	Mavrokolympos River (Ext. of Yeroskipos-Peyia W C A).....	196	23. 5.74	1104	21. 6.74
10	Kouklia-Paphos-Peyia.....	111	6. 6.75	1193	6. 6.75
11	Nisou-Potamia valley.....	274	15.12.78	1488	15.12.78
12	Xylophagou-Ormidhia Area.....	72	12. 3.78	1760	12. 3.82

#### Water Meters

The preservation of the aquifers through the close control of the groundwater extraction and use, which is the object of the declaration of an area under the provisions of the Water Supply (Special Measures) Law, cannot be effected with out metering the water pumped from each borehole or well.

According to the provisions of the above referred law, water meters should be installed in the Water Supply (Special Measures) Law areas. Information about the installation and operation of water meters are not available for Western Mesaoria area, since this area is still under Turkish occupation. For Paphos, Xylophagou-Ormidhia and Nisou-Potamia valley Area, the Law has not yet been completely enforced. In Limassol-Akrotiri area during 1985 there were 397 water meters installed of which 278 are in continuous operation. The total volume of water recorded is 13.18 MCM. During the year 23 illegal pumpings have been reported to the District Officer, out of which 16 were presented to Court.

#### 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. Such a licence is issued by the Director of the Water Development Department, after the interested person to become a Driller applies for it and when the Director of the Department is satisfied that the applicant is competent to carry out such a job. A fee is paid for the licence and each year for its renewal.



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 above said Director, together with a technical report on each borehole drilled.

During 1985 this Department issued 10 Drillers licences and renewed 78 others. The number of private drilling rigs which drilled for water during 1985, was 83 and this Department has been notified about the drilling or cleaning of 99 boreholes. Information from private drillers have been received by this Department for 104 boreholes.

During 1985, 14 private Drillers were reported to the District Officers for illegal drilling.

#### WATER QUALITY

##### Chemical Analyses

During the year, 493 samples of water were sent to the Government Analyst and 1034 to the WDD Laboratory for chemical analyses. Out of these, 722 samples were taken from springs, wells or boreholes, which are used or proposed as water supply sources. The remaining 805 samples were taken from rivers, springs, observation boreholes and other miscellaneous sources.

##### Bacteriological Analyses

The bulk of sampling for bacteriological analysis is carried out by the Health Inspectors. However for special purposes samples for bacteriological analysis are taken by this Department as well.

During the year 48 samples were sent to the Government Analyst.

##### Suspended Sediment Analyses

In view of the future construction of large dams in Cyprus and the problem arising from reservoir sedimentation, the sediment sampling programme was continued. Though not very intensive, the programme provided for sampling during floods in as many rivers as possible.

During the year 27 samples of river water were taken for suspended sediment analyses.

#### CENTRAL COMMITTEE FOR THE ISSUE OF LOANS AND THE REACTIVATION OF TURKISH CYPRIOT OWNED WELLS

The Council of Ministers, at its meeting of the 19th February, 1976-Decision No 14694 - decided the establishment of the above said Committee. The terms of reference of the committee are to accept and examine application from Greek Cypriot displaced farmers to use wells/boreholes abandoned by their Turkish Cypriot owners and to grant loans for the purchase, repair and installation of pumping plants and pipelines for the irrigation of abandoned fields of Turkish Cypriot ownership. For this purpose, the Government placed at the disposal of the Committee, the sum of 457,500 for the above said loans.

According to the above said decision of the Council of Ministers, the Committee is chaired by the Director-General, Ministry of Agriculture and Natural Resources, who transferred the chairmanship to the Director of Water Development Department. Other members are the Director-General, Ministry of the Interior, the Director-General, Ministry of Finance, the Director-General,

Planning Bureau, the Commissioner for Co-operative Development, the Director, Department of Agriculture and the representatives of the Ministry of Agriculture and Natural Resources at the District Committees for the protection of Turkish Cypriot properties, or their representatives.

The Committee convened at its first session on 27th March, 1976 and at the beginning, the rules and procedures have been decided upon it would function.

Accordingly, special application forms have been prepared, obtainable from the

District Officer and the Water Development Department, which displaced farmers could fill when applying to be granted a loan to purchase and install pumping plants and pipelines and/or permission to utilise existing pumping equipment on the specific well/borehole for which application was made. The applications which in most cases are from groups of farmers at the first stage are examined by the District Officer and the District Agricultural Officer. When the applicant or applicants are lawful tenants of abandoned by their owners Turkish Cypriot fields, leased to them by the Central Committee for the protection of Turkish Cypriot Property - the District Engineer transmits the application with suggestions as to which fields may be irrigated from the same borehole or group of boreholes accompanied by an irrigation scheme, where necessary, with the estimated cost, to the Committee which decides as to the fields to be irrigated and the loan to be granted.

The decisions of the Committee are then notified to the Loan Commissioner who releases the proper amount, to the interested farmers, who sign an agreement for the repayment of 1/3 of loan and the running expenses as well. The remaining 2/3 of the amount is given to the farmer ex gratis. The repayment period for the loans has been set to ten years with an interest of 4.5%.

When part or the whole pumping unit of Turkish Cypriot ownership exists on the borehole/well, a loan may be granted for the purchase of what is missing and the value of the existing equipment with its anticipated life is calculated. Taking into account these parameters and after subtracting the residual value which the pumping plant is expected to have after a maximum of eleven years or at the end of its expected life, an amortization rate is calculated which has to be repaid every year by the involved farmer or farmers. The farmer has to repay only the 1/3 of the amount the remaining 2/3 is give ex gratis.

From its establishment the Central Committee for the issue of loans and the reactivation of Turkish Cypriot owned wells/boreholes had 57 meetings during which it approved 441 application from 1275 displaced farmers for the irrigation of 12293 donums of land. The amount of loans granted by the end of this year was 376904 and the pumping plants of Turkish Cypriot ownership to 42 190.-

During the year under examination no applications were made by farmers to be examined by the above said committee and so no meeting was convened.

#### SPECIAL STUDIES

##### PROJECT CYP/81/002

##### Improvement of Hydrological Data Acquisition and Processing.

During 1985 the above project, preparatory work of which started in 1984, attained its full swing.

The Executing Agency for this Project is the World Meteorological Organization (WMO) through the Resident Representative in Cyprus of the United Nations Development Program (UNDP) and the Government Implementing Agency is the Water



Development Department, Ministry of Agriculture and Natural Resources.

The Project was providing for A UNDP contribution for subcontract, equipment and miscellaneous up to \$100 000 U.S. dollars and for Government contribution for Project personnel and other items up to 92 000 Cyprus pounds.

The title of the Project indicates clearly the goals aimed to be accomplished.

It was felt that the hydrometric network of the country, for both surface and ground water, the collection and processing methods for hydrological data which were geared at supplying to the water development planners the necessary information for planning water works, had to be revised in view of the fact that our major waterworks have either been built or they are at an advanced stage of being implemented and hydrological information was now necessary for their management and new methods of data collection and processing as well to take advantage of the technological progress in this field and facilitate the flow of information.

Although the Project Document was signed to become effective since October 1984 and certain preparatory work already was carried out in 1984, the real work started in January 1985 with the installation in the Water Resources Division of the first components of our microcomputer network and peripherals and the subsequent arrival of the experts from the Slovak Institute of Hydrometeorology, Bratislava, Czechoslovakia which through Polytechna which is the sole national contractor for Czechoslovakia in these matters, got the subcontract to carry out the work for \$50 000 U.S. dollars.

The direction of the project is the responsibility of the Water Development Department, Mr Dedalos C. Kypris Head of the Water Resources Division being appointed as the Project Director and Mr. Jacovos S. Jacovides, Head of the Hydrology Division, as the Co-Director. Three qualified officers of this Department with a total input of six manmonths contributed as counterparts of the foreign experts and 12 technical superintendants, senior technicians and technicians of W.D.D. contributed about 60 manmonths to the Project.

During 1985 the subcontractor's experts visited Cyprus four times and worked for a total of about 4.5 manmonths for the Project.

The above said experts that visited Cyprus are the following: Mr Ferdinand Samaj, Director SHMU, Bratislava Prof., Milan Djubak, System Hydrologist, Technical Univ. Bratislava, Dr Jaroslav Drako, System Hydrologist, SHMU, Mr Milan Matuska, Hydrogeologist, SHMU, Mr Milan Martinovich, Mathematician, Software Engineer SHMU.

According to the original workplan the Project was due to be completed by the end of 1985. However due to delays in the delivery of some equipment, certain computer peripherals and problems with their on line connection to the already installed microcomputer network, the final mission on behalf of the subcontractor to Cyprus has to be postponed for the year 1986.

Although the work of the Project was not complete as regards sediments, water quality, Hydrological Data Bank and Computerised Data Processing, still the following reports have been prepared by the subcontractor and submitted in draft form by the end of the year:

- 1 Hydrological Data Bank and Computerized Data processing (I. User's manual, II Reference manual).
- 2 Master Plan for the establishment and/or upgrading of country's required Basic (min/opt) Surface Station Network.

- 3 Master Plan for the establishment and/or upgrading of country's required Basic (min/opt) Groutwater Station Network.
- 4 Revision of methods for collection, control, processing, storage and retrieval of Hydrological Data.
- 5 Recommendations for possible modifications of the WRD/WDD's organizational structure.
- 6 Recommendations for the upgrading of the workshop.
- 7 Water Quality Monitoring Programme (approach).
- 8 Sediment Monitoring Programme (approach).
- 9 Improvement of Hydrological Data Acquisition and Processing (Executive Summary)

The equipment received and installed within the context of the Project upto the end of 1985 are the following:

- 1 Three Microcomputers make Intertec type Headstart VPU-512 with 512 kb memory and one diskette drive.
- 2 One Hard Disk make Intertec type Headstart DSS-50 of 50Mb storage with one fixed platter and one removable cartridge of 25Mb each.
- 3 One Dot Matrix Printer make Epson type RX-80.
- 4 One Diskette Drive make Intertec type Floppy 5 1/4".
- 5 One Plotter make Houston Instruments type EMP-29M, flat bed for A3 size paper and 8 pens.
- 6 One Digitizer make Houston Instruments type E7024, 19" X 26" total active area tablet.

By the completion of the project it is expected that a major step will be taken, in connection to the need that the Water Resources Division of the Department has, that is to meet the continuously increasing demands for hydrological and hydrogeological data by waterworks planners and managers, both qualitatively, and quantitatively, quickly and in a flexible way to cope with the complexity of the water works and the diversification of the water supply needs according to the economic development realities and targets.



TABLE II-8

## VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1985

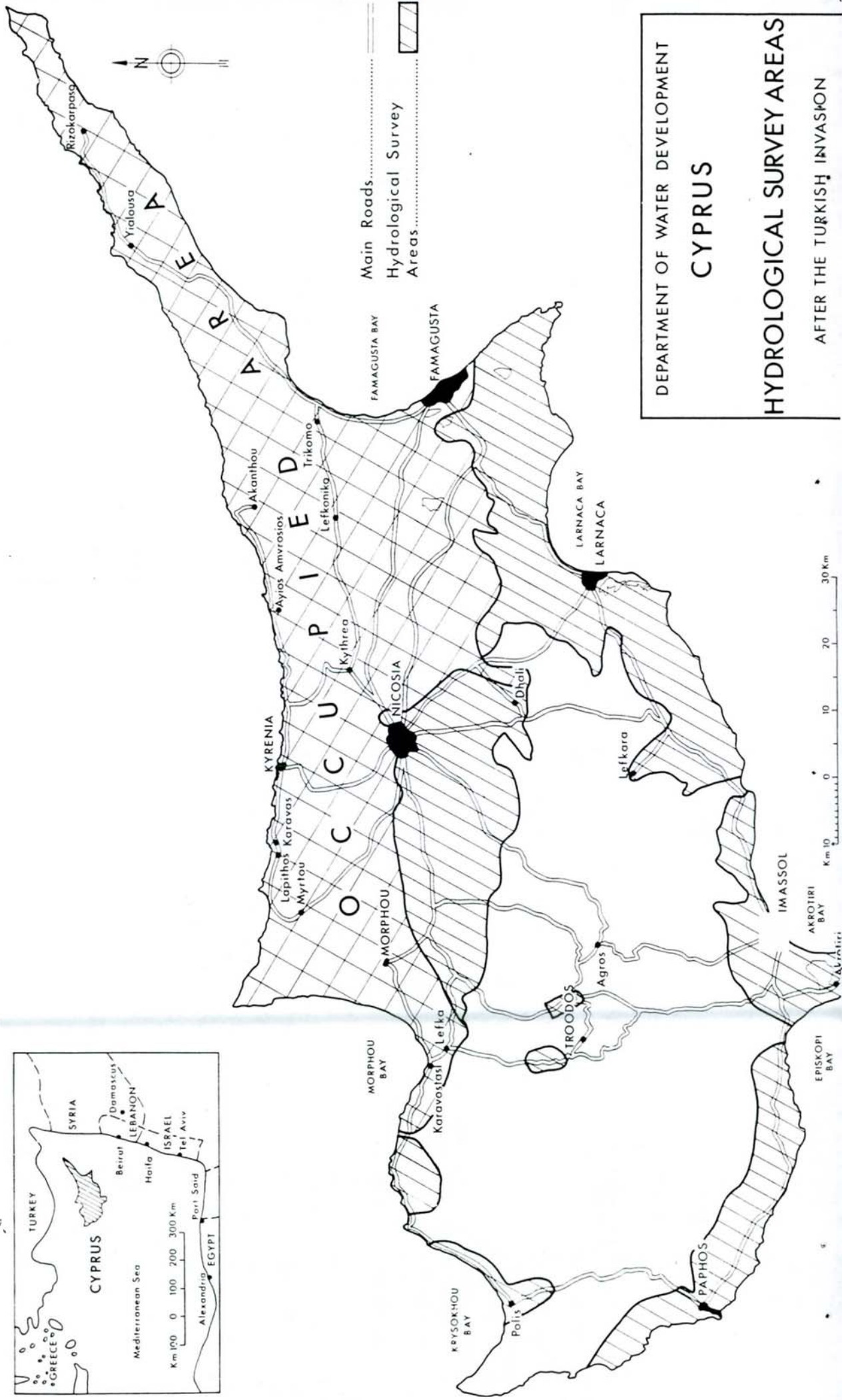
DAMS - PONDS		Capacity $10^3 \times m^3$	Inflow Commencing date (1985)	Maximum Volume recorded $10^3 \times m^3$	Date of Maximum record (1985)	Minimum Volume recorded $10^3 \times m^3$	Date of Minimum record (1985)	Remarks
1	Agridhia.....	59	January	59	14. 2.85	30	21.10.85	Overflowed 14. 2.85
2	Agros.....	72	January	54.5	17. 4.85	Empty	31. 8.85	Overflowed 3.11.84
3	Akrounda.....	22	January	22	3.11.85	Empty	5. 7.85	Overflowed 24.12.84
4	Akapnou-Ephtagonia.....	132	January	132	24.12.84	17.5	17.10.85	Gate closed 20. 3.85,
5	Arakapas Dam.....	128	March	128	15. 4.85	33.3	2.10.85	Overflowed April
6	Arakapas No 1.....	192	January	192	11. 2.85	73.5	10.10.85	Overflowed 11. 2.85
7	Arakapas No 2.....	119	January	119	1. 2.85	53	10.10.85	Overflowed 1. 2.85
8	Argaka.....	990	January	990	24. 1.85	35	19.10.85	Overflowed 24. 1.85
9	Asprokremmos.....	51000	January	28968	26. 4.85	15826	19.12.85	
10	Athalassa.....	790	January	21	26. 4.85	Empty	1. 7.85	
11	Ayia Marina.....	298	January	298	21. 3.85	45	8.11.85	Overflowed 21. 3.85
12	Ayii Vavatsinias Dam.....	53	January	53	17.12.84	23.2	8.10.85	Overflowed 17.12.84
13	Ayii Vavatsinias No 1.....	55	January	55	25.11.84	23	10.12.85	Overflowed 25.11.84
14	Ayii Vavatsinias No 2.....	43	January	37.5	6. 6.85	28.2	8.10.85	
15	Dhierona.....	159	January	159	12. 2.85	51.2	2.12.85	Overflowed 12. 2.85
16	Dhypotamos.....	13700	January	1962	10. 6.85	1284	31.12.85	Gate closed first time 11. 1.85
17	Ephtagonia I.....	92	January	92	26. 2.85	5.2	19.12.85	Overflowed 26. 2.85
18	Ephtagonia II.....	127	January	127	9. 2.85	4.2	19.12.85	Overflowed 9. 2.85
19	Ephtagonia III.....	65	January	65	18. 2.85	13.5	19.12.85	Overflowed 18. 2.85
20	Kalavastos.....	17100	January	5548	21. 5.85	1580	19.12.85	Gate closed first time 2.11.84
21	Kalo Khorio.....	32	January	32	6.11.84	Empty	21.10.85	Overflowed 6.11.84
22	Kalopanayiotis.....	363	March	363	1. 4.85	30	10. 9.85	Closed 20.3.85, Overflowed 1.4.85
23	Kandou.....	38	January	38	18. 1.85	4	23.10.85	
24	Kato Mylos.....	104	January	104	5. 2.85	15	15.11.85	
25	Khandria.....	70	January	70	19. 2.85	6.1	20.12.85	
26	Khirokitia.....	205	January	205	19. 3.85	34	10.12.85	

TABLE 11-8

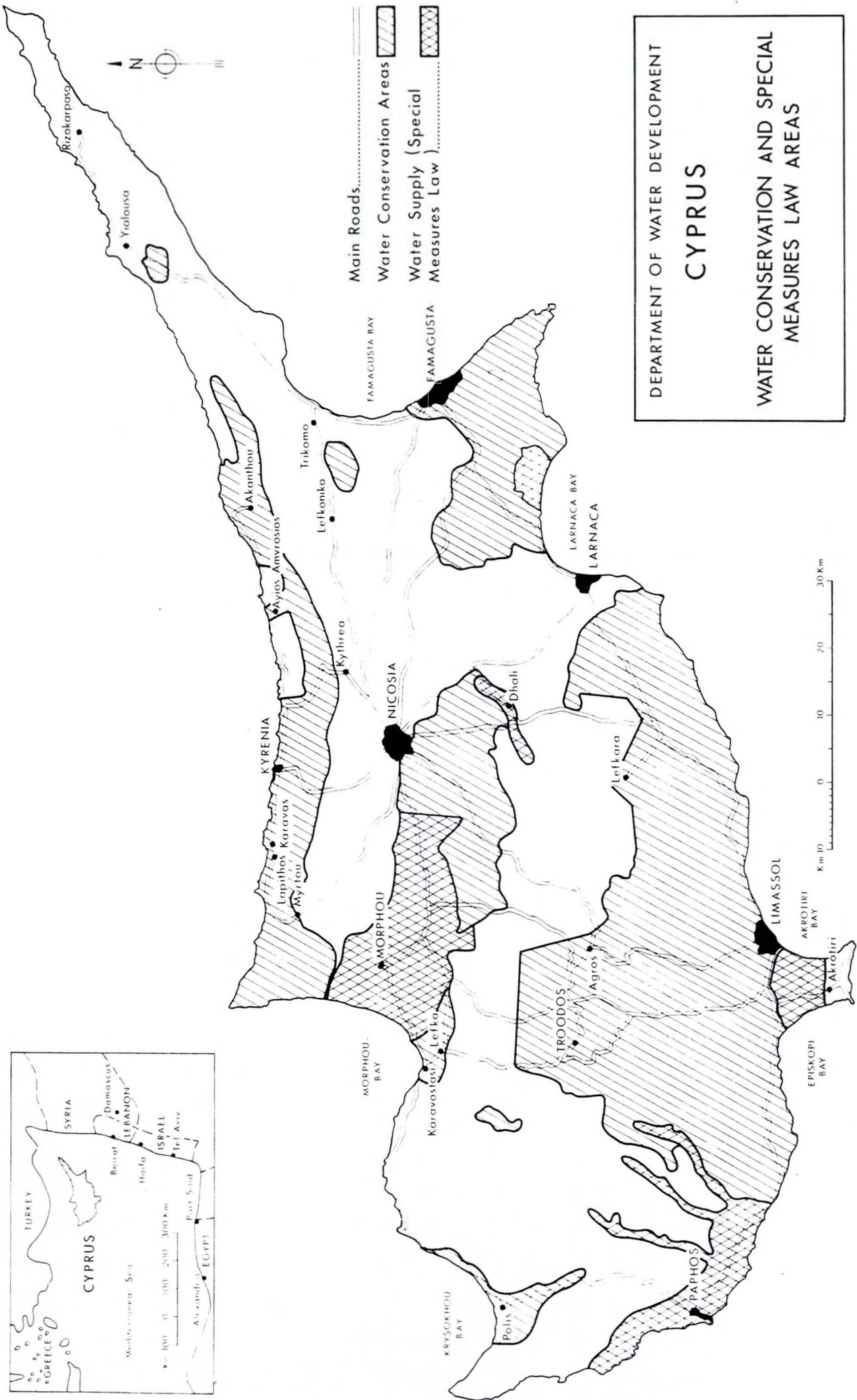
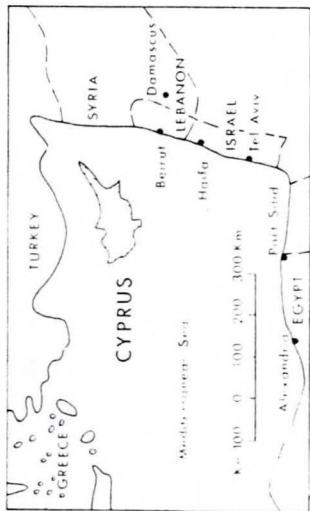
VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1985 (cont.)

27	Kiti.....	1625	-	-	-	-	-	No inflow	
28	Kyperounda I.....	50	January	50	2. 2.85	5.6	5.12.85	Overflowed	2. 2.85
29	Kyperounda II.....	273	January	273	5. 4.85	30	5.12.85	Overflowed	5. 4.85
30	Lagoudhera.....	70	January	70	8. 3.85	35	5.10.85	Overflowed	8. 3.85
31	Lefka Marathasa.....	368	January	368	15.12.84	135	17.10.85	Overflowed	15.12.84
32	Lefka Kafizes.....	113	January	113	15.12.84	15	26.10.85	Overflowed	25.12.84
33	Lefkara.....	13850	January	2022	10. 4.85	658	21.12.85		
34	Liopetri.....	325	January	19	22. 1.85	Empty	30. 3.85	Overflowed	20. 1.85
35	Lymbia.....	220	January	220	20. 1.85	76	13.12.85	Overflowed	24.12.84
36	Lythrodondas Upper.....	32	January	32	24.12.84	Open	25.10.85	Overflowed	17.11.84
37	Lythrodondas Lower.....	32	January	32	17.11.84	Empty	5.10.85	Overflowed	18.12.84
38	Melini.....	59	January	59	18.12.84	16.5	15.10.85	Overflowed	20. 2.85
39	Mavrokolymbos.....	2180	January	764	27. 4.85	268	5.11.85		
40	Ora Pond.....	62	January	62	20. 2.85	0.5	15.10.85	Overflowed	20. 2.85
41	Ormidhia (Vathys).....	100	-	Empty	-	Empty	-	Overflowed	10. 4.85
42	Pakhyamos.....	43	January	43	10. 4.85	Empty	20. 6.85	Overflowed	20. 1.85
43	Palekhorri (Kambi).....	620	January	620	20. 1.85	215	4.11.85	Constantly open	
44	Paralimni Lake.....	1365	-	-	-	-	-	Overflowed	11. 3.85
45	Pelendri.....	123	January	123	11. 3.85	18.8	3.10.85	Overflowed	16.12.84
46	Pera Pedhi.....	55	January	55	16.12.84	6.5	3.10.85	Overflowed	3. 1.85
47	Petra Upper.....	10	January	10	3. 1.85	Empty	3.10.85	Overflowed	22. 1.85
48	Petra Lower.....	25	January	25	22. 1.85	Empty	3.10.85	Overflowed	3. 3.85
49	Pharmakas No 1.....	20.4	January	20.4	3. 3.85	7.1	10.10.85	Overflowed	3. 3.85
50	Pharmakas No 2.....	43	January	43	3. 3.85	Empty	3.12.85	Overflowed	3. 3.85
51	Pomos.....	860	January	860	2. 2.85	73	8.11.85	Overflowed	2. 2.85
52	Polemichia.....	3400	January	1942	9. 4.85	556	20.12.85		
53	Prodromos.....	110	January	76	8. 4.85	Empty	25. 9.85		
54	Pyrgos.....	283	January	283	24. 1.85	Empty	31. 8.85	Gate closed	30. 4.85,
55	Trimiklini.....	340	January	340	3. 5.85	Open	6.11.85	Overflowed	3.5.85
56	Xyliatos.....	1220	January	1220	6. 1.85	524	20.12.85	Overflowed	5. 1.85
57	Yermasoyia.....	13600	January	11866	26. 4.85	4473	21.12.85		





DEPARTMENT OF WATER DEVELOPMENT  
**CYPRUS**  
 HYDROLOGICAL SURVEY AREAS  
 AFTER THE TURKISH INVASION



DEPARTMENT OF WATER DEVELOPMENT

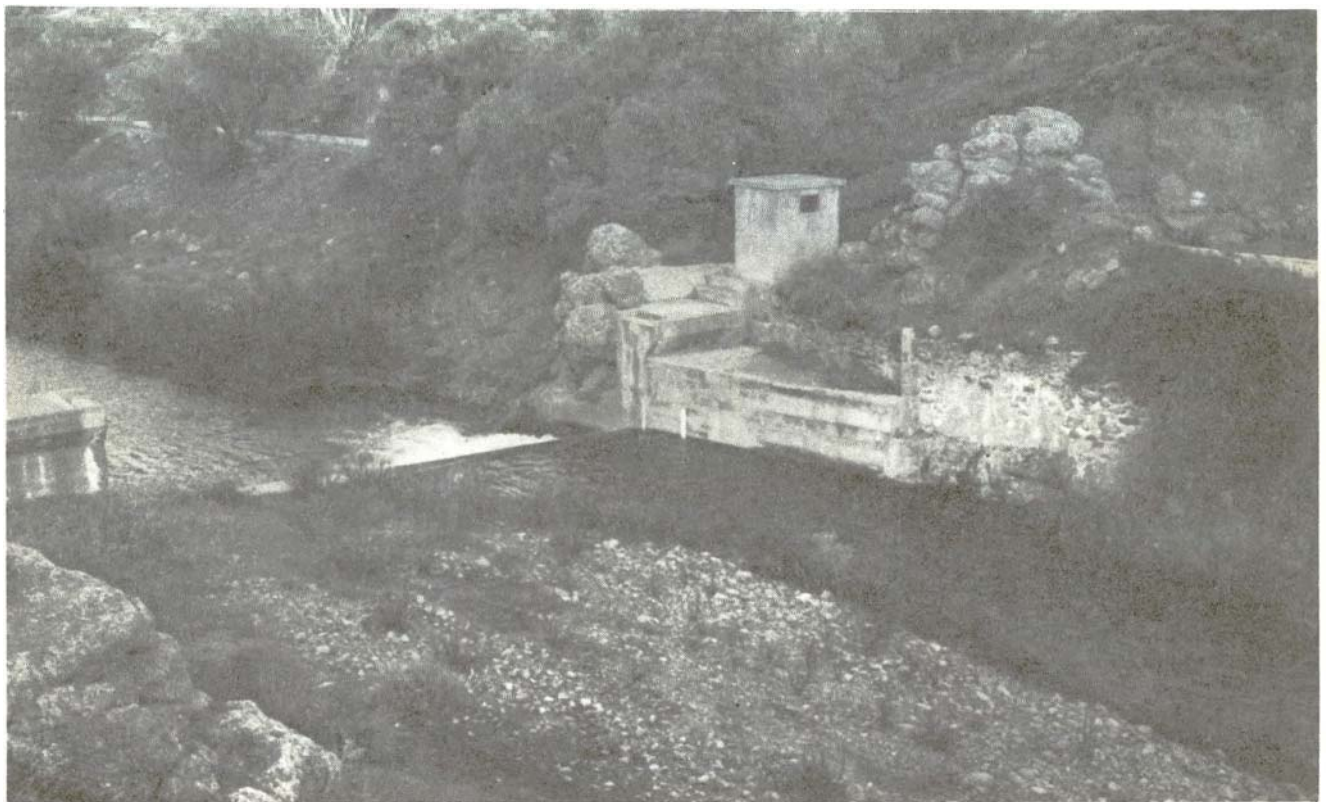
**CYPRUS**

WATER CONSERVATION AND SPECIAL MEASURES LAW AREAS





Flow gauging station at Kryos river near Khalasa measuring the inflow to Kouris Dam. WDD Photo B91EN19(18.2.85).



Flow gauging station at Akaki river near Malounda. WDD Photo B91EN10 (12.2.85).

III DIVISION OF HYDROLOGY  
AND WATER RESOURCES MANAGEMENT

by

I St Iacovides  
Senior Hydrologist  
Head of the Division

Introduction

The Division of Hydrology and Water Resources Management was formally established in late 1982 within the frame-work of the reorganization of the Department.

The main tasks and activities of the Division aim at providing the Department with basic information about the water resources to enable

- Decisions on the exploitation of water resources
- Development of additional water resources
- Allocation for water use
- Appraisal of the exploitation and development policy of water resources and its consequences as to quantity and quality.
- Formulation and evaluation of new water projects.
- Management and conjunctive use of surface and groundwater resources.
- Applied research in all the above fields.

The structure of the Division consists of the following three branches with their main functions as described.

Engineering Hydrology Branch

Main function: Watershed behaviour evaluation of runoff and flood studies; forecast of flow; recommendations for updating and readjustment of surface water network; computer applications on watershed runoff simulation and divertible quantities; Optimization and forecast models for operating and managing surface water systems and resources; surface water pollution evaluation and studies for its prevention.

Groundwater Hydrology Branch

Main function: Regional groundwater evaluations; updating of the inventory



of groundwater resources; investigations into obtaining and updating of hydrogeological properties of aquifers; spring flow phenomena; groundwater (streambed) recharge; status and inventory of domestic water supply sources; groundwater pollution evaluation and management; aquifer simulation models (description and forecast of behaviour as to quantity and quality); environmental radioisotope studies.

#### Water Resources Management and Operation Branch

Main function: Based on the studies of the Surface and Groundwater Branches formulation of constraints and criteria for decision making on the availability of the water resources; advice on new development projects and follow up of these projects; recommendations with respect to pollution control; operation studies on surface and groundwater resources and their conjunctive use; appraisal of the exploitation policy of water resources and its consequences as to quantity and quality.

During 1985 the Division consisted of the following staff

- 1 Senior Hydrogeologist - Head
- 1 Geologist I - Ast. Head
- 1 Hydrologist I
- 1 Executive Engineer I ; joined the Division on 1st December 1985.
- 2 Senior Technicians
- 2 Technicians I
- 2 Technicians II (on contract)
- 1 Hourly Technician
- 
- 11 total staff

#### MAIN ACTIVITIES

##### Engineering Hydrology Branch

The work carried out during the year in the framework of the various projects of the department was as follows:

##### Southern Conveyor Project

Work has started in updating the existing study on the operation of the Kouris dam to be based on (a) the updated runoff series from the catchment area of the Kouris dam; (b) the conclusions of the sedimentation study for

the area and (c) the latest demand projections for the S C P for both phases. This work will result in the evaluation of water spills and the subsequent recharge of the downstream aquifer. The conjunctive use of the dam and the aquifers will enable a plan to be produced for operation of the scheme on the occasion of water shortages.

#### Krasokhoria Integrated Rural Development Project

Hydrologic input data was provided to the consultants carrying out the feasibility studies for Platys and Xylourikos damsites. The resulting hydrologic studies and estimated floods have been reviewed.

#### Karyotis Project

The Division had the full responsibility for the contribution of the Department of the hydrologic input to this project. In this regard the Division prepared and submitted to the Consultants the following:

Mean daily observed flows, monthly, annual and maximum monthly flow for 1982-84 together with rating curves for Karyotis river (3 weirs) Atsas (2 weirs) Elea river (2 weirs) and Peristerona river (2 weirs).

The depth-area-rainfall was processed and provided for the period of 1916-1984 for the same catchments as above.

Selected flood events and the rainfall associated with them have also been supplied for the flood evaluations of the project.

Sediment data have been provided for all the rivers in the area.

Observed data (1966- 1982) and simulated flow series (1916-1982) for Karyotis, Atsas, Elea and Peristerona rivers were prepared.

Monthly and annual depth-area rainfall for the Marathasa river were also compiled and provided to the consultants. Also the available daily observed flows were produced for three measuring sites on the Marathasa river.

Finally the Division participated in meetings and consultations regarding the hydrologic input required for this feasibility study.



## Improvement of Hydrological Data Acquisition and Processing Project (CYP/81/002)

This project which provided an overall assessment of the current methodology of hydrologic data acquisition and processing in Cyprus and indicated the need for further refinement and demand for additional data according to the present and future needs for water management in the country was practically completed in 1985. The Division participated to a very large extent in the discussions, provision of data and assessment of the submitted reports.

### Other Project and Studies

During the year under review the following hydrologic studies were carried out, continued or initiated:

- Pedhieos River at the proposed damsite at Moulos
- An alternative site for the treatment and temporary storage of the Limassol Waste Water
- Study on the flow of Maroullena river (Ayia Koroni)
- Ormidhia antiflood dam
- Inia Irrigation works; Development of the runoff of Elin tis Petras stream.

### Groundwater Hydrology Branch

The work carried out during the year by this Branch of the Division in the framework of the various projects of the Department was as follows:

#### Southern Conveyor Project

- A plan for the groundwater utilization within the S C P in the Kokkinokhoria area was developed and proposed for discussion during the Advisory Committee meetings. This plan involved three alternatives for which indicative costs for their implementation were put forward.
- Groundwater surveys and evaluations were carried out for the Vrysoulles and Paralimni areas for consideration of their possible inclusion in the S C P irrigation network.
- The developing groundwater conditions in the Kokkinokhoria aquifer, Kiti-Pervolia area, Pareklisia aquifer and Akrotiri area were continued to be monitored and assessed throughout the year. Electrical conductivity surveys

were carried out at Akrotiri, Yermasoyia and Kokkinokhoria aquifers for monitoring the sea intrusion trend.

- A pilot groundwater survey in the Kokkinokhoria over 2 sq.km. (Ormidhia and Liopetri) has shown that since 1980 the number of wells was doubled whilst the yield per hour was reduced to half of what it was. The overall extraction has though remained the same. The decline of the water-table continues at about 1.5 to 2 m per year.
- Proposals have been prepared for a new groundwater abstraction and well inventory survey to be carried out in 1986.

#### Maroni Gypsum Aquifer

After the construction of the dam on the Vasilikos river and the diversion structure at Vavla on Maroni river, diverting water to the Dhyptomamos dam the recharge of the gypsum aquifer has diminished considerably. This has been further reduced by the realignment of the Maroni river in the sinkhole area for safety reasons:

To augment the recharge, three boreholes have been drilled in the artificial river course with the aim of penetrating into the gypsum. These boreholes are expected to develop into sinkholes and allow recharge to occur into the gypsum aquifer. The boreholes drilled are the following.

Serial No.	Total depth (m)	Comments
118/85	48.8	Unsuccessful - No gypsum was met
124/85	33.5	Isolated blocks of gypsum were met. Infiltration expected is small. Perforated casing (PVC) for the first 8m was installed
132/85	46.3	Two karstic openings were found of 60cm length at 36.6 - 37.2 m and 37.5 - 38.1 m. 13 inch perforated casing was installed for the first 5.5 m. The rest of the borehole stands without casing.



#### Use of Radioisotopes in Hydrology:

The sampling of groundwater in the area of the Kouris Delta aquifer was extended to cover the whole of the Akrotiri aquifer. The analytical work for Tritium and the Stable Isotopes is being done in Vienna at the International Atomic Energy Agency which finances this study. The groundwater flow regime, sources of recharge and magnitudes as well as residence time of the water in the aquifer are the expected output of the Tracer mathematical model being developed for this area. The model is being developed on an IBM PC AT microcomputer which has been provided by the IAEA in September 1985.

In addition to the above the IAEA is financing a study of the conjunctive use of the Yermasoyia aquifer with the dam. Samples of water have been collected during releases of water from both the surface and the groundwater. This study will enable a more efficient operation of Yermasoyia aquifer sustained by releases from the dam.

#### Limassol Water Supply from the Yermasoyia reiverbed.

A study on the Yermasoyia aquifer has resulted to the limiting quantities that can be supplied from the aquifer. This has indicated that the maximum daily supply (physically possible) is 30,000 m<sup>3</sup>/day and the mean daily supply is 22,000 m<sup>3</sup>/day. Such yields of course will greatly depend on the maintenance of a certain height of the water-table which can be accomplished only by releases from the dam, both upstream and downstream of the Limassol wellfield. The estimated total yield of the system (dam and aquifer) at high reliability is about 9.5 MCM. Plans to enable such releases have been put forward for implementation.

#### Karyotis Project

On the request of the Consultants, data and information have been supplied for the development of a groundwater mathematical model for the lower Karyotis area and Pendayia aquifer.

The following have been processed and provided to the Consultants:

- Maps indicating thickness and base of the aquifer
- Transmissivity and specific yield values
- All available groundwater levels up to 1974
- Groundwater extraction from each borehole up to 1974

- Estimates on the monthly recharge from riverflow and local rainfall.

Water Resources Management and Operation Branch

Kouris Delta Emergency Scheme

The boreholes of the Kouris Delta continued to supplement the supply from Yermasoyia and Polemidhia Dams for the irrigation of some areas in Akrotiri-Phasouri. The total quantity extracted during 1985 from the Kouris Delta aquifer was 2.2 MCM from 7 boreholes. From this quantity, 0.35 MCM was exported for the recharge of the Yermasoyia aquifer utilizing the same conveyor that imports water from Yermasoyia Dam for irrigation during the summer period.

During the year, 4 new boreholes were drilled in the area, 3 for the Limassol Water Supply and 1 for observation purposes. Data on these boreholes are given on the table below:

TABLE III-1  
DRILLING AND PUMPING TESTS IN THE KOURIS DELTA AQUIFER

Borehole								Recommended	
Ser No.	No.	Purpose	Elev. MAMSL	Depth (m)	Casing $\emptyset$ (inch)	Bridge slotted screen (m)	Transm. $m^2/d$	P.Suct. (m)	Yield $m^3/h$
76/85	1581	Limas- sol W.S.	19.84	79.3	10	48.8 - 73.6		75	Not tested
130/85	1580	"	20.06	79.3	10	48.8 - 73.6		75	Not tested
155/85		"		58.2	10	32.9 - 51.2	8250	54	180
109/85	1582	Obser- vation	4.11	42.7	4	6-42.7(Perfor.)	-	-	-

The performance of the aquifer was monitored during the year and on a monthly and or a 15-day base the water level, quality changes and progressive yield records were monitored.

Yermasoyia Riverbed aquifer

The extraction from the Yermasoyia riverbed aquifer for the water supply of the Limassol Town, as well as of the Amathous, Yermasoyia, Potamos Yermasoyias and the Moutayiaka village for the last 4 years depends almost on the



controlled releases of water from the Yermasoyia dam.

The total extraction from the aquifer in 1985 for water supply purposes was 6.576 MCM as follows (m<sup>3</sup>):

Limassol W.S.	Amathous	Yermasoyia	Potamos Yermasoyias	Moutayiaka	Total
4 514 120	557 850	101 470	801 890	600 470	6 575 800

To maintain the extraction, releases were made from the dam and some quantities of water were imported from the Kouris Delta area for recharge of the aquifer. A total of 3.771 MCM were recharged into the aquifer as follows:

Period	Quantity (MCM)
18 February - 26 February	0.383
12 March - 5 May	0.350 (Imported from Kouris Delta)
3 June - 14 June	0.893
22 July - 9 August	0.980
16 September- 30 September	0.625
11 November - 29 November	0.540
Total .....	2.771 MCM

During the year five water supply boreholes were drilled in the Yermasoyia aquifer. Four were for the Limassol W.S. and one for the Amathous water supply. Data on these boreholes are given on the table that follows.

TABLE III-2

DATA OF THE OBSERVATION BOREHOLES IN THE YERMASOYIA AQUIFER								Recommended	
Ser. No.	H.No.	Purpose	Elev. MAMSL	Depth (m)	Casing Ø (inch)	Bridge-Slotted Screen (m)	Trans. (m <sup>2</sup> /d)	P.Suct. (m)	Yield (m <sup>3</sup> /h)
73/84	1081	L/sol W.S.	20.67	51.2	10	24.4-30.5 36.6-48.8	7700	33.0	180
25/85	1100	"	21.28	48.8	10	24.4-42.7	5600	44.5	200
33/85	1101	"	18.56	51.8	10	24.4-42.7	7090	45.0	200
54/85	110	"	15.93	49.4	10	24.4-42.7	8500	45.0	200
49/85	1099	Ama-thous	33.91	42.7	10	24.4-36.6	3670	38.0	120

The monitoring of all the hydrologic and hydrogeologic changes was maintained throughout the year.

### Artificial Recharge Studies

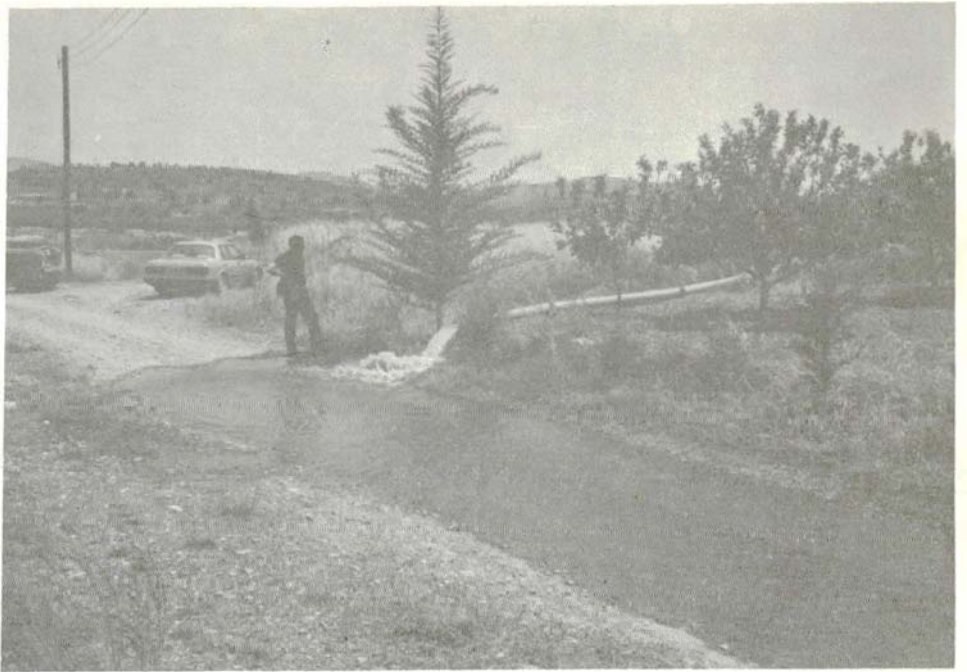
a) For the purpose of evaluating the artificial recharge potential in the Akrotiri alluvial aquifer, the Division planned, equipped and monitored the existing recharge pond in the Phassouri plantation (0.054 MCM storage capacity).

For this purpose the inflow from Kouris diversions into the pond, the overflow and one intake used for irrigation were equipped with weirs and continuous automatic water level recorders. Also a storage capacity curve was prepared for the pond and a limnigraph recorder was installed. Existing observation wells and boreholes (11) were also monitored every 15 days. In the period of November 1984 to May 1985 a total of 2.412 MCM were entered into the pond. Of this quantity 0.321 MCM were used for irrigation, spilled and evaporated allowing a total of 2.091 MCM to infiltrate into the groundwater. The average infiltration rate was 13000 m<sup>3</sup>/day. This information is expected to be useful both in the water-balance evaluation of this aquifer but also in the case of designing similar waterworks in the future.

b) For the purpose of increasing the riverbed recharge from Kouris to counter-balance the increased extraction due to the Kouris Delta emergency scheme, the riverbed upstream and downstream the M1 was levelled at a cost of £ 7,000 to allow spreading of the riverflow and provide greater opportunity for recharge. The effect was very well marked by the rise of the groundwater in the general immediate area as depicted by the groundwater contours.



Preliminary pumping test  
of BH 33/85 in  
Yermasoyia AQUIFER  
drilled for the Limassol  
Water Supply  
WDD Photo C16EN-8 (8.5.85)



Observation of  
the Water Level  
at the Phassouri  
recharge pond  
17.1.85



Kouris Delta recharge  
in the spreading grounds  
south of the M1 bridge  
WDD Photo B86EN-38(13.1.85)





## IV

### INVESTIGATIONS AND LABORATORY BRANCH

by Ch. Kritiotis EEI, Head

#### General

During 1985 the work of the Site Investigations, Laboratory and Grouting Section of the Division of Planning, related to a number of major and more minor projects undertaken by the Department. Furthermore, at the request of other Government, Semi-Government and Private organizations, a number of projects were undertaken and completed during the year.

The increased volume of work noted in previous years persisted in 1985 and this led to the full utilization of available machinery and equipment throughout the year.

Site investigation work performed was mainly involved with subsurface geological, foundation and construction material investigations at the feasibility and final design study stages and during construction.

Departmental projects for which site investigation work was carried out were as follows:

- Southern Conveyor Project: Akhna Terminal Storage Reservoir, Kouris Dam, Kokkinokhoria Irrigation Area, Main Conveyor.
- Vasilikos-Pendaskinos Project: Drilling for earthing purposes, Maroni River Diversion (grouting).
- Krasokhoria Project: Platys Dam, Apsiou Pond, Xylourikos Dam.
- Khrysokhou Irrigation Project: Evretou Dam.
- Karyotis Project: Ayios Theodoros Dam, Panayia Reservoir.

Site investigation or drilling work undertaken for others was of a very diverse nature and included:

- Site investigations for Public Works Department: Ayia Napa-Makronisos road, New Nicosia-Larnaca road.
- Foundation investigations for Department of Town Planning and Housing: Anglisidhes-Tersephanou Housing estates, Taht-el-Kale (N'sia) Housing estate (grouting).
- Foundation Investigations for a number of private organisations.

Following the example of previous years and for geological investigations, a very close collaboration was maintained with the Engineering Geology Section of the Geological Survey Department.

#### Laboratories

The work of the Laboratories Section may be distinguished into that of the main and field laboratories. In the main (soils/concrete) laboratories in Nicosia, tests were performed in connection with the foundation and construction material investigations relating to Departmental projects. Tests were also performed at the request of other Government and semi-Government Departments and private organizations.

The work carried out by the Central Laboratory is analysed in Table 1 with relevant details as to the number and type of tests performed for each project.



SOIL LABORATORY TESTS DURING 1985

CONCRETE

PROJECT	SCP		VPP		KIP	KRASOKHORIA		SMALL PROJECTS					Tenders	Total	Private Firms	Total	
	Kouris Dam	Akhna Dam	Dhyptomamos Dam	Kalavassos Dam	Evretou Dam	Platys Dam	Kouklia	Xylourikos Dam	Apsiou Dam	Xeropoulos Dam	Anaphotia Rech. Reser	Private Firms					Miscellaneous
Sieve Analysis	-	44	1	2	19	4	1	-	-	-	1	3	5	95	175	9	9
Hydrometer	15	8	-	-	29	31	16	8	9	1	-	-	3	-	120	-	-
Atterberg Limits	15	8	-	-	4	31	16	8	9	1	-	-	3	-	96	-	-
Specific Gravity	15	8	-	-	29	31	16	8	9	1	-	-	3	-	120	-	-
Moisture Content	-	-	-	-	-	31	-	-	-	-	-	37	185	-	253	-	-
Compaction Test	3	8	-	-	6	5	-	8	-	-	-	-	-	-	36	-	-
Permeability	4	-	-	-	6	5	-	-	-	1	-	-	-	-	16	-	-
Drained-Un-dr. Triaxial	-	1	-	-	8	-	-	-	-	-	-	-	2	-	11	-	-
Pin Hole	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4	-	-
Shear Box	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-
Relative Density	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-
Water Absorption	-	-	-	-	2	-	-	-	-	-	-	3	-	-	5	-	-
Linear Shrinkage	-	-	-	-	4	-	-	-	-	-	-	-	-	-	4	-	-
Swelling Pressure	-	-	-	-	-	-	-	-	-	-	-	-	7	-	7	-	-
Consolidation	2	-	-	-	2	-	-	-	-	-	-	-	-	-	4	-	-
Crushing Value	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-
Soundness	-	-	-	-	5	-	-	-	-	-	-	-	-	-	5	-	-
Los Angeles	-	-	-	-	5	-	-	-	-	-	-	-	-	-	5	1	1
Colour	-	-	-	-	-	-	-	-	-	-	-	-	-	10	10	-	-
Crushing Strength(cores)	-	-	-	-	9	-	-	-	-	-	-	-	-	-	9	-	-
Cube Crushing Str. ....	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	752	752
<b>TOTAL</b>	<b>54</b>	<b>77</b>	<b>1</b>	<b>2</b>	<b>131</b>	<b>142</b>	<b>49</b>	<b>32</b>	<b>27</b>	<b>4</b>	<b>1</b>	<b>44</b>	<b>208</b>	<b>105</b>	<b>877</b>	<b>762</b>	<b>762</b>

IV  
TOPOGRAPHY BRANCH

by A Evripidhou  
Senior Technical Superintendent  
Head of Branch

The Topography Branch operates within the Planning Division of the Department of Water Development and conducts all the survey work of the Department. These surveys are of the engineering type and are carried out during the investigations, design, construction and post-construction stages of projects under investigation.

The Branch is headed by a Senior Technical Superintendent and staffed with 6 Technicians I, 5 Technicians II, 4 Technicians II, on a temporary basis, 12 regular Rodmen, 4 Drivers and 10 Casual Labourers.

All modern surveying instruments are available and these are being used by the staff, who received training in the Topography Branch and undertake assignments such as:- profile levelling, cross sectioning, contour surveys, setting out of project outlines, instrumental observations for movement or deformation detection of major structures, sedimentation of reservoirs etc.

Main areas of activities of the Topography Branch during the year 1985 were the Southern Conveyor Project, Krasokhoria Project, Vasilikos-Pendaskinos Project, Pitsilia Project and Khrysokhou Project. A list of the surveys conducted during the year is given below:-

SURVEYING WORK CONDUCTED DURING  
1985

Southern Conveyor Project

- . Kouris Dam - Extension contour survey for spillway area - Contour survey of the reservoir.
- . Main Conveyor - Setting out most of the route between "Vounaros" area and "Tsirion" stadium and Zyyi area to Mazotos Village for Land Aquisition purpose - Minor changes on the route - Setting out and profile levelling
- Setting out and profile levelling of new route from Larnaca Free Zone to Dhekelia Garisson Area
- . Kokinokhoria Extension Irrigation Scheme - Extension of site surveys - Alternatives Routes - Setting out and profile levelling
- . Break Pressure Tanks - 3 Nos. Setting out, profile levelling and cross sections for the Access Roads

Vasilikos Pendaskinos Project

- . Ayios Theodoros Irrigation Scheme - Setting out of Roads - Setting out of Access Roads - Profile levelling and cross sections
- . Maroni Irrigation Scheme - Setting out of Pipelines and profile levelling
- . Kalavastos Dam - Setting out of Access Roads, profile levelling and cross sections.
- . Kalavastos Irrigation Scheme - Setting out of routes for pipelines and Roads - Profile levelling.

Karyotis Project

- . Panayia Dam - Site Survey - Extension
- . Kakopetria - Galata - Diversion Sites, contour survey



- . Ayios Nikolaos Dam - Damsite (Extension) and Reservoir contour survey
- . Asinou Dam - Damsite and Reservoir contour survey
- . Ayios Theodoros Dam - Extension Damsite survey

#### Krasokhoria Project

- . Ayios Therapon Pond - Site survey
- . Ayios Amvrosios Pond - Extension site survey
- . Kouklia Pond - Extension site survey - Monumentation for the pipeline and the weirsite
- . Apsiou Pond - Setting out of pipeline.
- . Xylourikos Dam - Reservoir Contour Survey. Main Conveyor - Setting out (provisionally)
- . Platys Dam - Reservoir contour survey

#### Khrysokhou Watershed Irrigation Project

- . Evretou Main Conveyor - Setting out route for pipeline and profile levelling
- . Pomos Dam - Main Conveyor - Setting out
- . Argaka Dam and Intake - Main Conveyor - Setting out

#### Routine Works

- . Aradhippou antiflood works - Extension site survey
- . Ormidhia antiflood works - Extension site survey
- . Laghoudhera Pond - Extension site survey
- . Aradhippou Recharge Scheme 2 No. Dams - Site surveys
- . Ora Pond - Extension site survey
- . Kannavia, Ayia Irini, Spilia Irrigation Scheme - Conveying M.S.L. datum
- . Ayios Yeorghios Kafkallou - Site survey
- . Ayia Napa Exist. W. Supply Scheme - Levelling
- . Ayia Irini Pond No.4 - Contour survey
- . Yerakies, Kambos and Tsakistra Exist. Irrigation Scheme - Levelling
- . Lakatamia and Anthoupolis Recharge Scheme - Site Survey
- . Athienou Recharge Scheme - Site survey
- . Dhali Waste Disposal Scheme - Site survey and profile levelling
- . Ora Pond Conveyor - Setting out and profile levelling
- . Paralimni Pond - Contour survey for sediments
- . Phasouri Pond - Cross sectioning for sediments
- . Potamia and Ayios Sozomenos Septi Tanks - Contour survey
- . Measurements on settlement markers for Kalopanayiotis, Lefkara, Xyliatos Dams and Khirokitia Treatment Plant.

## V DIVISION OF DESIGN

by N.P. Stylianou  
Senior Water Engineer  
Head of Division

### Introduction

The Design Division of the Water Development Department deals mainly with the preparation of detailed designs of major projects undertaken by the Department. These projects may involve the design of dams, ponds and other hydraulic structures, irrigation networks and domestic water supply schemes.

In case such works are to be constructed by contract, the designs are supplemented with all necessary contract documents.

The Division is also involved with the design work for major projects assigned to Consultants. This work is supervised and eventually reviewed by this Division.

Although in principle the activities of the Design Division are within the above mentioned frame of works, it is often required to extend its activities by undertaking the preparation of feasibility studies for projects of local importance. The activities of this Division extend even further into assisting in the supervision of the construction works, either to ensure that construction is carried out in full agreement with the designs and specifications or to help in solving problems encountered during the construction stage.

In addition to the Division Branches involved in the above mentioned type of works, this Division incorporates the Drawing and Records Branch of the Department. This Branch carries out all



drawing work of all major and minor projects, keeps the technical records, helps in the preparation of technical reports, runs the library of the Department and undertakes all photographic, video filming, reproduction and photo-process lab work.

#### **SUMMARY OF ACTIVITIES**

The main activities of the Design Division during 1985 was the continuation of the work on the detail studies and final design of the Irrigation Network for the Khrysokhou Irrigation Project. The work included the detail design and preparation of construction drawings and contract documents including specifications, bill of quantities and Conditions of Contract.

Contract documents were prepared for two civil contracts and for a number of supply contracts, as follows:

1. Contract for the construction of field roads and the installation of the irrigation network.
2. Contract for the construction of night storage ponds and the installation of the main pipeline conveyor.
3. About five supply contracts for the supply of pipes, fittings, valves, hydrants, water meters etc.

During the first phase of the Project an area of about 2000 hectares gross will be irrigated from Evretou Dam. The area extends from Skoulli village northwards into Khrysokhou valley. The irrigated area has been divided into irrigation units of about 3 hectares in size but some smaller units have also been formed. The maximum irrigation design discharge was generally assumed to 0.6 l/sec/ha. More details concerning the Khrysokhou Project are given in the appropriate section of this report.

DRAWING AND RECORDS BRANCH  
 by S C Pitsillides STS  
 Head of Branch

The Drawing and Records Branch is made up of the following sections:

- The Drawing and Cartography Section
- The Plan Registry and Plan Reproduction Section
- The Photographic Section and Photo Process Laboratory and
- The Technical Library and Technical Information Section

At the end of 1985 the Drawing and Records Branch numbered 18 staff i.e. 12 Technicians I, 4 Technicians II and 2 hourly paid assistants of the plan reproduction section. For varying periods of the year five Technicians travelled every day to the construction sites of Kouris Dam, Kornos Treatment Plant and Khirokitia offices for VPP and SCP. By the end of the year only one of these four Technicians worked away from HQs, at Khirokitia.

The work carried out by the Drawing and Records Branch during 1985 is listed on Table V -

TABLE V - 1  
WORK CARRIED OUT BY THE DRAWING AND RECORDS BRANCH DURING 1985

Ref.	Description	Time spent in hours	Man months	% of total
a	Existing dams (completion plans, sedimentation maps, control monuments etc) .....	1380	8.89	3.87
b	Irrigation distribution systems for dams .....	144	0.93	0.40
c	Routine irrigation schemes .....	343	2.21	0.96
d	Routine domestic water supply schemes .....	2423	15.61	6.80
e	Krasokhoria Project .....	1069	6.89	3.00
f	Pitsilia Project (Completion plans) .....	1642	10.58	4.61
g	Vasilikos-Pendaskinos Project .....	6076	39.14	17.06
h	Southern Conveyor Project .....	6094	39.26	17.11
i	Khrysokhou Watershed Irrigation Project .....	274	1.77	0.77
j	Karyotis Project .....	247	1.59	0.69
k	Larnaca - Orini Project .....	194	1.25	0.54



### Drawing and Cartography Section

The largest load of work was for the Southern Conveyor Project and the Vasilikos-Pendaskinos Project as can be seen on table V- This is due to the fact that members of the Drawing Branch staff have been assigned to SCP and VPP sites in addition to work carried out at HQs.

The inauguration of the Vasilikos-Pendaskinos Project demanded, on short notice, a lot of extraordinary work for the Drawing Branch staff such as the preparation of technical data posters for Kalavassos and Dhyptomamos dams, photograph exhibition and a full colour brochure for the occasion. The VPP brochure was printed in adequate quantities to serve as a handout for all interested in the project.

During 1985 the cartography section started the compilation of all WDD major works and pipelines with the aim of over printing this information on large scale maps in cooperation with the Department of lands and surveys.

### Plan Reproduction and Plan Registry Section

A number of 31,150 prints were prepared of all types and sizes through some 2500 orders to the Printing Section.

Plan registry work was shared by the Drawing & Records Branch staff.

### The Photographic Section and Photo Process Laboratory

Photographic coverage of construction works of the Department was carried out throughout 1985 in black and white, colour and colour slides still photography as well as colour 16 mm cine filming and video recording. Full coverage of VPP continued throughout 1985 and periodic visits were made to Kouris Dam and Evretou Dam although the responsibility for photographic coverage of these two dams lies with the respective contractors.

New pieces of equipment were purchased in 1985 with the aim to enable us to piece-together material and produce short documentary video recording of projects. These were video recorders, TV monitor, cassette deck for sound dubbing and a video effector through which the short documentaries will be pieced together.

The Photo Process Laboratory carried out all the photolithographic work of the Department including preparatory work for colour maps, base maps for the SCP distribution networks for Kokkinokhorra as well as enlargements, reductions and reproduction of drawing.

TABLE V-1 (Cont.)

Ref.	Description	Time spent in hours	Man months	% of total
l	Recharge works .....	18	0.12	0.05
m	Antiflood works .....	196	1.26	0.55
n	River training works .....	--	--	--
o	Watershed surveys .....	12	0.08	0.03
p	Hydrological .....	155	1.00	0.44
q	Programmes and organisation .....	898	5.79	2.52
r	Computer lessons .....	148	0.95	0.42
s	Productivity centre course .....	--	--	--
t	Sewage disposal .....	428	2.75	1.20
u	Completion plans and reports .....	1008	6.49	2.83
v	Reports .....	989	6.37	2.78
w	Emergency schemes .....	--	--	--
x	General - Odd jobs .....	891	5.74	2.50
y	Auxiliary services			
	(i) Library .....	1543	9.94	4.33
	(ii) Plan Registry .....	603	3.88	1.69
	(iii) Plan reproduction .....	2039	13.13	5.72
	(iv) Drawing materials store .....	463	2.98	1.30
	(v) Photographic section and photo process lab	1863	12.00	5.23
	Total for auxiliary services .....	6509	41.94	18.27
z.	Leave etc			
	(i) Leave paid .....	2484	16.00	6.97
	(ii) Leave without pay .....	110	0.71	0.31
	(iii) Sick leave .....	1315	8.47	3.69
	(iv) Maternity leave .....	309	1.99	0.87
	(v) D.C. ....	271	1.75	0.76
	Total for leave etc. ....	4488	28.91	12.60
	Grand total .....	35623	213.19	100%



## Technical Library and Technical Information Section

In 1985 C£1464.03 was spent on the purchase of 48 technical books and subscription to 16 periodicals. The Library continued to issue monthly notes on material received and of articles of special interest in periodicals. Following are lists of books purchased, of periodical subscriptions and of WDD reports.

### *Books Purchased*

MAX W ABRAHAMSON. Engineering law and the I.C.E. contracts. Great Britain 1979. Book No. A 375. C£ 44.00.

AWWA. Water distribution library set. US\$ 105.00:-

- Water distribution. Operator training handbook. USA, 1976. Book No. A 350.
- Basic management principles for small water systems. USA, 1982. Book No. A 351.
- Design and construction of small water systems. A guide for managers. USA 1984. Book No. A 352.
- Distribution systems - Actions and innovations. USA, 1980. Book No. A 353.

CENTRAL BOARD OF IRRIGATION AND POWER. US\$ 45.00

- Post session proceedings of the symposium on water management: Experiences of the past and direction for future, New Delhi 1-3 July 1983. Book No. A 383.
  - Symposium on modernisation of irrigation systems New Delhi, April 2-4, 1979. Book No. A 384.
  - Symposium on water management: Experiences of the past and directions for future. Volumes I and II. New Delhi, 1983. Book Nos A 385, A 386.
- J R ILLINGWORTH. ICE works construction guides. Site handling equipment. London 1982. Book No. A 394. St£3.75.

- T M MEGAW. ICE works construction guides. Tunnelling. London 1982. Book No. A 395. St£ 3.50.
- J K BALLANTYNE. ICE works construction guides. The resident engineer. London 1983. Book No. A 396 St.£3.50.
- C G GUNNERSON-J M KALBERNATTIN. Appropriate technology in water supply and waste disposal. New York, 1979. Book No. A 397. St.£18.95.
- G C BYE. Portland cement. Composition production and properties. Great Britain 1983. Book No. A 398. St.£7.50.
- ASCE-JOINT COMMITTEE. Financing and changes for wastewater systems. Book No. A399. St.£3.25.
- ASCE. Gravity sanitary sewer design and construction. New York, 1982. Book No. A400. St£22.25.
- ASCE-AWWA-CSSB. Water treatment plant design. New York 1971. Book No. A 401. St£11.50.
- ASCE-WATER POLLUTION CONTROL FEDERATION. Design and construction of sanitary and storm sewers. New York 1982. Book No. A 402. St£18.90.
- HYDRAULICS RESEARCH. Tables for the hydraulic design of pipes and sewers. Wallingford, 1983. Book No. A 403. St£12.50.
- SAWYER-GILLIOTT. The Fidic conditions. Digest of contractual relationship and responsibilities. London 1981. Book No. A 404. St£12.75.
- W E I. ARMSTRONG. Contractual claims under the ICE conditions of contract. Great Britain. Book No. A405 St£6.00.
- J PARRIS. Casebook of arbitration law. London, 1976. Book No. A406. St£18.25.
- GLYN P JONES. A new approach to the international civil engineering contract. London, 1976. Book No. A407. St.£15.00.
- G A HUGHES. Building and Civil Engineering claims in perspective. London, 1983. Book No. A408. St£30.00.
- ICE. Civil engineering procedure. London, 1978. Book No. A409 St£7.00.
- E J PARKER. Accounting for maintenance. Planning and control of plant and vehicles. London, 1978. Book No. A410 St£10.50.
- EZIO LEFORATI. The assessment of structural safety. England, 1979. Book No. A411 St£21.87.
- GRANVILLE CALDER. The principles and techniques of engineering estimating. England, 1976. Book No. A412 St£6.00
- MARTIN BARNES. Measurement in contract control. London, 1977. Book No. A413 St£17.00
- J COTTINGTON & R. AKINHEAD. Site investigation and the law. Great Britain, 1984. Book No. A414. St£15.00



JOHN PARRIS. Arbitration. Principles and practice. Great Britain, 1983. Book No. A 453. Stg.\$18.75.

ASCE. Seismic response of buried pipes and structural components, USA, 1983. Book No. A455. Stg\$11.25.

ASCE. Wastewater treatment plant design. Manuals and reports on engineering practice - No. 36. USA, 1977. Book No. A454. Stg.\$16.25.

WORLD HEALTH ORGANIZATION. Guidelines for drinking-water quality. Vol.1. Recommendations. Geneva, 1984. Book No. A498. C\$4.50.

ELEVENTH INTERNATIONAL CONFERENCE ON SOIL MECHANICS AND FOUNDATION ENGINEERING. Proceedings of the eleventh international conference on soil mechanics and foundations engineering. San Francisco - 1985. Volumes 1-4, The Netherlands 1985. Book Nos A501-A504. US\$261.95.

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD. Irrigation with reclaimed municipal wastewater. A guidance manual. USA, 1984. Book No. A496. \$13.00.

K KESHISHIAN. Famagusta town and district Cyprus, Nicosia, 1985. Book No. A547. C\$10.00.

BSI. CP110: Part 1:1972. The structural use of concrete Part 1: Design materials and workmanship. London, 1972. Book No. A297. C\$ 27.00.

BSI. CP 110: Part 2: 1972. The structural use of concrete Part 2. Design charts for simply reinforced beams doubly reinforced beams and rectangular columns. London, 1972. Book No. A298. C\$22.00.

D WALLACE. The ICE conditions of contract. London, 1978. Book No. A299. C\$ 45.00

ICE. Civil engineering standard method of measurement London, 1976. Book No. A300 C\$.6.00.

L.S. BLAKE. Civil engineer's reference book. England, 1975 Book No. A 301. C\$ 50.00.

G N SMITH. Elements of soil mechanics. Great Britain, 1982. Book No. A 302. C\$8.95.

W H MOSLEY-J H BUNGV. Reinforced concrete design. London, 1981. Book No. A 303. C\$ 8.95.

C E REYNOLDS - J STEEDMAN. Reinforced concrete designer's handbook. London, 1981. Book No. A 304. C\$ 17.00.

1985 S u b s c r i p t i o n t o P e r i o d i c a l s

ASCE. Construction engineering and management US\$ 44.50

ASCE. Geotechnical engineering US\$82.00

ASCE. Hydraulic engineering US\$ 103.00

ASCE. Irrigation and Drainage engineering US\$4100

ASCE. Structural engineering US\$130.50  
ASCE. Surveying engineering US\$29.00  
ASCE. Water resources planning and management. US\$51.00  
AWWA. Journal. US\$75.00  
Employment Gazette. Stg. £34.50.  
Water and waste treatment Stg. £26.50

Journal of the irrigation engineering and rural planning US\$36.00  
International water report US\$37.00  
Journal of the institution of water engineers and scientists  
Stg. £30.00  
Concrete magazine US\$60.00  
ICE Proceedings Stg. £94.00  
ICE Geotechnique Stg. £65.00

#### *WDD Reports (21 Nos)*

PH PHOTIOU. Chakistra irrigation scheme. Mini feasibility study.  
Nicosia, January, 1985. Report No. D/149. Book Nos A307, A308.

PH PHOTIOU. Yerakies irrigation scheme. Mini feasibility study. Nicosia  
January 1985. Report No. D/150 Book Nos. A309, A310.

K SPANOS. Khrysokhou irrigation project. Progress report No.3. Covering  
the period from 1.7.84-30.9.84. Nicosia, December, 1984. Report No.  
D/303. Book Nos A311, A312.

K C HASSARIS. Water supply review unit cost of water to Nicosia,  
Larnaca and Famagusta areas for the years 1983, 1984, 1985. Nicosia,  
February 1985. Report No. L/30. Book No. A313, A314.

TAY. Μεγάλα υδατικά έργα. Ασυκασία, Οκτώβρης 1984. Αρ. εκθέσεως  
L/28. Αρ. βιβλίου A315.

WDD. Dam storage data 1984. Book Nos A316, A317.

PH PHOTIOU. Chakistra irrigation scheme. Mini feasibility study.  
Nicosia, April 1985. Report No. D/151. Book Nos. A 354, A355.

PH PHOTIOU. Kambos irrigation scheme. Mini feasibility study.  
Nicosia, April 1985. Report No. D/152. Book Nos A 356, A357.



T E H SABBEN CLARE. Vasilikos-Pendaskinos Project. Progress report No.13. Covering period from 1.7.84 to 31.12.84. Nicosia, February, 1985. Report No. D/213. Book Nos A358, A359.

K SPANOS. Khrysokhou irrigation project. Progress report No.4, Covering the period from 1.10.84 to 31.12.84 Nicosia, April 1985. Report No.D/304. Book Nos A 360, A 361.

I IACOVIDES. Krasokhoria integrated rural development project. Interim hydrological input. Nicosia January 1985. Report No.H/61. Book Nos A 362, A363.

Σ IOUCLAIDES. Geotechnical investigation. CYTA-Kakoratsia. Nicosia, January 1985. Report No. F/82. Book Nos A364,A365.

D M PATSALIDES. Southern conveyor project (Phase I) progress report No.1 covering period up to 31.3.85. Report No.D/401. Nicosia, May, 1985. Book Nos. A415,A416.

I IACOVIDES - A GEORGHIOU - P SKORLIS - A CHRISTODOULIDES. Southern conveyor project. The water resources of the Kiti-Fervolia aquifer. Report No. H/55. Nicosia, May, 1985. Book Nos. A417, A437.

Π ΝΕΟΦΥΤΙΑΝΗΣ-Ν ΤΣΙΟΥΡΗΣ. Πενταετής Σχέδιο 1978-1983 Ενιαίας Αγροτικής Ανάπτυξης Ελλάδας. Αρδευτικό Έργο. Report No. C/151. Αευκωσία, Μάιος, 1985. Book Nos. A418 A419.

T E H SABBEN CLARE. Vasilikos-Pendaskinos project. Progress report No. 14. Covering period from 1.1.85 to 30.3.85 (Financial data to 31.7.85) D/214 Nicosia, August 1985. Book Nos A477, A478.

CHR IOANNOU - S STEPHANOU. Proposed modifications of the Khrysokhou irrigation project. Nicosia, September 1985. Report No. D/153. Book Nos A506, A507, A508.

A F GEORGHIADES. Khrysokhou irrigation project. Evretou dam. Status report on project implementation No.3, May-September 1985. Nicosia, October 1985. Book No. A517.

T E H SABBEN CLARE. Vasilikos-Pendaskinos Project. Progress report No.14 covering period from 1.1.85 to 30.6.85. (Financial data to 31.7.85). Nicosia, August 1985. Report No. D/214. Book Nos A509, A510.

K SPANOS. Khrysokhou irrigation project. Progress report No.5 covering the period from 1.1.85 to 30.6.85. Nicosia, September 1985. Report No. D/305. Book Nos A500,A499.

D M PATSALIDES. Southern Conveyor Project (Phase 1) Progress report No.2. Covering the period 1.4.85 to 30.9.85. D/402 Nicosia, December, 1985. Book Nos A569,A570.

## VI RURAL PROJECTS PLANNING DIVISION

by  
C Andreou  
Senior Water Engineer  
Head of Division

### Introduction

The Rural Projects Planning Division deals especially with rural domestic water supply and the planning and design of contributory irrigation schemes. Other activities of the Division is the rehabilitation of water supply and irrigation schemes, within the Pitsilia Integrated Rural Development Project, water supply schemes of touristic and livestock areas, encroachment in rivers and streams, quarrying in river beds, design of sewage systems for Refugee Housing Estates, the administration of capital aid from the Federal Republic of Germany, and the examination of applications for building permits and permits for the division of building plots.

By the end of 1985 the staff of the Division was consisting of the following:

- 1 Senior Water Engineer - Head of the Division
- 2 Executive Engineers Class I
- 1 Executive Engineer Class II
- 1 Senior Technical Superintendent
- 1 Technical Superintendent
- 3 Senior Technicians
- 2 Technicians I
- 1 Daily Paid Technician
- 1 Secretary - Typist

### VILLAGE WATER SUPPLY SCHEMES

The general village water supply situation during 1985 is described in Tables VI - 1 and VI - 2. There are no villages in Cyprus without piped water.

During 1985 only 56 out of a total number of 619 villages remained with public fountains ie 1.89% of the total village population.

Out of 563 villages with house to house supply systems 542 enjoyed a per capita daily rate of over 90 litres (20 gallons).



## Water Supply Schemes Prepared During 1985

A total number of 76 schemes were prepared and submitted to the District Officers during 1985, at a total estimated cost of £3,295,224 as shown on Table VI - 3.

Another 28 schemes were in the course of preparation by the end of the year as per Table VI - 4.

Besides the above mentioned schemes a total number of 10 water supply schemes were prepared for the housing of displaced persons (Refugee self-housing and housing estates), at a total estimated cost of £79,700 as per table VI - 3A, which were submitted to the Department of Town Planning and Housing.

In 1985, five schemes to supply water to livestock areas were prepared at a total estimated cost of £69,200 as per table VI - 3B.

Domestic water supply schemes for touristic areas are also included in the schemes already mentioned.

In cases where there are no established Water Boards, the Division deals also with the design of town water supply schemes.

### Brief Description of Important Water Supply Schemes prepared during 1985.

#### Nicosia District

Lymbia: Improvements to the existing house to house system. Total Estimated cost £75,000.

Xeri: Improvements to the existing house to house system. Total Estimated cost £81,000.

Klirou: A scheme to provide additional supply from B/H 51/83. Total estimated cost £72,000.

Ayia Marina (Xyliatou): A scheme to provide additional supply from B/H 131/84. Total estimated cost £35,000.

Akaki: Improvements to the existing house to house scheme. Total estimated cost £48,000.

Paleometokho: Improvements to the existing house to house system. Total estimated cost £113,000.

Yeri: Improvements to the existing house to house system. Total estimated cost £122,000.

#### Laphos District

Pomos: Overall improvement of existing water supply distribution system at a cost of £70,000

Khlorakas: Replacement of the main conveyor pipeline for the additional water supply to the village and the tourist area at a cost of £263,000.

Yiolou: Additional supply from the spring "Argaki ton Villourgon" at a cost of £39,000.

## IRRIGATION SCHEMES

The planning and design of irrigation schemes aims at increasing the irrigated area near the sources for self employed farming organizations such as Village Irrigation Associations or Divisions.

The main target is to increase permanent irrigation annually which can be implemented with the financial participation by the farmers.

As the main principles of this special programme is the quick and effective use of water at or near the source combined with intensive agriculture methods, design considerations are usually based on land and water use data furnished by the District Agricultural Offices. Project evaluation is undertaken by a Joint Interdepartmental Committee.

The advantages of the rural projects programme, the beginning of which dates back to the creation of the Department is "speed of reaction" in all phases of project development, "wide participation" of farming communities, "greater flexibility" in budgetary procedure and "greater exploitation" of the existing agriculture and agro-economic background of the island.

The planning and design of these schemes can be undertaken at a greater advantage by technical staff, whose skill has been acquired by long experience in construction methods and long friction with local problems and practices.

The main types of schemes planned and designed, postulated water conservation either by the improvement of the old obsolete intake and distribution system, the construction of small reservoirs for night or seasonal storage, the exploitation of new boreholes and the artificial recharge of depleted aquifers.

A certain number of schemes have been designed and are now under construction with government contribution.

During 1985 a total number of 22 irrigation schemes was prepared and submitted to District Officers at a total estimated cost of £285,230 as per Table VI - 5.

Another 48 schemes were in the course of preparation or under investigation by the end of 1985 as per Table VI - 7.

### Brief Description of Important Irrigation Schemes prepared during 1985

**Malopanayiotis:** Pumping scheme from B/H No. 104/77 at Fano Troullinos to supplement the irrigation of 70 donums of deciduous gardens at a cost of £31,000.

**Kato Moni:** Pumping scheme from B/H No. 14/84 for the irrigation of 75 donums of permanent crops and vegetables within the village area at a cost of £70,000.

**Arechiou:** Pumping scheme from B/H No. 58/81 for the irrigation of 60 donums permanent crops and vegetables at a cost of £27,000.

**Kambia:** Pumping scheme from B/H No. 105/83 for the irrigation of 126 donums of permanent crops and vegetables at a cost of £42,500.



Interdepartmental Committee for Small Irrigation Projects

The Committee is functioning in conformity with directions of the Director General of the Ministry of Agriculture and Natural Resources for the purpose of assessing project viability for budgeting purposes and co-ordinates the activities of the District Agriculture Services, for the supply of agro-economic data in the preparatory stages of the projects. During 1985, 11 schemes have been considered by the Committee as per Table VI - 6.

TABLE VI - 6

VILLAGE WATER SUPPLIES

Year	Villages with House-to-House distribution system				Villages with Public Fountains				Villages without a piped supply.			
	Schemes completed	Total No. of Villages	Villages %	Population %	Total No. of Villages	Villages %	Population %	Total No. of Villages	Villages %	Population %	Total No. of Villages	
1960	-	90	14.33	-	441	70.23	-	97	15.44	-	628	
1961	41	131	20.86	-	428	68.19	-	69	10.95	-	628	
1962	59	190	30.25	-	380	60.55	-	58	9.20	-	628	
1963	67	257	40.90	-	324	51.60	-	47	7.50	-	628	
1964	39	296	47.13	66.71	323	51.43	32.29	9	7.44	1.00	628	
1965	5	301	47.93	68.86	321	51.11	30.44	6	0.96	0.70	628	
1966	7	308	49.05	69.81	316	50.31	29.95	4	0.64	0.24	628	
1967	11	319	50.80	71.40	307	48.88	28.46	2	0.32	0.14	628	
1968	27	346	55.10	75.72	282	44.90	24.28	-	-	-	619	
1969	14	360	57.32	78.60	268	42.68	21.40	-	-	-	619	
1970	32	392	62.42	83.23	236	37.58	16.77	-	-	-	619	
1971	16	408	64.95	85.42	220	35.05	14.58	-	-	-	619	
1972	29	437	69.60	88.70	191	30.40	11.30	-	-	-	619	
1973	67	504	81.40	95.10	115	18.60	4.90	-	-	-	619	
1974	22	526	85.00	97.20	93	15.00	2.80	-	-	-	619	
1975	6	532	85.94	97.55	87	14.06	2.45	-	-	-	619	
1976	11	543	87.72	97.60	76	12.28	2.40	-	-	-	619	
1977	8	551	89.02	98.04	68	10.98	1.96	-	-	-	619	
1978	6	557	89.98	98.20	62	10.02	1.80	-	-	-	619	
1979	2	559	90.30	98.27	60	9.70	1.73	-	-	-	619	
1980	1	560	90.47	98.04	59	9.53	1.96	-	-	-	619	
1981	1	561	90.63	98.06	58	9.37	1.94	-	-	-	619	
1982	-	561	90.63	98.06	58	9.37	1.94	-	-	-	619	
1983	-	561	90.63	98.06	58	9.37	1.94	-	-	-	619	
1984	1	562	90.79	98.10	57	9.21	1.90	-	-	-	619	
1985	1	563	90.95	98.11	56	9.05	1.89	-	-	-	619	

TABLE VI - 2

## WATER SUPPLY SITUATION AT THE END OF 1985

District	Satisfactory piped supply supply rate: 90 litres/head/day & over			Unsatisfactory piped supply supply rate below 90 litres/head/day			Total popula- tion 1969
	No	%	pop.	No	%	pop.	
	Villages with House to House			Villages with House to House			Total No of Vill.
	No	%	pop.	No	%	pop.	
Micosia	150	88.76	119263	10	5.92	1230	169
Kyrenia	39	82.98	30786	2	4.26	59	47
Famagusta	82	83.68	82644	3	3.06	444	98
Limassol	104	91.22	72527	4	3.51	65	114
Paphos	111	84.09	48529	13	9.85	2109	132
Larnaca	56	94.92	40238	2	3.39	156	59
<b>TOTAL</b>	<b>542</b>	<b>87.56</b>	<b>393987</b>	<b>34</b>	<b>5.49</b>	<b>4063</b>	<b>619</b>



TABLE VI - 3

## VILLAGE WATER SUPPLY SCHEMES PREPARED IN 1985 AND SUBMITTED TO DISTRICT OFFICERS

Ser No.	Village	Nature of Scheme	Est. cost £
NICOSIA DISTRICT			
1	Crounda.....	Installation of valves.....	340
2	Yeri-Dhali		
	Indust. zone.....	Removing of pipes.....	4 700
3	Lymbia.....	Improvements to the exist house to house scheme.....	75 000
4	Astromeritis.....	Add. supply from BH 22/82/83...	31 000
5	Palekhorio (O).....	Extensions.....	1 300
6	Lakatamia.....	Extensions.....	3 400
7	Lakatamia.....	Add. supply from BH 120/84.....	20 000
8	Spilia.....	Installation of valves.....	1 200
9	Yeri.....	Improvements to the exist house to house.....	81 000
10	Gourri.....	Replacement of pipes.....	5 200
11	Perakhorio (N)....	Installation of chlorinator on BH 78/79.....	1 440
12	Klirou-Mitsero....	Replacement of pumping mains...	1 700
13	Malounda.....	Extensions.....	8 100
14	Kalokhorio (O)....	Replacement of pipes.....	11 000
15	Yeri .....	Replacement of pipes.....	10 200
16	Pharmakas.....	Replacement of pipes.....	2 700
17	Klirou.....	Replacement of pipes.....	23 500
18	Yeri.....	Laying of new pipes.....	4 700
19	Klirou.....	Add. supply from BH 51/83.....	72 000
20	Ayia Marina (Nyl).	Add. supply from BH 131/84.....	35 000
21	Arechiou.....	Replacement of pipes	7 600
22	Akaki livestock area.....	Extensions.....	1 300
23	Pano Lakatamia		
	Gov. housing.....	Fencing of stor. tanks.....	2 200
24	Akaki.....	Improvements.....	48 000
25	Sha .....		5 300
26	Xeri (National Guard).....	New pipeline and storage tank.....	17 000
27	Ayia Varvara.....	Extensions.....	1 850
28	Dhali.....	Extensions.....	5 000
29	Lakatamia (National Guard).....	W S to Military camp	6 000
30	Paleometokho....	Improvements.....	113 000
31	Saranóí.....	Improvements.....	3 000
32	Livachia (Pits)...	Installation of water meters...	2 900
33	Makheras Mon,....	Installation of pumping unit...	400
34	Yeri.....	Add. supply from BH 103/85.....	23 000
35	Kambos.....	Installation of grate valves...	1 700
36	Yeri.....	Improvements to the existing house to house scheme.....	122 000
37	Moutoullas-Kalopansyiotis etc....	New pipeline along Kakopetria pine wood valley new road.....	28 000
Total.....			2820 630

Ser No.	Village	Nature of Scheme	Est.cost £
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LIMASSOL DISTRICT

1	Kalokhorio.....	Additional supply from BH 20/81.....	36 000
2	Prastio (Kellaki)..	Add. supply from BH 136/83.....	29 200
3	Moni.....	Add. supply from BH 114/84.....	41 500
4	Pyrgos.....	Add. supply from BH 19/84.....	18 600
5	Pakhna.....	New storage tank.....	9 500
6	Ayios Thomas.....	Development of spring.....	1 850
7	Kolossi.....	New distribution system.....	56 000
8	Yermasoyia.....	Add. supply from BH 25/81.....	78 500
9	Kolossi.....	Water supply to community building sites.....	5 300
10	Ayios Athanasios...	Water supply to Cyprus Land Development Organization building sites.....	48 000
11	Eptagonia.....	Add. supply from BH 50/85 and new distribution system.....	94 000
12	Lophos.....	Second main supply pipeline....	1 100
13	Akrounda.....	Add. supply from BH 21/85.....	45 000
14	Vasa (Kilani).....	Replacement of main supply pipeline.....	10 300
15	Evchimou.....	Add. supply from BH 50	21 600
16	Brimi.....	Water supply to livestock area..	18 000
17	Anoyira.....	Add. supply from "Apikreni" spring	5 000
18	Trakhoni.....	Second main supply pipeline....	13 400
19	Pissouri.....	New distribution system.....	148 000
20	Pissouri.....	Add. supply from BH 22/73.....	12 000
21	Pissouri & Tourist Lev. area.....	Add. supply from BH 156/83.....	500 000
Total.....			£1 192 850

PAPHOS DISTRICT

1	Pomos.....	New distribution system.....	70 000
2	Khlorakas.....	Replacement of the main conveyor pipeline and improvements.....	263 000
3	Yiolou.....	Add. W S from the spring "Argaki ton Villourgon".....	39 000
4	Paphos Lower villages.....	Add. W S from BH 7/85.....	28 500
5	Tala.....	Add. W S from Paphos Lower W S scheme.....	16 744
Total.....			£417 244



Ser. No	Village	Nature of Scheme	Est. cost £
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FAMAGUSTA DISTRICT

1	Ayia Napa.....	Extensions.....	20 000
2	Phrenaros.....	Replacements.....	4 000
3	Ayia Napa.....	Replacements and extensions.	20 500
4	Avgorou.....	New distribution system.....	160 000
5	Dherinia.....	New distribution system.....	185 000
Total.....			£389 500

LARNACA DISTRICT

1	Pano Lefkara.....	New distribution system.....	166 000
2	Kalokhorio.....	New distribution system.....	28 000
3	Klavdhia.....	New connection.....	8 500
4	Ayios Theodoros..	Developments.....	7 000
5	Athienou.....	Developments.....	110 000
6	Mari.....	New conveyor pipeline.....	17 500
7	Vavla.....	New distribution system.....	14 000
8	Kiti.....	New distribution system.....	125 000
Total.....			£475 000

SUMMARY OF TABLE VI - 3

District	No of Schemes	Est. cost £
Nicosia.....	37	820 630
Limassol.....	18	1 192 850
Paphos.....	5	417 244
Famagusta.....	5	389 500
Larnaca.....	8	475 000
Total.....		£3 295 224

TABLE VI - 3A

WATER SUPPLY SCHEMES FOR REFUGEE HOUSING OR SELF HOUSING ESTATES  
PREPARED AND SUBMITTED IN 1985

Ser No	Village	Nature of Scheme	Est. cost £
NICOSIA DISTRICT			
1	Archangelos Michael Kato Lakatamia.....	Gov. Housing Extensions....	3 900
LIMASSOL DISTRICT			
1	Kato Polemichia.....	"Ayios Spyridhon" Government Housing Estates.....	42 000
2	Episkopi.....	Self housing - Area E	4 800
		Total.....	<u>£46 800</u>
FAMAGUSTA DISTRICT			
1	Akhna Forest.....	Extensions.....	6 200
2	Akhna Forest.....	Extensions.....	7 900
3	Vrysoulles.....	Extensions.....	7 500
		Total.....	<u>£21 600</u>
LARNACA DISTRICT			
1	Livadhia.....	Extensions.....	2 100
2	Pervolia.....	Extensions.....	2 200
3	Dhekelia.....	Extensions.....	2 600
4	Xylophaghou.....	Extensions.....	500
		Total.....	<u>£7 400</u>

## SUMMARY OF TABLE VI - 3A

District	No. of Schemes	Est. cost £
Nicosia.....	1	3 900
Limassol.....	2	46 800
Famagusta.....	3	21 600
Larnaca.....	4	7 400
Paphos.....	-	-
	Total.....	<u>£79 700</u>



TABLE VI - 3B  
 WATER SUPPLY TO LIVESTOCK AREAS

Ser No	Village	Nature of Scheme	Est.cost
NICOSIA DISTRICT			
1	Keri livestock area..	Water supply from BH 141/84	35 000
FAMAGUSTA DISTRICT			
1	Avgorou.....	New distribution system....	7 000
LARNACA DISTRICT			
1	Lari.....	New distribution system....	2 700
PAPHOS DISTRICT			
1	Khrysokhou.....	Supply of water from Khrysokhou W S Scheme at a cost of.....	13 200
2	Anarita.....	Supply of water from Paphos Lower villages W S scheme at a cost of.....	11 300
Total.....			<u>£24 500</u>

SUMMARY OF TABLE VI - 3B

District	No. of Schemes	Est.cost £
Nicosia .....	1 .....	35 000
Famagusta.....	1 .....	7 000
Larnaca.....	1 .....	2 700
Limassol.....	- .....	-
Paphos.....	2 .....	24 500
Total.....		<u>£69 200</u>

TABLE VI - 4

## VILLAGE WATER SUPPLY SCHEMES PENDING DURING 1985

Ser No.	Village	Nature of scheme
NICOSIA DISTRICT		
1	Astromeritis.....	Improvements
2	Kannavia.....	New storage tank
3	Malounda.....	BH for EAΔMK Military camp
4	Kato Moni.....	Extensions
LIMASSOL DISTRICT		
1	Yerasa.....	Additional supply
2	Kato Amianōs.....	Additional supply
3	Kyperounda.....	New distribution system
4	Amathus .....	Phase "B"
5	Episkopi.....	Self-housing
6	Pano Polemichia.....	Self-housing
FAMAGUSTA DISTRICT		
1	Licopetri.....	Connection to Famagusta pipeline and new distribution system
2	Sotira-Tourist area...	New scheme to supply tourist area with potable water
LARNACA DISTRICT		
1	Ormichia.....	New distribution system
2	Xyloymbou.....	New distribution system
3	Laroni.....	New distribution system
4	Tokhni.....	New distribution system
5	Ayious Vavatsinias....	New distribution system
6	Athienou.....	New distribution system
7	Skarinou.....	New distribution system
PAPHOS DISTRICT		
1	Akoursos.....	Additional supply & H-H scheme
2	Yeroskipou.....	Overall improvements of H-H scheme
3	Kanneviou.....	Additional water supply
4	Anarita.....	Improvements & new storage tank
5	Mesoyi.....	Improvements & new storage tank
6	Paphos Lower villages.	Additional supply from BH 72/85 & 90/8
7	Paphos Town Improvements	
8	Stroumbi-Polemi.....	Additional supply from BH 139/84
9	Yiolou.....	Improvements to distribution system
10	Kouklia.....	Livestock area W.S.
11	Argaka.....	Livestock area W.S.



TABLE VI - 5

## IRRIGATION SCHEMES PREPARED IN 1985 AND SUBMITTED TO DISTRICT OFFICERS

Ser No	Village	Div./Asse.	Locality	Nature of proposed work	Est. cost £	Village contr. %
1	Palekhorio.....	Liv.	Milouri	Distribution pipes.....	4 800	1/3
2	Kalopanayiotis. Div.		Pano Troul-Linos	Pumping scheme from BH 104/77.....	31 000	1/3
3	Pelenōri.....	Div.	Kolokasi	Distribution pipes.....	15 800	1/3
4	Apliki.....	Div.	Kalogiros	Distribution pipes.....	1 800	1/3
5	Spilia.....	Div.	Kato Kleftis	Distribution pipes.....	4 680	1/3
6	Spilia.....	Div.	Kavallorotso	Distribution pipes.....	6 000	1/3
7	Spilia.....	Div.	Sklidros	Distribution pipes.....	3 000	1/3
8	Kato Moni.....	Div.	Kato Moni	Pumping scheme from BH 14/84.....	70 000	1/3
9	Katydhata.....	Div.	Kariches	Extension of irrigation channels..	11 000	1/3
10	Kambia.....	Div.	Kambia	Pumping scheme BH 105/83.....	42 500	1/3
11	Aredhiou.....	Liv.	Aredhiou	Pumping scheme BH 58/81.....	27 000	1/3
12	Pyrgos(T).....	Div.	-	Supplementary pumping scheme from BH 3/85.....	45 000	1/3
				Total.....	£262,580	
LIMASSOL DISTRICT						
1	Kellaki.....	Div.	Pothies	Distribution pipelines.....	12 600	1/3
2	Kalokhorio.....	Div.	-	Distribution pipelines.....	14 000	1/3
3	Prochomos.....	Div.	Harđji-Marouka	Extensions.....	800	1/3
4	Louvaras.....	Asse.	Pervolia-Kou-troutsou-			
5	Pelenōrie.....	Asse.	Paskalis	Improvements.....	3 050	-
			Dhimna tou			
6	Pelenōrie.....	Div.	Khoriou	Improvements.....	1 400	46%
			Dhima-Koripi-			
7	Pelenōria.....	Div.	Kolokasi	Distribution pipelines.....	15 800	1/3
8	Agros.....	Div.	Potamoulia	Improvements.....	3 950	1/3
9	Agros.....	Div.	Pano Taliou	Improvements.....	2 300	1/3
			Kokkinoyi	Improvements.....	2 800	1/3
10	Ayios Konstantinos	Div.	Vavatsinia	Improvements.....	2 370	1/3
				Total.....	£59 150	

TABLE VI - 5 (cont.)

Ser No	Village	Div./ ASSC.	Locality	Nature of proposed work	Est. cost £	Village contr. %
PAPHOS DISTRICT						
1	Theletra...	Div.		Construction of storage tank.....	8 500	1/3

SUMMARY OF TABLE VI - 5

District	No of schemes	Est. cost £
Nicosia .....	12	262 580
Limassol .....	10	59 150
Paphos .....	1	8 500
Total .....		<u>£330 230</u>



TABLE VI - 6

## SMALL IRRIGATION SCHEMES APPROVED BY THE INTERDEPARTMENTAL COMMITTEE IN 1985

Ser. No.	Village	Locality
1	Palekhoris.....	Milouri
2	Kalopanayiotis.....	Pano Troullinos
3	Pelençria.....	Kolokasi
4	Apliki.....	Koloyiros
5	Spilia.....	Katokleftis
6	Spilia.....	Kavallorotsos
7	Spilia.....	Sklidros
8	Kato Moni.....	Kato Moni
9	Katyçhata.....	Karichas
10	Kambia.....	Kambia
11	Areçhiou.....	Areçhiou
12	Kellaki.....	Pothies
13	Pelençria.....	Dhimma tou Khoriou
14	Pelençria.....	Potamoulia
15	Agros.....	Panotaliou
16	Agros.....	Kokkinoi
17	Kannavia.....	Koumna
18	Akaki.....	Riatiko
19	Phlasou.....	Sellosnies
20	Klirou.....	Laoura
21	Kalokhorio.....	Kalou Khoriou
22	Pharmakas.....	Koskinas

## SCHEMES NOT APPROVED

1	Kili.....	Kili irrigation
2	Arminou.....	Arminou irrigation

TABLE VI - 7

## IRRIGATION SCHEMES IN THE COURSE OF PREPARATION, UNDER INVESTIGATION OR PENDING DURING 1985

Ser No.	Village and Nature of Proposed work
NICOSIA DISTRICT	
1	Lythrodonças - Irr. Ass. Kato Pervolia, Pumping scheme
2	Kalounda - Pumping scheme
3	Linou - Irr. Liv. Linopsas, Extension of irrigation channels
4	Akaki - Irr. Liv. Riatiko, Extension of irrigation channels
5	Milikouri - Irr. Liv. Kefalovrysos, Extensions of irrigation pip
LIMASSOL DISTRICT	
1	Kaminaria-Tris Elies - Pumping scheme
2	Vasa (Kellaki) - Pumping scheme
3	Kato Amiandos - Improvements
4	Ayios Ioannis (Agros) - Improvements
5	Kalokhorio - Improvements
6	Pelendria - Improvements
7	Moniatis - Improvements
8	Tris Elies - Pumping scheme
9	Potamitissa - Improvements
10	Asgata - Pumping scheme
11	Agrichia - Improvements
LARNACA DISTRICT	
1	Ochou - New irrigation division
2	Psematismenos - Supplementary supply to existing irr. division
PAPHOS DISTRICT	
1	Violou-Miliou - BH 111/81, pumping scheme
2	Miliou - BH 99/82, pumping scheme
3	Mamonia - BH 133/83 & 61/51, pumping scheme
4	Phascula - BH 166/83 & 236/62, pumping scheme
5	Stavrokonnou - BH 59/73, pumping scheme
6	Ayios Yeoryios - Replacement of pumping unit
7	Khoulou - BH 98/84, pumping scheme
8	Kholetria - BH 18/69, pumping scheme
9	Salamiou - BH 134/83, pumping scheme
10	Amargeti - "Ziripillis", pumping scheme
11	Statos - "Kato Pigachi", new storage tank
12	Khoulou - BH 134/84, pumping scheme
13	Theletra - Diversion weir & distribution system
14	Panajia - "Sarka", improvements
15	Amargeti - BH 67/75, pumping scheme
16	Elechiou - "Katinou", pumping scheme from Tank, BH
17	Statos - "Akres and Kato Livachi", improvements
18	Lasa - "Romanos", distribution system



TABLE VI - 8

ANTIFLOOD AND RECHARGE SCHEMES IN THE COURSE OF PREPARATION  
LARNACA DISTRICT

	Est. cost
1. Ormidhia Antiflood	35 000
2. Arachippou "Parthenitis" Recharge	8 000

TABLE VI - 9

## SEWAGE SCHEMES PREPARED IN 1985

Ser. No.	Description	Est. cost £
1	Hotel and Catering Institute sewerage scheme - Drg No S/SL/1.....	29 000
2	Mathiati N G Camp sewerage scheme Drg No U/SL/1.....	41 500
3	Nicosia Septage Treatment Plant at Ayios Sozomenos - Drg No T/SD/3.....	117 000
4	Nicosia Septage Treatment combined with Perakhorio-Nisou-Dhali SD Drg No T/SD/6	303 500
	Total .....	<u>£491 000</u>
5	Vasilikos-Pendaskinos Project New area of Skarinou - Drg No UP/IR/832	150 000
	Grand Total.....	<u>£641 000</u>

## VII DIVISION OF CONSTRUCTION

by  
A P Georgiades  
Senior Water Engineer  
Head of the Division

### Introduction

The Division of Construction is one of the major divisions of the Department, and it deals with the planning, supervision and control of all constructional activities of the Department by direct labour. The Division also plays an important role when projects are constructed by contract.

The Division is sub-divided into three main branches:

- The Planning and Control Branch (including the Tender Section)
- The Major Projects Branch, and
- The Minor Projects Branch

During 1985 the Division consisted of the following staff:

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1	Senior Water Engineer - Head of the Division
1	Executive Engineer, Class I - Assistant Head of the Division
3	Executive Engineers, Class II
1	Senior Technical Superintendent
2	Technical Superintendents
8	Senior Technicians
3	Technicians 1st Grade
3	Technicians 2nd Grade
3	Chief Foremen
5	Assistant Chief Foremen
34	Monthly paid Foremen (in all districts)
31	Weekly paid Foremen (in all districts)
<hr/>	
95	Total Staff

In addition to the above technical staff the Division also engaged a daily average of 693 regular workmen of various trades, mostly skilled, and also 229 casual labour, mostly unskilled, for the execution of the schemes approved for construction during 1985.

The Division has continued during 1985 to collect data regarding actual rates of construction, standards of materials and equipment for the revision of the manual "Schedule of Rates and Prices" which was published in 1984, and was distributed to all Divisions and Technical Officers of the Department.

The commencement of the construction of the new minor projects, especially the contributory ones again started late in the year due to the delay in the completion of the usual administrative formalities and the allocation of funds. This delay in the commencement of the works causes considerable problems to the construction programme, but mostly to the distribution of manpower, having in mind that the Department engages a daily average of 922 labour. As it can be observed from the statement of monthly expenditure for the year 1985, shown elsewhere in this report, 50% of the Development Budget on water works was incurred in the first eight months of 1985 and 50% in the remaining four months. Over and above the usual problems caused by the delay in the starting of the construction programme a lot of minor projects cannot be completed by the end of the year as scheduled and have to be revoted for completion in the next year.



It is believed that more attention should be given on this problem by the Ministry of Interior and the Planning Bureau so that the administrative formalities and the allocation of funds are completed earlier. If this is achieved the work distribution of the Division will be more effective and the construction programmes will be materialised as planned.

#### CONSTRUCTION PROGRAMME AND PROGRESS

The Planning Branch of the Division prepared a construction programme for 1985 including all the schemes that were approved for construction in 1985. All these schemes were included in the Development Budget of our Department, or in the budget of other Departments, or Ministries. Over and above these budgeted schemes the Division had to respond and deal with all non-budgeted water projects for emergency schemes or for villages and private developers. In general the Division had to deal with the constructional activities of the Department relating to routine water projects approved for construction in 1985, except for specific major projects where its role was limited due to financing procedures, etc.

All these schemes undertaken for construction during 1985, may be classified into five main groups as follows:

- All projects, new and carry over, approved in our Department's Development Budget.
- The Pitsilia Integrated Rural Development Project, approved in the Budget of the Ministry of Agriculture and Natural Resources,
- All Water Supply and Sewage schemes for the housing of the Refugees, approved in the budget of the Department of Planning and Housing,
- All other projects, covering a wide range of types, i.e water supply schemes for livestock farms, industrial areas, Turkish Cypriot villages, relocation of pipes, etc, approved in the budgets of a number of Ministries, or Departments, and
- All types of non-budgeted projects, i.e. improvements to existing water supply and irrigation schemes, laying of distribution mains for land development, etc, carried out from funds deposited in full by villages or private developers.

In total during 1985 the Department had to deal with the construction of 633 projects of an estimated value of £27,508,431. The overall expenditure incurred on all these projects during 1985 reached the amount of £22,462,514, against £18,905,999 for 1984, £12,654,747 for 1983, £9,863,081 for 1982 & £9,038,378 for 1981.

The above expenditure figures for the past five consecutive years prove that the Department's activities have increased by 2.5 times during this period.

Table VII-1 below gives a summary of the work executed by the Department during 1985. Detailed lists showing all the schemes undertaken for construction, and more information are given in separate tables and short description reports that follow, further on in this report.

TABLE VII-1

## SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1985

Ser No	Description	No of schemes	Amount allocated £	Expenditure incurred £
1	Rural domestic water supply schemes	63	1,373,673	948,942
2	Minor irrigation schemes .....	42	765,168	513,808
3	Other major irrigation works .....	14	340,188	245,320
4	Town water supply schemes .....	12	469,004	327,351
5	Vasilikos-Pendaskinos Project .....	2	6,443,139	5,837,459
6	Southern Conveyor Project .....	1	12,000,000	9,498,025
7	Khrysokhou Irrigation Project .....	1	3,846,459	3,776,820
8	Paphos Irrigation Project .....	1	235,783	201,707
9	Karyotis Project* .....	1	230,000	26,660
10	<del>Pitsilia Integrated Rural Development Project .....</del>	<del>40</del>	<del>193,796</del>	<del>46,849</del>
11	Refugee Housing and Self-housing schemes .....	36	175,152	94,616
12	Schemes undertaken for construction for other Government Departments	88	993,093	685,818
13	Schemes undertaken for construction for villages (non-budgeted) from deposits .....	82	116,132	68,887
14	Schemes undertaken for construction for private developers (non-budgeted) from deposits .....	250	326,844	190,252
	*Feasibility study stage			
	TOTAL	633	£27,508,431	£22,462,514

## PLANNING BRANCH

During 1985 the main activities of this branch may be classified as follows:

- The programming and cost control of all schemes approved for construction,
- The preparation of a construction programme for all schemes approved for construction,
- The preparation of monthly progress charts report showing all budgeted schemes, and the progress and expenditure incurred each month.
- The assessment of our Department's requirements in materials and equipment, such as pipes and fittings, pumping units, etc, and their order through the Government Central Stores Department in time so that the schemes approved for construction are executed smoothly and uninterruptedly.
- The checking of the estimates of the schemes designed by other Divisions of the Department, so as to conform with the current rates and to ensure their execution within the estimated cost.
- The collection of data regarding actual rates of construction standards



of materials and equipment and their appraisal and utilization for the up-to-date information of the "Schedule of Rates and Prices" manual, which is being reprinted and distributed each year to all Technical officers concerned.

- The distribution of resources, such as labour force, plant and materials to the various schemes under construction.
- The invitation of tenders direct for the supply of such materials that are not available at the Central Stores, i.e. building materials, and for the hiring of machinery from the private sector when such machinery is not available at the E.M.S. &
- The acquisition/requisition of immovable property which is affected by the construction of the schemes.

#### CONTROL BRANCH

The main activity of this branch is to exercise control over the construction of all schemes where the Division is directly involved. It has to follow up and see that all construction programmes are adhered to, or revised if required by the Supervising technical staff, that the progress of the works ~~under construction is attained at reasonable standards as as planned.~~ The quality of the work on all schemes under construction has also to be followed up very carefully and be kept always at the highest possible standards.

Another important objective of this branch is to ensure that the schemes undertaken for construction are completed within the estimated time and approved amount. As most of the budgeted schemes are contributory (village water supplies, minor irrigation schemes, etc) serious problems arise if a project is put in hand and the funds available are not sufficient for its completion. In such cases the scheme should not be put in hand but should be revised and be approved by the Government and the beneficiaries prior to its commencement.

The technical staff of this branch work in close co-operation with the supervising technical staff for the construction of a scheme, and solve all problems that might arise before, or during the execution of the project.

- All projects other than Nicosia District ones are constructed direct by the three Regional Offices of the Department, i.e. Larnaca-Famagusta, Limassol and Paphos, in close association with a senior technical officer of the Division who acts as the co-ordinator between the District Offices and the headquarters in Nicosia. In addition to that, the Head of the Division and other senior officers carry out periodic visits to the District Offices and to the sites of the works under construction.

The Division is always kept informed on the progress of the schemes in the Districts through the Technical Co-ordinator, and the monthly progress reports which are prepared by the supervising staff of the Districts and forwarded to the headquarters. These monthly progress reports are being utilized for the preparation by the Planning branch of the Division of the general monthly progress chart which covers all schemes in all Districts.

#### LABOUR FORCE

For the construction of a scheme the Division usually engages gangs consisting of monthly, or weekly (hourly) paid foremen, regular artisans of the Department

of various trades, and casual, skilled or unskilled labour force which is recruited locally through the Government Labour Offices.

The average daily labour force engaged by the Division including the workshops during 1985 for the construction of all the projects was 922. Out of this figure 693 employees were regular and 229 were casual. They cover a variety of trades i.e. builders, carpenters, pipelayers, etc.

The total expenditure incurred during 1985 on wages alone on schemes constructed by direct labour by our Division reached the amount of £2,589,815. Out of this amount £2,272,307 represented the wages of the regular workers, and £317,508 represented the wages of the casual workers.

Table VII-2 shows the monthly average labour force engaged direct by our Division in 1985.

TABLE VII-2

LABOUR FORCE FOR 1985

Month	Skilled	Unskilled	Regular	Casual	Total
January	672	232	669	235	904
February	672	190	663	199	862
March	679	198	676	201	877
April	689	189	682	196	878
May	702	207	700	209	909
June	706	231	700	237	937
July	711	247	699	259	958
August	677	263	689	251	940
September	723	231	705	249	954
October	722	226	705	243	948
November	752	198	715	235	950
December	760	196	721	235	956
Daily average No.	705	217	693	229	922
Daily average %	77	23	75	25	100

PIPES AND PIPE FITTINGS

The majority of pipes and pipe-fittings of all types used by the Division for the execution of the schemes approved for construction during 1985, were purchased through the Government Central Stores Department, where a reasonable stock of fast moving materials is always kept on a permanent basis for requisitioning by all Government Departments.

In exceptional cases where our requirements could not be met by the Central Stores Department due to the execution of emergency schemes, where a special



type of pipes was used, such as PVC or ductile, then these pipes were purchased either by our Department or the Central Stores Department through the usual procedure of open public tenders.

However, it should be noted that for specific major projects which are being financed by the World Bank or other International Finance organisations, pipes and pipe-fittings as well as other materials used, are purchased after the invitation of international tenders by our Department.

The annual requirements of our Department in pipes and pipe-fittings of all types, are assessed by the Planning Branch of the Division as soon as the Development Budget is approved and an order is put through the Government Central Stores, early before the commencement of the schemes.

During 1985 a length of 374,232 running meters of pipes of various types and dia were purchased at a value of £1,898,182 and laid all over the island for the execution of all the schemes approved in the 1985 Development Budget.

Table VII-3 shows in detail all types, lengths and value of pipes laid during 1985.

TABLE VII-3

PIPES LAID DURING 1985

I - GALVANIZED STEEL PIPES

Dia inches	Length m	Value £
1/2	4 560	2 547
3/4	1 080	708
1	2 820	2 151
1 1/4	1 908	1 995
1 1/2	3 900	4 740
2	10 920	20 053
2 1/2	11 124	23 391
3	29 736	81 563
4	19 534	68 189
Total	85 582	£205 337

II STEEL PIPES (COATED - PLAIN ENDED)

Dia mm	Length m	Value £
150	2 094	10 545
200	2 000	13 771
250	572	4 639
300	2 384	30 477
350	96	1 180
550	1 232	28 520
612.5	16	178
Total	8 394	£89 310

III ASBESTOS CEMENT PRESSURE PIPES - CLASS 15

Dia mm	Length m	Value £
75	2 331	1 414
100	26 325	77 997
125	1 870	7 187
150	16 389	59 635
200	10 218	51 727
250	2 003	14 024
300	999	10 973
350	2 586	30 698
400	860	15 347
450	929	20 800
500	2 075	53 710
Total	66 585	£343 512

IV ASBESTOS CEMENT PRESSURE PIPES - CLASS 20

Dia mm	Length m	Value £
75	141	117
100	33 186	94 394
125	1 418	6 175
150	10 576	46 639
200	7 442	48 780
250	7 425	67 166
300	2 882	38 987
350	1 469	22 979
400	3 173	75 787
500	2 474	74 664
600	600	42 161
Total	70 786	517 849



V ASBESTOS CEMENT PRESSURE PIPES - CLASS 25

Dia mm	Length m	Value £
100	8 249	31 924
125	1 708	9 950
150	3 334	24 980
200	2 038	22 454
250	246	2 984
300	798	14 539
500	4 603	172 939
Total	<u>20 976</u>	<u>279 770</u>

VI ASBESTOS CEMENT PRESSURE PIPES - CLASS 30

Dia mm	Length m	Value £
100	192	780

VII DUCTILE IRON PIPES

Dia mm	Length m	Value £
1400	2 390	398 940

VIII PVC/POLYTHENE PIPES - 6 atm and 10 atm

Outside Dia mm	Length m	Value £
21	5 160	639
26	3 813	648
33	4 668	1 187
42	24	9
50	1 720	1 106
63	79 101	38 748
75	18 457	12 608
90	2 772	1 940
110	546	436
125	42	35
160	3 024	5 328
Total	<u>119 327</u>	<u>£62 684</u>

SUMMARY OF ALL TYPES OF PIPES LAID DURING 1985

Ser No	Type	Length m	Value £
I	Galvanized steel pipes .....	85 582	205 337
II	Steel pipes (Coated) plain ended.....	8 394	89 310
III	Asbestos cement pressure pipes-class 15...	66 585	343 512
IV	Asbestos cement pressure pipes-class 20 ..	70 786	517 849
V	Asbestos cement pressure pipes-class 25 ..	20 976	279 770
VI	Asbestos cement pressure pipes-class 30 ..	192	780
VII	Ductile Iron pipes .....	2 390	398 940
VIII	PVC/Polythene pipes .....	119 327	62 684
Total		374 232	1 898 182

CONSTRUCTION PLANT

For the execution of the schemes approved for construction in 1985, the Division had to use Government machinery through the Electrical and Mechanical Services (EMS). No machinery of any type can be hired from the private sector unless such machinery cannot be obtained from the E.M.S. and the prior approval of the EMS is secured.

Machinery of many types was used during 1985 both from the EMS and the private sector through open public tenders.

In total during 1985 an amount of £509,458 was paid for the hiring of all types of machinery considered necessary for the execution of the work undertaken for construction direct by the Division.

The largest amount spent on one item is that on diggers which reached the amount of over £175,000 during the year, however again during 1985 the amount spent on the hiring of land rovers buses or saloon cars for the transportation of the various gangs to the sites of the works constitute quite a large percentage reaching the amount of £122,000.

Table VII-4 shows details of machinery hired for the execution of the schemes during 1985.

TABLE VII-4

MACHINERY HIRED DURING 1985

Ser No.	Description	Quantity	Unit	Value £
1	Tipper lorries .....	5 566	w/hrs	18 058
2	Tipper lorries .....	-	agreed	45 237
3	Buses .....	791	w/days	11 906
4	Buses .....	-	agreed	124
5	Saloon cars .....	3	months	540



TABLE VII-4 (con/med)

Ser No.	Description	Quantity	Unit	Value £
6	Saloon cars .....	840	w/days	5 738
7	Land-rovers .....	2 996	w/days	35 147
8	Land-rovers & mini buses .....	5 071	w/days	68 593
9	Electrowelding machines .....	7 243	w/hrs	6 851
10	Caterpillars .....	346	w/hrs	3 930
11	Caterpillars .....	-	agreed	1 949
12	Diggers .....	45 352	w/hrs	174 871
13	Diggers .....	1 132	R/m	596
14	Diggers/braker .....	296	w/hrs	2 335
15	Diggers/braker .....	301	R/m	301
16	Diggers/braker .....	-	agreed	2 143
17	<del>Compressors .....</del>	<del>6 740</del>	<del>w/hrs</del>	<del>13 933</del>
18	Compressors .....	23	w/days	306
19	Mixers .....	520	w/days	1 796
20	Mixers .....	-	agreed	1 385
21	Mixers .....	503	w/hrs	3 410
22	Mixers .....	6	months	270
23	Crane .....	1 686	w/hrs	13 499
24	Crane .....	1 909	w/days	3 906
25	Crane .....	-	agreed	220
26	Hydraulic excavator .....	-	agreed	20 890
27	Motor roller .....	33	w/days	1 148
28	Bulldozer .....	813	w/hrs	9 284
29	Excavator .....	8	w/hrs	62
30	Excavator .....	50 887	R/m	39 678
31	Michigan wheel loader .....	28	w/hrs	228
32	Tractor .....	1 210	w/hrs	4 075
33	Tractor .....	-	agreed	175
34	Drilling Machine .....	-	agreed	507
35	Drilling Machine .....	7	w/hrs	56
36	R.H.9 .....	286	w/hrs	2 508
37	R.H.9 .....	-	agreed	300
38	Traxcavator .....	528	w/hrs	3 860
39	Water pump .....	3	w/days	15
40	Grader .....	455	w/hrs	3 743

TABLE VII-4 (con/med)

Ser No.	Description	Quantity	Unit	Value £
41	Elevator .....	80	w/hrs	50
42	Fork lift .....	-	agreed	40
43	Transmixer .....	70	w/hrs	698
44	Water tank .....	66	w/days	76
45	Water tank .....	-	agreed	777
46	Computer services .....	1.1. - 31.12.85		2 373
47	Rollers .....	305	w/hrs	1 491
48	Iron cutting machine .....	-	agreed	250
49	Dumper .....	26	w/days	130
Total .....				£509 458

## BUILDING AND OTHER MATERIALS

All materials required for the construction of the schemes have to be requisitioned from the Government Central Stores through the usual way. However, such materials that cannot be made available through the GCS, i.e. aggregate, sand etc, are purchased locally from the private sector through public tenders.

During 1985 a quantity of 725 tons of mild steel at a value of £133,969 was purchased from the GCS, 1656 water meters of various diameters at a value of £25,607 were also purchased from the GCS. All our needs in cement reaching the quantity of 3372 tons at a value of £89,529 were purchased direct from the Vasiliko Cement Factory through a general Government tender for all our needs for 1985.

All other building materials used during 1985 were purchased locally from the private sector through public tenders. In total during 1985 the Division purchased building materials and water meters of a value of £412,304.

Table VII-5 shows in detail all building and other materials used by the Division during 1985, for the execution of the schemes approved.

TABLE VII-5

MATERIALS PURCHASED AND WATER METERS INSTALLED  
I BUILDING AND OTHER MATERIALS USED DURING 1985

Ser No	Description	Quantity	Value £
1.	Cement .....	3 372 tons	89 529
2	Mild steel .....	725 tons	133 969
3	Aggregate .....	8 504 m <sup>3</sup>	15 933
4	Sea Sand .....	3 478 m <sup>3</sup>	13 156



TABLE VII-5 (con/ned)

Ser No	Description	Quantity	Value £
5	Stone - sand .....	2 311 m <sup>3</sup>	8 179
6	Crushed sand .....	192 m <sup>3</sup>	258
7	Sandy - soil .....	38 526 m <sup>3</sup>	46 285
8	Clay .....	12 m <sup>3</sup>	34
9	Havara .....	15 108 m <sup>3</sup>	13 794
10	Soil .....	5 762 m <sup>3</sup>	2 477
11	Quarry sand .....	19 m <sup>3</sup>	71
12	Concrete .....	231 m <sup>3</sup>	5 074
13	Stones .....	393 m <sup>3</sup>	312
14	Shingle crushed .....	3 207 m <sup>3</sup>	7 092
15	Shingle .....	26 592 m <sup>3</sup>	44 440
16	Aluminium windows and doors .....	-	4 684
17	Formwork .....	224 m <sup>3</sup>	1 008
18	Painting of metal works for dams .....	agreed	402
Total .....			£386 697

## II WATER METERS INSTALLED DURING 1985

Ser No	Dia mm	Number	Value £
1	12 (1/2")	1 290	5 361
2	20 (3/4")	13	63
3	25 (1")	6	44
4	32 (1 1/4")	41	334
5	40 (1 1/2")	1	60
6	50 (2")	119	4 401
7	65 (2 1/2")	23	1 008
8	80 (3")	35	1 504
9	100 (4")	104	6 205
10	150 (6")	10	919
11	200 (8" )	1	110
12	250 (10")	2	521
13	300 (12")	8	2 570
14	500 (20")	3	2 507
Total .....		1 656	£25 607

## RURAL DOMESTIC WATER SUPPLY SCHEMES

The construction programme for 1985 included 63 rural domestic water supply schemes of an estimated cost of £1,373,673. The expenditure incurred on all these schemes during the year reached the amount of £948,942.

These 63 schemes were split all over the island and were mostly related to supplementary water supply schemes or improvements to existing schemes.

All these schemes are indicated in detail in Table VII-6, below.

### SUMMARY OF RURAL DOMESTIC WATER SUPPLY SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1985

District	No of schemes	Amount allocated for 1985 £	Expenditure incurred in 1985 £
Nicosia .....	19	328 340	217 148
Larnaca .....	9	390 020	235 247
Famagusta .....	4	93 809	68 127
Limassol .....	13	238 048	196 839
Paphos .....	18	323 456	231 581
Totals .....	63	<u>£1 373 673</u>	<u>£948 942</u>



TABLE VII-6

## RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1985

Ser No	Scheme	Amount Allocated		Govt	Village	Total	Expenditure		Total	Remarks
		£	£				£	£		
NICOSIA DISTRICT										
1	Analiondas-Supplementary supply from new borehole .....	34 500	11 500	29 606	9 869	39 475			39 475	Completed
2	Argates-Supplementary supply ..	182	-	182	-	182			182	Completed
3	Astromeritis-Supplementary supply .....	22 162	23 512	11 045	11 886	22 931			22 931	Work in progress
4	Aredhiou-Supplementary supply New Storage Tank & extensions .	21 500	21 500	13 740	13 739	27 479			27 479	Work suspended
5	Arkhangelos Michael (monastery) Supplementary Supply-Combined with Analiondas .....	15 000	-	9 656	-	9 656			9 656	Work suspended
6	Ayia Varvara-Improvements .....	249	249	-	-	-			-	Completed
7	Ayios Theodoros Soleas .. Supplementary ws from BH .....	5 600	-	5 600	-	5 600			5 600	Completed
8	Dhali-Supplementary water supply and improvements to existing system .....	20 205	20 205	12 071	3 646	15 717			15 717	Completed
9	Episkopio-supplementary supply from BH .....	1 400	700	1 120	560	1 680			1 680	Work in progress
10	Kapedhes - Supplementary supply from new borehole .....	14 666	7 333	13 813	6 907	20 720			20 720	Completed
11	Kalokhorio (Klirou) - Supplementary supply from BH 131/83 ...	19 855	19 200	14 307	6 652	20 959			20 959	Completed
12	Kambia-Supplementary supply from B/H .....	18 000	9 000	15 753	9 877	23 630			23 630	Completed

TABLE VII-6

## RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1985 (cont)

Ser No	Scheme	Amount Allocated		Expenditure		Total	Remarks
		Govt £	Village £	Govt £	Village £		
13	Kambia-Analionças-Argates .....	4 973	-	4 973	-	4 973	
14	Kliirou-Supplementary supply from new Bore hole .....	1 556	1 556	-	-	-	Completed
15	Lakatamia-Supplementary supply from B/H 120/84 .....	10 000	10 000	7 423	7 423	14 846	Completed
16	Malounda-Extension to distribution system .....	1 357	449	1 139	379	1 518	Completed
17	Malounda-New storage tank and supply to ELDYK camp. ....	1 548	-	1 544	-	1 544	Completed
18	Mammari-Improvements .....	3 750	3 750	3 066	3 066	6 132	Completed
19	Meniko .....	2 173	710	80	26	106	Completed
Total for Nicosia District .....		£198 676	£129 664	£145 118	£72 030	£217 148	
LARNACA DISTRICT							
1	Aradhippou - New distribution system .....	6 760	6 760	2 272	2 271	4 543	Completed
2	Athienou-Supplementary water supply from new B/H 110/82 .....	10 000	10 000	8 825	8 825	17 650	Pending electr. supply to Electr pump
3	Kiti-Construction of a new water tank .....	7 000	7 000	5 967	5 967	11 934	Work in progress
4	Kornos-Improvement of w/s .....	11 500	11 500	7 445	7 444	14 889	Completed
5	Khirokitia-New Distribution system .....	20 000	20 000	12 564	12 564	25 128	Work in progress



TABLE VII-6

## RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1985 (cont)

Ser No	Scheme	Amount Allocated		Expenditure		Total	Remarks
		Covt £	Village £	Govt £	Village £		
6	Perivolia-Construction of a new water tank .....	7 250	7 250	4 600	4 600	9 200	Work in progress
7	Tersephanou-New distribution system .....	25 000	25 000	19 493	19 493	38 986	Completed
8	Xylophaghou-Connection onto F/sta pipeline Phase II .....	86 666	42 334	15 157	15 079	30 236	Work in progress
9	Xylophaghou-Ormidthia Connection onto Famagusta pipeline Phase I	42 500	42 500	41 340	41 341	82 681	Work in progress
Total for Larnaca District .....		£216 676	£173 344	£117 663	£117 584	£235 247	
FAMAGUSTA DISTRICT							
1	Ayia Napa-Improvements .....	5 950	-	2 621	-	2 621	Completed
2	Dherinia-Extention to Distr System .....	9 783	4 891	7 554	3 777	11 331	Completed
3	Paralimni-Ayia Napa Supplementary W.S. from F/sta pipeline. Pumping Scheme .....	35 051	-	34 365	-	34 365	Work in progress
4	Paralimni-Protaras water supply to Tourist area .....	38 134	-	19 810	-	19 810	Work in progress
Total for Famagusta District ...		£88 918	£4 891	£64 350	£3 777	£68 127	

TABLE VII-6

## RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1985 (cont)

Ser No	Scheme	Amount Allocated		Expenditure		Total £	Remarks
		Covt £	Village £	Govt £	Village £		
LIMASSOL DISTRICT							
1	Ayios Athanasios-Improvements of existing system .....	3 604	3 604	3 261	3 261	6 522	Completed
2	Asomatos - Supplementary supply from BH 97/70 .....	8 500	11 530	7 731	7 730	15 461	Connection of storage tank
3	Erimi-Improvements of existing system .....	6 391	6 391	5 170	5 169	10 339	Completed
4	Episkopi-Improvement of existing system .....	13 000	51 500	12 453	49 349	61 802	Completed
5	Kato Polemidhia-Improvement of existing system .....	1 544	1 544	1 452	1 453	2 905	Completed
6	Kilani-New reservoir .....	5 200	2 600	6	3	9	To commence in 1986
7	Moniatis-Improvement of existing system .....	12 000	12 000	10 922	10 922	21 844	Work in progress
8	Moutayiakka-Regional scheme (phase A) replacement of existing pipeline .....	25 000	25 000	22 512	22 511	45 023	Work in progress
9	Omodhos-Supplementary supply from BH 92/77 .....	2 891	2 891	2 421	2 422	4 843	Completed
10	Paramythia-Palodhia-Spitali-Supplementary supply from BH 8/82	3 821	3 821	3 144	3 143	6 287	Completed
11	Pera pedhi -Supplementary supply from BH 109/77 .....	7 333	3 667	3 945	1 972	5 917	Pending electricity supply
12	Prastio Evdhimou-Supplementary supply from BH 57/81 .....	11 000	11 000	7 270	7 270	14 540	Pending the installation of pumping units



TABLE VII-6

## RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1985 (cont)

Ser No	Scheme	Amount Allocated		Govt	Expenditure Village	Total	Govt	Expenditure Village	Total	Remarks	
		£	£								£
13	Troodhitissa (monastery)-Supplementary supply from BH 65/81 ...	1 083	1 083	674	673	2 166	674	673	1 347	Completed	
	Total for Limassol District .....	£101 367	£136 681	£80 961	£115 878	£238 048	£80 961	£115 878	£196 839		
	PAPHOS DISTRICT										
1	Ayia & Appides-New infiltration galletry & Pumping units .....	10 000	-	8 618	-	10 000	8 618	-	8 618	Completed	
2	Ayia Regional scheme Repairs to main conveyor .....	6 667	3 333	6 581	3 290	10 000	6 581	3 290	9 871	Completed	
3	Ayia Marina (Khrysokhou) New PVC main pipeline .....	8 000	8 000	4 555	4 554	16 000	4 555	4 554	9 109	Completed	
4	Akoursos-Improvement of spring	400	-	330	-	400	330	-	330	Completed	
5	Arodhes Pano-Supplementary supply from BH .....	2 887	-	-	-	2 887	-	-	-	Completed Pending compensations	
6	Emba-Improvements to distribution system .....	4 487	4 487	-	-	8 974	-	-	-	Completed	
7	Kholetria & Kritou Terra-Improvements to ex. system .....	4 823	-	3 951	-	4 823	3 951	-	3 951	Completed	
8	Khloraka-Improvements to distribution system .....	30 000	30 000	13 048	13 049	60 000	13 048	13 049	26 097	Work in progress	
9	Khoulou-Supplementary W.S. from BH .....	2 280	2 280	-	-	4 560	-	-	-	Completed Balance for BH	
10	Mesa Khorio-Improvement to distribution system & storage tank	7 900	7 900	7 139	7 139	15 800	7 139	7 139	14 278	Completed	
11	Panayia-New main conveyor pipe-line from Kholetria Spr. ....	1 122	1 122	846	846	2 244	846	846	1 692	Completed	

TABLE VII-6

## RURAL DOMESTIC WATER SUPPLY SCHEMES - EXPENDITURE 1985 (cont)

Ser No	Scheme	Amount Allocated		Govt £	Village £	Total £	Govt £	Village £	Total £	Remarks
		Govt £	Village £							
12	Panayia-Realignment of distribution pipes .....	1 800	-	1 800	-	1 800	1 404	-	1 404	Completed
13	Peyia-Supplementary water supply from BH 49/82	9 912	9 912	19 824	9 672	19 343	9 671	9 672	19 343	Completed
14	Tala-Supplementary supply from new borehole .....	2 569	2 569	5 138	-	-	-	-	-	Completed. Pending the payment for the cost of BH
15	Yeroskipou-Improvements to distribution system .....	22 466	43 340	65 806	37 914	57 568	19 654	37 914	57 568	Completed
16	Yiolou-Supplementary W.S. from spring, st. tank and pumping installations .....	1 150	1 150	2 300	758	1 516	758	758	1 516	Work in progress
17	Goudhi (Khrysokhou)-Improvements to distr. system to Supplementary supply from BH 31/82 .....	9 900	35 400	45 300	7 093	32 456	7 093	25 363	32 456	Work in progress
18	Xeropiysi- Replacement of main conveyor pipeline .....	13 804	33 796	47 600	13 150	45 348	13 150	32 198	45 348	Completed
Total for Paphos District .....		£140 167	£183 289	£323 456	£96 798	£231 581	£96 798	£134 783	£231 581	



## MINOR IRRIGATION SCHEMES

The 1985 programme of construction included 42 minor irrigation schemes of an estimated value of £765,168. The overall expenditure incurred on all these 42 schemes during the year reached the amount of £513,808. Both figures almost identical as those of 1984.

These 42 minor irrigation schemes were split in the four districts of the island and were mostly related to:

- Pumping schemes from boreholes,
- Piped distribution systems,
- Lining of channels by R.C.C.
- Improvements to existing irrigation schemes.

A summary of these schemes by district is given below. Detailed lists showing all 42 minor irrigation schemes which were undertaken by the Division for construction during 1985 are given on Table VII-7.

### SUMMARY OF MINOR IRRIGATION SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1985

District	No of schemes	Amount allocated for 1985 £	Expenditure incurred during 1985 £
Nicosia .....	19	306 398	203 368
Famagusta .....	1	70	70
Limassol .....	9	150 248	103 859
Paphos .....	13	308 452	206 511
Totals .....	42	£765 168	£513 808

TABLE VII-7

## MINOR IRRIGATION SCHEMES - EXPENDITURE 1985

Ser No	Scheme	Amount Allocated		Expenditure		Total	Remarks
		Govt £	Village £	Govt £	Village £		
1	Akaki-Lining of R.C.C. channels	9 100	-	-	-	-	
2	Ayios Epiphantos 'Maroullena', - Pumping scheme & distribution	2 418	1 244	999	500	1 499	Completed
3	Ayii Trimithias - R.C.C. channels	154	51	106	35	141	Completed
4	Argates 'Kounapis' - Improvements to existing chain of wells	3 679	3 679	Gr 17	Gr 8	Gr 25	Work suspended
5	Argates - Gabions	13 300	-	13 294	-	13 294	Completed
6	Dhenia - B.H. scheme and lining of channels	3 467	1 733	-	-	-	Scheme rejected
7	Kourdiali - Distribution network	4 333	2 167	4 175	2 087	6 262	Completed
8	Kalokhorio (Orini) - Lining of channels	3 830	1 915	3 556	1 778	5 334	Suspended
9	Kochati - Lining of channels	20 000	10 000	-	-	-	Pending issue of loan
10	Linou 'Linopsas' - R.C.C. channels	26 666	13 334	26 445	13 222	39 667	Completed
11	Meniko - R.C.C. channels	969	487	-	-	-	Completed
12	Nikitari - BH scheme	13 965	6 982	10 945	5 472	16 417	Completed
13	Orounda	32 155	16 072	28 173	7 043	35 216	Completed
14	Orounda 'Maoutsos' BH scheme	1 502	1 081	712	513	1 225	Completed
15	Orounda 'Nero tou Philippou' BH scheme	5 305	3 172	3 483	2 083	5 566	Completed
16	Pera - Politiko (Moulos)	26 218	13 109	14 874	7 437	22 311	Work in progress



TABLE VII-7

## MINOR IRRIGATION SCHEMES - EXPENDITURE 1985 (cont)

Ser No	Scheme	Amount Allocated		Total	Govt	Expenditure		Total	Remarks	
		Govt	Village			Village	Govt			
		£	£	£	£	£	£	£		
17	Potami 'Potamos'	20 874	10 437	31 311	15 822	7 911	23 733	Completed		
18	Phlasou 'Selloshis'	22 000	11 000	33 000	21 981	10 991	32 972	Completed		
19	Tembria	-	-	-	Gr 163	Gr 81	Gr 244	Completed		
	Total for Nicosia District	£209 935	£96 463	£306 398	£144 385	£58 983	£203 368			
	FAMAGUSTA DISTRICT									
1	Gypsos	70	-	70	70	-	70	Completed		
	Total for Famagusta District	£ 70	-	£ 70	£ 70	-	£ 70			
	LIMASSOL DISTRICT									
1	Apsion - Improvement of existing network	1 653	827	2 480	344	172	516	Completed		
2	Ayios Mamas - 'Kambos' I.D. New Pumping Sch. B.H. 53/77	33 667	16 833	50 500	20 580	10 290	30 870	Completed		
3	Agros 'Taliou - Kaouros - Lambada' Distr. network	4 133	2 067	6 200	3 178	1 589	4 767	Completed		
4	Ayios Ioannis (Agros) 'I.D. Peroyia' - construction of div. weir and distr. network	6 466	3 234	9 700	5 498	2 749	8 247	Completed		
5	Sykopetra - 'Agridhia - Konomidhes - Distr. network	3 000	1 500	4 500	2 441	1 176	3 617	Completed		
6	Pano Platres - Distr. network	7 280	3 640	10 920	-	-	-	Revision of scheme		
7	Perapedhi - BH 109/77 New pumping scheme & improv.	32 800	16 400	49 200	26 141	13 070	39 211	Work in progress		

TABLE VII-7

## MINOR IRRIGATION SCHEMES - EXPENDITURE 1985 (cont.)

Ser No	Scheme	Amount Allocated		Expenditure		Total £	Remarks
		Govt £	Village £	Govt £	Village £		
8	Saittas - Moniatis - Improvements with closed systems .....	13 195	3 105	13 195	3 105	16 300	Completed
9	Trimiklini - Improvements with closed system .....	299	149	221	110	331	Completed
	Total for Limassol District .....	£102 493	£47 755	£71 598	£32 261	£103 859	
	PAPHOS DISTRICT						
1	Kelokedhara - 'Psathaes' B.H. 68/79 and distr. network .....	13 933	6 966	12 951	6 476	19 427	Completed
2	Kelokedhara 'Ziripillis' B.H. 65/64 and distr. network .....	8 093	4 046	7 958	3 979	11 937	Completed
3	Kato Akourdhalia Diversion weir main conveyor st. tank & distr. system .....	10 620	5 310	10 071	5 036	15 107	Completed
4	Kholi - Construction of st. tank	123	62	-	-	-	Completed
5	Kritou Terra - 'Kephalovryos' BH 83/73 and distr. network	18 333	5 667	17 005	5 002	22 007	Completed
6	Miliou 'Liskiaris' - Weir storage tank and distr. net- work .....	30 665	15 332	223	112	335	Legal obstacles
7	Miliou 'Kolokouris' Improvements- closed system .....	4 000	2 000	3 416	1 708	5 124	Pending inst. of p. unit
3	Nata - B.H. 21/72 and distr. network .....	39 500	19 750	32 039	16 020	48 059	Completed



TABLE VII-7

## MINOR IRRIGATION SCHEMES - EXPENDITURE 1985 (cont)

Ser No	Scheme	Amount Allocated		Expenditure		Total	Remarks
		Govt £	Village £	Govt £	Village £		
9	Nikoklia - B.H. scheme and distr. network .....	33 515	16 757	26 954	13 477	40 431	Completed
10	Nea Dhimmata Improvements .....	4 002	2 001	3 281	1 641	4 922	Completed
11	Polemi - B.H. 26/60 and distr. network .....	21 000	10 500	14 576	7 288	21 864	Work in progress
12	Steni - B.H. 113/78 and distr. network .....	18 000	9 000	6 216	3 108	19 324	Work in progress
13	Trakhyedhoula B.H. 173/61 and distr. network .....	6 185	3 092	5 316	2 658	7 974	Completed
Total for Paphos District .....		£207 969	£100 483	£140 006	£66 505	£206 511	

## OTHER MAJOR IRRIGATION WORKS

### (SUPPLEMENTARY WORKS)

During 1985 the Division had to deal with supplementary works for 14 other major irrigation schemes of an estimated cost of £340,188. The overall expenditure incurred on these 14 schemes during the year reached the amount of £245,320.

Out of this category of schemes the Akrotiri project featured first in expenditure reaching the amount of £70,223, and involving the laying of asbestos cement pipes for the extension of the distribution networks. Other important schemes executed during 1985 were the Erimi - Kolossi which also involved the extension of the distribution network the Esso Galata Pond and distribution system, and the Khirokitia pond and distribution network.

A list showing details of all 14 other Major Irrigation works which were undertaken for construction during 1985 is shown on Table VII - 8.

## TOWN WATER SUPPLY AND GOVERNMENT WATER SUPPLY SCHEMES

The construction programme for 1985 included three main categories of schemes regarding Town and Government Water Supplies:-

- (a) New schemes for Town Water Supplies,
- (b) Government Water Supply schemes, and
- (c) Improvements of Water Supply Sources, Refineries, Pumping Stations and Conveyors.

For the three above categories of schemes an amount of £469,004 was allocated during 1985 for the execution of 12 different schemes. The overall expenditure incurred during 1985 on these 12 schemes was £327,551, and the largest expenditure incurred on one scheme was £198,924 for Khirokitia Treatment Plant.

Most of these schemes aim at improving the existing water supplies of Towns or villages which depend on Government sources of supply.

A list showing details of all 12 schemes executed during the year for Town Water Supplies and Government Water Supply Schemes is given on Table VII-9.



TABLE VII-8

## OTHER MAJOR IRRIGATION WORKS - EXPENDITURE 1985

Ser No	Scheme	Amount Allocated		Expenditure		Total	Remarks
		Govt £	Village £	Govt £	Village £		
1	Akrotiri - Extensions to the distr. networks .....	112 080	-	70 223	-	70 223	Work in progress
2	Argaka-Makounda - Pumping schemes from three BHs . . .	5 470	-	3 410	-	3 410	In progress
3	Anaphotia Anglisides - Const. of recharge dam and diversion canal .....	20 000	-	16 711	-	16 711	Work in progress
4	Erimi-Kolossi Extension of distr. system .....	36 667	18 333	31 469	15 735	47 204	Work in progress
5	Galata Esso - Pond and distr. network .....	33 320	16 660	19 214	9 607	28 821	Work in progress
6	Khirokitia pond - Diversion weir, Main conveyor and constr. of pond .....	24 534	12 257	18 879	9 439	28 318	Completed
7	Khirokitia Distr. network from pond .....	16 909	8 454	16 909	8 454	25 363	Completed
8	Lefkara - Irrig. outlets ..	1 000	-	610	-	610	In progress
9	Pakhyamos - Electr. supply to BH .....	4 500	1 125	2 976	-	2 976	In progress
10	Palekchori 'Sklidros' - Distr. network .....	3 094	1 031	2 200	734	2 934	In progress
11	Polemidthia - Yermasoyia (installation of water meters)	10 300	-	6 601	-	6 601	Work in progress
12	Trakhoni - Ypsonas - Installation of water meters .....	1 280	-	747	-	747	Work in progress

TABLE VII-8

## OTHER MAJOR IRRIGATION WORKS - EXPENDITURE 1985 (cont.)

Ser No	Scheme	Amount Alllocated		Expenditure		Total	Remarks
		Govt £	Village £	Govt £	Village £		
13	Yerakies - Chakistra - Kambos (Pumping equipment)	8 341	3 738	7 802	2 600	10 402	In progress
14	Yermasoyia - Polemidhia relocation of pipes .....	1 085	-	1 000	-	1 000	Completed
Total .....		£278 580	£61 608	£198 751	£ 46 569	£245 320	



Table VII-9

## TOWN WATER SUPPLY AND GOVERNMENT WATER SUPPLY SCHEMES

Ser No.	Scheme	Amount allocated in 1985 £	Expenditure incurred during 1985 £
A NEW SCHEMES FOR TOWN WATER SUPPLIES			
1	Municipality Paphos WS .....		466
2	Paphos WS .....	19 600	19 272
3	Paleometckho .....	4 000	3 234
4	Delta Kouris recharge .....	7 000	7 011
5	Iron moulds .....	4 500	5 469
6	Yermasoyia recharge works from Kouris Dam .....		17 896
7	Compensations .....		561
8	Yermasoyia .....	24 844	1 911
	Total .....	£ 59 944	£ 55 820
B GOVERNMENT WATER SUPPLY SCHEMES			
9	Paralimni - Ayia Napa .....	150 000	49 501
10	Armou .....		5 768
11	Paphos Lower Villages .....	27 000	17 338
	Total .....	£ 177 000	£ 72 607
C IMPROVEMENT OF WATER SUPPLY SOURCES, REFINERIES, PUMPING STATIONS AND CONVEYORS			
12	Khirokitia		
	(a) Supply of mechanical and electrical equipment .....		80 181
	(b) Constructional works .....	232 060	118 743
	Total .....	£ 232 060	£ 198 924
	Grand Total .....	£ 469 004	£ 327 351

MAJOR IRRIGATION WORKS  
VASILIKOS-PENDASKINOS PROJECT

For details of the implementation of contracts for this project, see under chapter VIII/1.

During 1985 considerable work was carried out by force account under the direct supervision of personnel of the Construction Division. A short description of those items executed direct by the Division is given below. The overall expenditure during 1985 for Vasilikos-Pendaskinos project reached the amount of £ 5,837,459. A list showing in detail the expenditure incurred on each item separately is given on Table VIII/1-1.

PAPHOS IRRIGATION PROJECT

Though the Paphos Irrigation Project was completed and put into operation a few years ago, still there are outstanding claims to be settled, especially on the Asprokremmos Dam Contract which has been examined through the process of arbitration where the head of the Division is involved directly in the Claims Committee.

In addition constructional work is being executed each year by forced account direct by the District Office for extension to the distribution system. The overall expenditure incurred on Paphos Irrigation Project during 1985 reached the amount of £ 201,707. Table VII-10 shows in detail all expenditure incurred during the year.

TABLE VII-10  
MAJOR IRRIGATION WORKS - PAPHOS IRRIGATION PROJECT

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
1	Land acquisition .....	235 783	10 993
2	G P Zachariades - final certificate ...		95 000
3	Ellin Union - construction of power station .....		16 773



TABLE VII-10  
MAJOR IRRIGATION WORKS - PAPHOS IRRIGATION PROJECT (Cont.)

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
4	Extension of irrigation network at Anarita .....		63 319
5	Connection of irrigation network with Mavrokolymbos .....		5 540
6	Extension of irrigation network Tala		2 847
7	Extension of irrigation network Eastern Area .....		7 224
8	Colcrete Ltd (final settlement) .....		11
	Total .....	£235 783	£201 707

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

The Pitsilia Integrated Rural Development Project which covers 49 villages with a total area of 60,000 hectares and a population of 21,000 inhabitants, was substantially completed in 1984.

The activities in 1985 with an expenditure of only £ 46,849 were mostly related to the completion of carry over schemes which were put in hand in previous years, and minor repairs or improvements. In total during 1985 the Division had to deal with 40 such schemes and as it can be observed from the list below the expenditure incurred on each scheme was almost negligible.

Table VII-11 shows in detail all 40 schemes for which the Division had to respond for completion and minor works, as well as the expenditure incurred on each one separately.

TABLE VII-11  
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT  
SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1985

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
	A PONDS AND DISTRIBUTION SYSTEMS		
1	Arakapas distribution system No. 2 ...	5 302	229
2	Arakapas pond No. 2 .....	19 842	2 335
3	Agridhia pond and distribution system	4 918	339
4	Akapnou Ephtagonia pond and distribution system	6 761	2 314
5	Ayii Vavatsinias pond No. 2 .....	2 271	426
6	Ayii Vavatsinias distribution system No. 2	2 952	187
7	Dhierona pond .....	9 777	1 198
8	Dhierona distribution system .....	1 561	421
9	Ephtagonia pond Nos 2 and 3 .....	9 470	3 054
10	Kato Mylos pond and distribution system	5 902	1 865
11	Khandria pond .....	2 406	824
12	Kyperounda pond No. 2 .....	7 963	1 275

TABLE VII-11  
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT  
SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1985 (Cont.)

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
13	Kyperounda distribution system No. 2	2 799	Cr 35
14	Lagoudhera distribution system .....	3 109	572
15	Melini pond .....	919	403
16	Ora pond .....	1 589	299
17	Ora distribution system .....	7 433	3 112
18	Pelendria pond .....	7 824	2 662
19	Pharmakas pond 1 and 2 .....	11 942	2 408
20	Pharmakas distribution system 1 and 2	840	840
	Total .....	<u>£115 580</u>	<u>£24 728</u>
21	B XYLIATOS DAM		
	(i) Purchase of filters .....	671	17
	(ii) Phase B .....	3 290	Cr 67
	(iii) Acquisition .....	1 788	1 517
	(iv) Arbitration .....	1 591	1 592
	Total .....	<u>£7 340</u>	<u>£3 059</u>
	C BOREHOLE SCHEMES		
22	Agros B/H 21/82 .....	8 497	600
23	Alona B/H 46/80 .....	8 166	4 318
24	Askas B/H 98/80 .....	1 817	4
25	Ayios Konstantinos B/H 123/76 and 8/81	8 466	272
26	Dhierona B/H .....	2 968	60
27	Dhymes B/H 81/80 .....	5 243	483
28	Lagoudhera B/H 53/80 .....	3 549	31
29	Louvaras B/H 32/77 and 16/81 .....	2 795	1 466
30	Sykopetra B/H 48/82 .....	192	18
31	Zoopiyi B/H 9/81 .....	7 152	281
	Total .....	<u>£48 845</u>	<u>£7 533</u>
	D VILLAGE WATER SUPPLY SCHEMES		
32	Ayios Pavlos .....	57	40
33	Ayios Ioannis Agrou oper. exp. ....	2 713	2 647
34	Ayios Ioannis Agrou B/H 65/76 ( .....	1 180	767



TABLE VII-11  
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT  
SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1985 (Cont.)

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
35	Gourri B/H 99/83 .....	6 825	5 348
36	Phikardhou .....	2 562	331
	Total .....	£13 337	£9 133

E IRRIGATION SCHEMES

37	Pelendria (Kato Phylagra) .....	8 694	2 396
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SUMMARY OF ALL PITSILIA INTEGRATED RURAL DEVELOPMENT SCHEMES  
UNDERTAKEN FOR CONSTRUCTION DURING 1985

Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £	Number of schemes
PONDS AND DISTRIBUTION SYSTEMS .....	115 580	24 728	20
XYLIATOS DAM .....	7 340	3 059	4
BOREHOLE SCHEMES .....	48 845	7 533	10
VILLAGE WATER SUPPLY SCHEMES .....	13 337	9 133	5
IRRIGATION SCHEMES .....	8 694	2 396	1
Grand total .....	£193 796	£46 849	40

REFUGEE HOUSING AND SELF-HOUSING SCHEMES

This category of work was inaugurated in 1976, one and a half years after the Turkish invasion of Cyprus. Until then urgent schemes were implemented supplying water to makeshift refugee camps all over Cyprus. During the period of 1976-1985 an enormous achievement has been accomplished in this urgent and human task, and the vast volume of work in this sector of construction has been almost completed. The Division of Construction, since the Turkish invasion of Cyprus has given top priority on these schemes dealing always with prompt action for the completion of schemes aiming at supplying domestic water supply to new Government Housing Estates or Self-housing Estates.

By the end of 1985 the total expenditure incurred on this sector of domestic water supply schemes for the refugees exceeded the amount of £3 million. It should be made quite clear that a lot more has been spent for the supply of adequate water for the refugees for the supplementing of existing water supply schemes of towns or villages where the majority of the refugees have been housed. This amount is related entirely on new Government Housing Estates or Self-housing Estates.

During 1985 the Division had to deal with 36 schemes of various categories for the housing of the refugees. Most of these schemes were put in hand in previous years and were carried over for completion in 1985. Two schemes were related to sewage systems for Housing Estates, ten were related to

water supplies to Housing Estates and 24 were related to water supplies to Self-housing schemes.

For all these 36 schemes an amount of £ 175,152 was allocated during the year and the expenditure incurred by the end of 1985 reached the amount of £ 94,616.

Table VII-12 shows in detail all 36 Refugee Housing and Self-housing schemes which were approved for construction during 1985.

TABLE VII-12

REFUGEE HOUSING AND SELF-HOUSING SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1985

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
A HOUSING ESTATES SEWAGE DISPOSAL AND WATER SUPPLY SCHEMES			
(i) Sewage Systems			
1	Kophinou (Larnaca) .....	3 964	3 638
2	Kophinou (Larnaca) .....	1 399	686
	Total .....	<u>£5 363</u>	<u>4 324</u>
(ii) Water Supplies			
1	Athalassa G (Nicosia) .....	5 350	202
2	Khrysozpiliotissa (Nicosia) .....	1 304	88
3	Kamares (Larnaca) .....	3 918	84
4	Kokkines (Nicosia) .....	12 167	328
5	Makarios III (Limassol) .....	3 021	3 038
6	Makarios III (Larnaca) .....	4 169	1 166
7	Mouttalos (Paphos) .....	1 600	1 600
8	Omonia (Limassol) .....	625	361
9	Perakhorio (Nicosia) .....	4 000	3 853
10	Zenon (Larnaca) .....	15 400	541
	Total .....	<u>£51 554</u>	<u>£11 261</u>
B WATER SUPPLY FOR SELF HOUSING SCHEMES			
(i) Famagusta District			
1	Avgorou B .....	4 000	4 000
2	Avgorou C .....	4 000	3 788
3	Avgorou D .....	4 000	3 599
4	Avgorou E .....	4 000	3 850
5	Avgorou Z .....	4 000	3 144
6	Akhna A Phase B .....	3 092	142
7	Akhna A Phase C .....	9 258	3 689



TABLE VII-12  
 REFUGEE HOUSING AND SELF-HOUSING SCHEMES UNDERTAKEN FOR  
 CONSTRUCTION IN 1985 (Cont.)

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
8	Akhna B .....	32 000	12 627
9	Sotira D .....	2 600	1 741
	Total .....	<u>£66 950</u>	<u>£36 580</u>
(ii) Limassol District			
1	Ayia Phyla D .....	30	30
2	Evdimou B .....	2 433	2 428
3	Episkopi D .....	4 400	4 090
4	K. Polemidhia D .....	10 200	10 195
5	K. Polemidhia E .....	8 400	8 039
6	K. Polemidhia C .....	4 030	679
7	Mouttayaika D .....	8 000	7 330
	Total .....	<u>£37 493</u>	<u>£32 791</u>
(iii) Larnaca District			
1	Dhromolaxia Z .....	2 484	2 098
2	Kiti D .....	700	562
3	Kophinou .....	400	406
4	Livadhia H .....	2 291	76
5	Livadhia Θ .....	2 100	1 531
6	Zyyi A .....	897	231
	Total .....	<u>£8 872</u>	<u>£4 904</u>
(iv) Paphos District			
1	Lemba .....	4 000	3 899
2	Timi .....	920	857
	Total .....	<u>£4 920</u>	<u>£4 756</u>

REFUGEES HOUSING AND SELF-HOUSING SCHEMES  
SUMMARY OF ALL DISTRICTS

Description	Number of schemes	Amount allocated in 1985 £	Expenditure incurred during 1985 £
A HOUSING ESTATES			
(i) SEWAGE SYSTEMES .....	2	5 363	4 324
(ii) WATER SUPPLIES .....	10	51 554	11 261
B WATER SUPPLY FOR SELF-HOUSING SCHEMES			
(i) FAMAGUSTA DISTRICT .....	9	66 950	36 580
(ii) LIMASSOL DISTRICT .....	7	37 493	32 791
(iii) LARNACA DISTRICT .....	6	8 872	4 904
(iv) PAPHOS DISTRICT .....	2	4 920	4 756
Total .....	36	£175 252	£94 616

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS

It has become the practice now and for many years that the Division of Construction undertakes the construction of any scheme related to water works and included in the budget of other Government Departments.

Such schemes which cover a wide field of water development are mostly related to:

- Domestic water supply schemes,
- Minor irrigation schemes,
- Water supply schemes to livestock,
- Relocation of water pipelines which are affected by the construction of new roads,
- Improvement of water supply or irrigation schemes for Turkish villages where now refugees have been housed,
- Sewage schemes, etc

During 1985 the Division had to deal with the construction of 88 such different schemes all over the island of an estimated value of £993,093. The overall expenditure incurred on all 88 schemes during the year reached the amount of £685,818. It is obvious from this figure that this category of works represents a fair amount of the Division's activities.

A list showing in detail all 88 schemes which were undertaken for construction during 1985 is given on Table VII-13.

TABLE VII- 13  
SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS DURING 1985

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
NICOSIA DISTRICT			
1	Athalassa sewage scheme .....	122 012	55 131
2	Athalassa (water tank) .....	750	750
3	Athalassa farm .....	1 500	1 213



TABLE VII- 13  
 SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS  
 DURING 1985 (Cont.)

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
4	Athalassa biological treatment plant ....	60 000	39 069
5	Philoxenia Hotel irrigation .....	23 500	22 910
6	Philoxenia sewage scheme .....	29 000	28 479
7	Akaki livestock area .....	1 300	874
8	Kakopetria sewage scheme .....	180 327	135 417
9	Mathiatis WS .....	7 740	1 317
10	Anayia WS .....	3 810	2 678
11	Maintenance of T/C boreholes .....	1 000	1 000
12	Fire hydrants .....	3 255	2 912
13	S.E.K.E.P. WS .....	1 300	1 374
14	Tseri WS .....	2 700	892
15	Avlona WS .....	4 000	2 989
16	Peristerona WS .....	1 000	889
17	Dhali WS .....	6 166	4 061
18	Astromeritis WS .....	1 350	841
19	Astromeritis road - relocation of pipes ..	10 000	4 353
20	Analiondas WS .....	1 840	1 579
21	Aredhiou WS .....	10 500	6 710
22	Yeri C - relocation of pipes .....	4 700	4 599
23	Moutoullas irrigation .....	16 000	13 418
24	Lakatamia WS .....	6 000	2 273
25	Phlasou - selleshis irrigation .....	3 000	2 985
26	Ayios Theodoros WS .....	98	82
27	Argates Ind. Area WS .....	31 274	23 196
28	Kalokhorio - Gourri road relocation of pipes .....	5 140	4 269
29	Mathiatis WS .....	2 600	2 600
30	Ayios Ioannis Malounda (ELDYK) irrigation	602	529
31	Makario Athlitiko Kentro .....	4 000	3 990
32	Makario Athlitiko irrigation .....	700	500
33	Lymbia road - relocation of pipes .....	360	346
34	Nicosia-Limassol road .....	800	204
35	Mosphileri WS .....	750	383
	<b>Total .....</b>	<b>£549 074</b>	<b>£374 812</b>

LARNACA AND FAMAGUSTA DISTRICTS

36	Zyyi (cleaning of borehole) .....	500	386
37	Xylotymbou livestock .....	2 000	1 386
38	Kalokhorio livestock .....	4 294	775
39	Kophinou (replacement of pipes) .....	2 000	1 294
40	Kivisil WS .....	2 200	168
41	Stavrovouni WS .....	500	194
42	Tersephanou WS .....	23 000	20 400
43	Klavdhia WS .....	8 500	5 756
44	Aradhippou antiflood .....	19 033	19 082
45	Tersephanou WS .....	12 500	9 747
46	Khirokitia irrigation .....	9 900	4 160
47	Troulli-Kelia road - relocation of pipes	300	271
48	Troulli irrigation .....	250	228
49	Kornos - Delikypos road - relocation of pipes .....	660	439
50	Ormidhia-Avgorou road .....	3 000	2 987

TABLE VII-13

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS  
DURING 1985 (Cont.)

Ser No	Description	Amount allocated in 1985 £	Expenditure incurred during 1985 £
51	Paralimni road - relocation of pipes ....	4 000	2 552
52	Makronisos - Ayia Napa WS .....	400	400
	Total .....	£93 037	£70 225
LIMASSOL DISTRICT			
53	Kato Polemidhia WS .....	4 000	3 278
54	Akrotiri WS to CY.T.A. station .....	231	191
55	Ayia Phyla WS .....	23 000	20 832
56	Pano Polemidhia WS .....	480	440
57	Kolossi WS .....	300	255
58	Malia WS .....	850	688
59	Polemidhia WS .....	150	113
60	Yermasoyia WS .....	7 313	3 335
61	Akrotiri WS .....	4 320	2 002
62	Yermasoyia WS chlorinator system .....	2 400	1 817
63	Ayios Konstantinos WS .....	1 000	638
64	Evdhimou improvement of existing system ..	17 000	14 603
65	Kato Polemidhia - Berengaria .....	354	354
66	Ayios Thomas improvement of Napi spring ..	1 850	1 021
67	Asomatos WS .....	1 530	1 392
68	Lemithou borehole scheme .....	27 334	14 151
69	Pera-Pedhi irrigation .....	6 867	6 731
70	Kandou irrigation .....	6 560	4 871
71	Paleomylos Hardji irrigation .....	6 755	6 755
72	Apeshia WS .....	2 500	2 103
73	Episkopi WS .....	53 000	40 678
74	Alektora WS .....	13 600	6 077
75	Krasokhoria irrigation .....	48 000	24 586
76	Limassol By-pass - relocation of pipes ..	31 500	15 201
77	Kyperounda-Agros - relocation of pipes ..	15 000	10 043
78	Zoopiyi-Agros - relocation of pipes .....	6 000	4 687
79	Saittas-Trimiklini-Pelendri - relocation of pipes .....	3 000	1 591
80	Saittas-Pera Pedhi - relocation of pipes	232	183
81	Ypsonas-Erimi - relocation of pipes .....	3 824	2 389
82	Pareklishia By-pass - relocation of pipes	1 300	1 106
83	Pareklishia road - relocation of pipes ..	1 708	1 612
84	Erimi-Mandria road - relocation of pipes	5 800	5 074
85	Ayia Phyla-Palodhia road - relocation of pipes .....	472	16
	Total .....	£298 230	£198 813
PAPHOS DISTRICT			
86	Goudhi Khrysokhou WS .....	25 500	18 276
87	Xeropiyi WS .....	19 992	19 047
88	Axylou WS .....	7 260	4 645
	Total .....	£52 752	£41 968
	GRAND TOTAL .....	£993 093	£685 818



#### SCHEMES UNDERTAKEN FOR CONSTRUCTION WITH FUNDS FROM VILLAGE DEPOSITS

During 1985 the Division had to respond to the requests of the District Officers or the Village Water Commissions, or Village Irrigation Committees for the execution of 82 schemes of various types.

Most of these 82 schemes undertaken by the Division for construction during 1985 from funds deposited direct by the beneficiaries were related mostly to:

- \* maintenance and repairs to pumping units used for domestic or irrigation purposes,
- \* Extensions, improvements or maintenance of existing water supply or irrigation distribution systems, etc

This practice is followed for many years because the villagers do not have the means to execute the works by themselves, and because this Department has got the experience and expertises to design and execute such schemes.

It should be noted that the funds deposited for the execution of these schemes are borne entirely by the villages and there is no Government contribution at all. In addition the villages have to pay an amount ranging between 20 % and 32 % as departmental charges.

For the execution of these 82 schemes an amount of £116,132 was deposited during 1985 and the overall expenditure incurred by the end of the year reached the amount of £68,887.

#### SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR PRIVATE DEVELOPERS

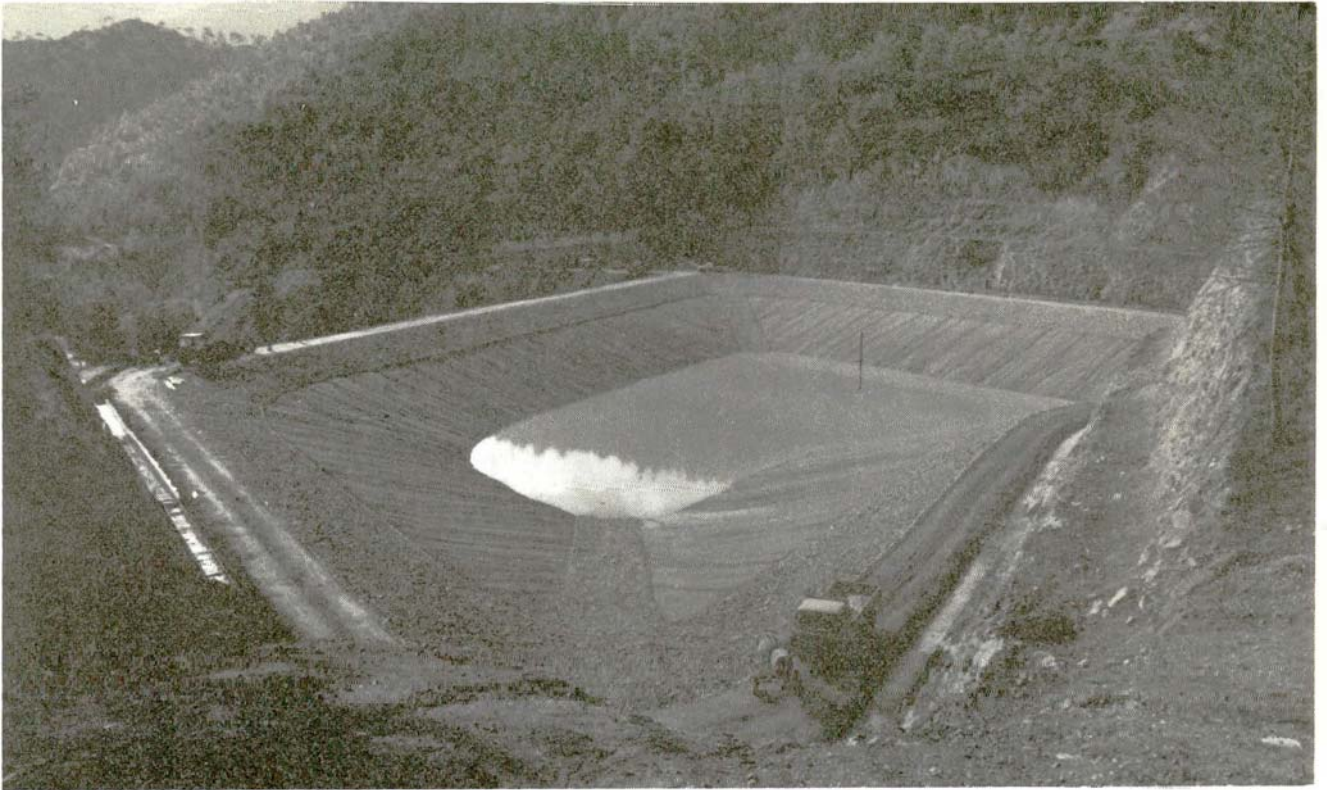
During 1985 the Division responded to the request of private developers for the construction of 250 schemes relating to water works.

These 250 schemes were related mainly to distribution systems for land developments, test pumping, hiring of moulds for reservoirs, etc, and were split all over the island.

The amount deposited for the execution of these schemes was £326,844 and the overall expenditure incurred during 1985 reached the amount of £190,252. This expenditure includes departmental charges ranging between 20 % and 32 %.

In the past all such works were executed by the Division of Construction so that the standard of work was maintained at the same level as the existing schemes and the interests of towns and villages were safeguarded.

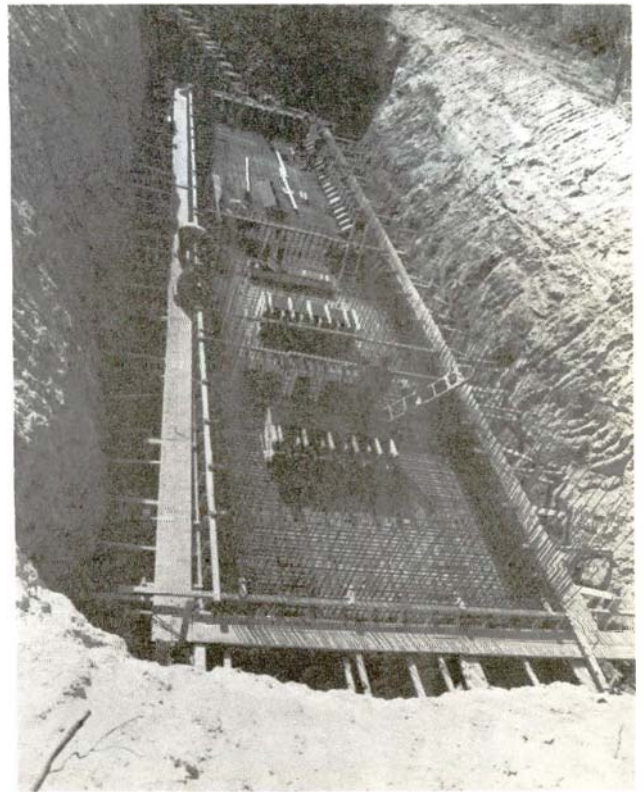




Esso Galata Pond. WDD Photo C50-EN-7 (27.11.85).



Kakopetria Sewerage Scheme.  
WDD Photo B99-EN-15 (26.3.85)



Mental Hospital Sewage Plant.  
WDD Photo C47-EN-E(15.11.85).



Recently and after the request of District Officers private developers and land owners were allowed to give to private sector the execution of some water supply schemes under the supervision of the Department.

## VIII MAJOR PROJECTS IMPLEMENTATION

### VIII/I Vasilikos-Pendaskinos Project

by  
Timothy Sabben-Clare  
Project Manager

#### GENERAL

1985 was another very satisfactory year for the Project during which most major elements of the works were taken over, commissioned and put to the use for which they were designed.

On 17th June the Project was inaugurated at Kalavassos Dam by His Excellency the President of the Republic Mr. Spyros Kyprianou. During the ceremony valves at the two dams were opened enabling water to flow for the first time to the completed parts of the Pendaskinos, Maroni and Vasilikos irrigation networks.

During the week commencing 9th December a wholesale alteration was made to the water mains and connections in the area between Khirokitia and Kornos Treatment Works. The treated water supply to Nicosia from the Khirokitia Treatment Works was cut off and the pumping station at Dhypotamos adjusted to pump raw water from Dhypotamos dam along the same mains to the new Works at Kornos which was finally taken over on 13th January 1986 after passing treated water into the public supply from 14th December 1985.

The Department's Construction Division continued to make a substantial contribution to the timely and economic completion of the Project by completion of the Kalavassos - Khirokitia pipeline, commissioned in April, Tokhni pumping station building completed in March 1985 and the substantial completion of most of the Pendaskinos and Maroni Irrigation areas (as well as the Maroni/Vasilikos connection pipeline) significant areas of which were operational since June.

#### ESTIMATED TOTAL PROJECT COSTS

The total estimated cost of the Project Section 3, summarised in Table VIII/I-1 below was revised downward during the year from the £30,635,000 at the time of the reevaluation in September 1982 to £26,629,300 including the first phase of the Project. This



has been possible due to several factors the most important of which are:

- Lower than expected price contingencies
- Substantial savings shown in both construction and supervision costs of works executed by the Direct Labour section of the Construction Division.
- An exceptionally competitive climate in both construction and supply contracts.

TABLE VIII/ -1

SUMMARY OF ESTIMATED TOTAL PROJECT COSTS

(in Cyprus Pounds as at 1 June 85)

Civil, Mechanical and Electrical Works by Contract		£
Kalavassos Dam .....		5 934 000
Dhyptamos Dam .....		3 736 000
Maroni Diversion .....		1 294 000
Pumping plant for Tokhni and Kornos Pumping Stations .....		662 000
Treatment Plant for Kornos Treatment Works .....		749 000
Civil works for Kornos Treatment Works .....		1 349 000
Telemetry .....		167 000
Project Headquarters .....		66 200
<b>Total .....</b>		<b>£13 957 200</b>
Civil Works executed by the Water Development Department's Construction Division (Direct Labour)		
Lefkara pipeline diversion .....		600 000
Tokhni Pumping Station .....		193 600
Telemetry cable laying .....		37 000
Kalavassos - Khirokitia Pipeline .....		2 106 000
Vasilikos Irrigation Area .....		2 250 000
Pendaskinos Irrigation Area .....		1 340 000
Maroni Irrigation Area .....		670 000
<b>Total .....</b>		<b>£7 196 600</b>
Infrastructure and Administration		
Agriculture Research Station .....		108 000
Purchase of vehicles and equipment .....		140 000
Survey work and investigation by the Water Development Department .....		136 500
Administration and supervision .....		600 000
Land consolidation .....		230 000
Land acquisition .....		100 000
<b>Total .....</b>		<b>£1 314 500</b>
Fees		
Consulting engineers .....		896 000
Panel of experts .....		25 000
Hydraulic model testing .....		40 000
		<b>£961 000</b>

TABLE VIII -1 VASILIKOS-PENDASKINOS PROJECT  
SUMMARY OF ESTIMATED TOTAL PROJECT COSTS (cont.)  
(in Cyprus Pounds as at 1 June 85)

Contingencies .....	£ 200 000
Total estimated cost .....	<u>£23 629 300</u>
First phase completed in late 1981 .....	3 000 000
Total first and second phase .....	<u>£26 629 300</u>

TABLE VIII -2 VASILIKOS-PENDASKINOS PROJECT  
TOTAL EXPENDITURE TO THE END OF 1985

1985 Budget .....	£ 4 000 000
1985 Revotes .....	243 139
1985 Special warrant .....	2 200 000
Total available during 1985 .....	<u>6 443 139</u>
Total expenditure 1985 .....	5 860 939
Available for 1986 revote .....	<u>£ 582 200</u>

The total expenditure on the Project to 31st December 1985 was £20,927,803 excluding the expenditure on the first phase and therefore compares with the total estimate of £23,629,300.

The item by item expenditure during 1985 and the total expenditure up to the end of 1985 is given in the Table below:

TABLE VIII -3 VASILIKOS-PENDASKINOS PROJECT  
TOTAL EXPENDITURE UP TO END OF 1985 (ITEM BY ITEM)

Item No.	Description	Expenditure in 1985 £	Expenditure upto 1985 £
31	Maroni Irrigation - Contract No 10 .....	362 785	641 264
32	Erection of building - Khirokitia H.Q. ....	--	65 870
33	Agricultural research - ARI building .....	18 123	75 518
34	Purchase of vehicles & machinery .....	--	89 059
35	Consultants fees and panel of experts .....	145 412	780 855
36	Hydraulic model testing .....	--	39 930
37	Works by WDD (topography, investigations etc.) ....	9 631	128 400
38 & 39	Administration .....	148 411	558 810
40	Land consolidation .....	37 090	105 907
41	Kalavassos Dam .....	757 236	5 975 433
42	Dhypotamos Dam and Lefkara Diversion .....	657 824	4 363 530
43	Maroni Diversion .....	513 684	1 226 566
44	Kalavassos - Khirokitia Pipeline .....	192 933	2 143 842
45	Pendaskinos Irrigation Area .....	892 223	1 177 676
46	Vasilikos Irrigation Area .....	903 785	903 785
47	Pumping Stations - Contract 4 A - (Electrical & Mechanical Plant).....	236 917	581 298
48	Kornos Treatment Works - Contract 5B (Civil) .....	557 949	1 147 630
49	Kornos Treatment Works - Contract 5A - (Electrical & Mechanical Plant) .....	313 264	666 892
50	Total Tokhni (Kalavassos) Pumping Station .....	64 560	191 249
51	Acquisition of land .....	16 792	64 289
52	Telemetry - Contract 6 .....	--	--
	Total Expenditure	<u>£5 828 679</u>	<u>£20 927 803</u>



## WATER BENEFITS

TABLE VIII -4 VASILIKOS-PENDASKINOS PROJECT  
SUMMARY OF WATER BENEFITS  
(Volumes in million m<sup>3</sup>)

Dam	Impounding started	Max. stored in 1985	Supply in 1985		
			to irrigation	to potable	total
Kalavassos	2 Nov. 84	5.5	0.494	3.675	4.169
Dhyptamos	21 Dec. 84	1.9	0.435	0.186	0.621

## STATUS OF FOREIGN LOANS

The total value of foreign loans from the International Bank for Reconstruction and Development (IBRD), the Kuwait Fund for Arab Economic Development (KFAED) and the European Investment Bank (EIB) is equivalent to about £14,800,000. The total balance still to be disbursed at the end of 1985 was £1,399,192 as shown in the following Table.

TABLE VIII -5 VASILIKOS-PENDASKINOS PROJECT  
FOREIGN LOANS STATEMENT

Financier	Total loan	Amount to disburse in foreign currency	Approx equivalent balance to disburse
			in Cf
IBRD	US\$ 9 910 000	US\$ 679 260	370 573
KFAED	KD 2 500 000	KD 479 477	901 781
EIB	ECU 9 000 000	ECU 264 330	126 838
Approximate total in Cf to disburse:			<u>£1 399 192</u>

## PROGRESS ON PROJECT IMPLEMENTATION

### Kalavassos Dam and Ancillary Works (Contract No.1)

#### Contract Details

Contractor: Messrs Joannou and Paraskevaides with Medcon Ltd  
(Joint Venture. JV)

Contract value: £5,648,000 (inc. £200,000 contingencies)

Contract start date: 3rd January 1983

Contract early impounding: 31st Dec. 1984 (was 2nd June 1985)

Actual early impounding: 2nd November 1984

Contract completion: 17th June 1985 (was 8th Sept. 1985)

Certificate of completion issued: 31st March 1985

End of maintenance period: 31 March 1986

#### Expenditure

Estimated total expenditure to completion including C.P.A., foreign currency purchase and W.D.D. admin/transport: £6,110,000

#### Claims (under consideration)

9 headings in the total sum of £82,570

Benefits to 31 December 1985

	Impounding level	Date	Capacity cu.m.
Maximum .....	160.875 .....	21 May 1985 .....	5 500 000
Minimum .....	147.860 .....	20 Dec. 1985 .....	1 568 000
Water pumped to Khirokitia Treatment Works:			3 674 857
Water gravitated to the irrigation network:			
Maroni area	233 558		
Kalavassos area	260 771 .....		494 329
Total water supplied in 1985: .....			<u>4 169 186</u>

Progress

The first half of 1985 saw work on site concentrated almost wholly on finishing all the ancillary works around the site as the main structure was complete and impounding water.

Construction of the control spillway weir proceeded slowly and the design needed modification to suit the varying rock quality and rock shape.

The crest of the dam received most attention however. The upstream and downstream stone walls, the kerbs, the lighting and the approach roads and car parks were all completed and the whole road and walkway area tarmaced just in time for the inauguration on 17th June 1985.

The inside of the valve tower and the valve house was transformed by the installation of all the staircases, handrails and floors and the partial completion of the electrical work. The finishes were completed to the valve house and the hoist installed.

Construction of the Guard House proceeded well and the building was all but complete for the inauguration ceremony which took place on the front patio of the house.

Work continued to complete the drainage system for the downstream side of the dam, the stairs on the embankment face, the roadways, the culverts and the landscaping of the downstream tip areas. In addition, work proceeded on the up-grading of the access road from the village to the dam by the installation of drains and culverts.

During early June 1985 the Contractor shifted his main batching plant off site and removed much of the rubbish and stored materials away from the dam.

The reservoir stayed almost steady in level during the first half of 1985 holding some 5.6 million cu.m. at 161 metres amsl. A gradual decrease in level followed the use of water at Khirokitia and by irrigation in the area near Kalavassos Village.

During the second half of 1985 the Contractor had a small gang on site attending to the still quite long list of minor remedial works that were needed to the completed structure.

The only major work outstanding at the year end was the realignment of the access road near Kalavassos Village. Some electrical work was also still outstanding in the valve shaft.



Meetings were held almost every week with the Contractor's staff to discuss finalisation of the accounts and to discuss rates for altered work and claims but agreement of all the quantities for the final account proved to be rather a slow process. Also the reduction in the RE's staff available to assist with the work, made it impossible to achieve the target for completion by end-January 1986 but very considerable progress was made. Several hundred new rates have been agreed and these are being presented for agreement by the VPP Committee of the WDD as time allows.

A package deal for the rate for transition fill, which formed quite a large percentage of the volume of the dam, was finalised formally and hence the Contractor dropped all the Claims pertaining to the embankment in return for this agreed rate for transition fill. Some progress was made with other claims and with the final account but a large amount remains to be completed. Completion of all the paper work associated with the construction proceeds quite well, however, but will take some time yet.

In discussions with the Contractor the CRE and WDD negotiated a further agreement whereby the contractor withdrew a list of claims amounting to a total of £62,000 in return for an early payment of 80% of half the retention money. Discussions on the remainder of the claims have been reasonably successful but require a considerable amount of research that is time - consuming. No agreements have yet been reached.

Many record drawings were completed and work continued in preparing these.

Instrumentation readings were taken regularly and analysed and plotted. In general the instrumentation has behaved satisfactorily and has shown that the dam is behaving as the design anticipated.

An analysis of final expenditure on this Contract showed that after the addition of sums for the acceleration agreement and CPA the original Contract Sum will be exceeded by some 5% including the cost of purchase of the Foreign Currency paid to the Contractor under the Contract.

The total expenditure on the dam during 1985 was £757,236 and the total spent on it to the end of 1985 was £5,975,433.

#### Dhypotamos Dam (Contract No.2)

##### Contract Details

Contractor: Messrs Shephard Hill Ltd. with Messrs. G.P. Zachariades Ltd.

Contract value: £4,268,896.568 (inc. £200,000 contingencies)

Contract start date: 2nd November 1982.

Core construction started: 12th December 1983

Contract early impounding: 21st December 1984 (was 2nd April 1985)

Actual early impounding: 11 January 1985

Contract completion date: 21st April 1985 (was 9th July 1985)

Certificate of completion issued: 14th April 1985

End of maintenance period: 14th April 1986

## Expenditure

Estimated final expenditure including C.P.A., foreign currency purchase, and WDD admin. transport .....	£3 763 000
<u>Add</u> Direct labour expenditure on Lefkara diversion and ancillary pipelines and connections: (approx).....	<u>£ 615 000</u>
Total estimated expenditure .....	<u>£4 378 000</u>

## Claims under consideration

2 headings in the total sum of £45 000

## Benefits (to 31.12.85)

	Impounding level	Date	Capacity cu.m
Maximum .....	153.68 .....	10 June 1985.....	1 935 000
Minimum .....	150.34 .....	31 Dec. 1985.....	<u>1 295 000</u>
			<u>640 000</u>
Water pumped to Kornos Treatment Works .....			185 600
Water gravitated to Pendaskinos irrigation area .....			<u>435 558</u>
Total water supplied in 1985 .....			<u>621 158</u>

## Progress

This dam also progressed very well in the period and impounding started on 11th January 1985. The Contractor was not anxious to impound early as the rising water would quickly inundate the haul road to the clay borrow areas (which were all upstream) and soon after affect the office and workshop area. Both difficulties were overcome: some clay was stockpiled for completing the dam crest and the offices and workshops gradually shifted as the water level rose.

As at Kalavassos the period saw completion of the embankment and the diversion of resources by the Contractor towards completion of all the ancillary works. Comprehensive lists of outstanding items were drawn up in co-operation with the Contractor and at the end of the period very little work was outstanding and the whole site was looking very tidy.

The valve shaft was completed and the hydraulic valve - operating system commissioned satisfactorily.

The spillway structure was completed and the plunge pool finally shaped to a design modified in the light of discussions with the Panel of Experts during their visit in February 1985.

The downstream area of the dam and the filter borrow areas were reinstated carefully and the reservoir completely cleared of all debris.

On the crest of the dam the upstream and downstream crest walls and the roadway were formed together with the approach works and car park area. Crest lighting was completed and the electric cables run into the valve house. Although the crest roadway was not then yet tarmaced, all other works were virtually completed to make the dam crest look tidy for the inauguration ceremony.



On the downstream side of the dam the drainage and landscaping works were completed. The final connections were made to the supply and irrigation pipelines so that water from the dam was used for irrigation in the Pendaskinos Valley. The main access road to the dam was completed.

In the car park area, preparations were made for the site of the Guard House, which may be built by the WDD direct labour organisation in the future. Power lines, water supply and drains have been installed underground, however.

Virtually no work took place on site during the second half of 1985 as the Contractor intended to complete the short list of outstanding items altogether towards the end of the maintenance period in March 1986. Regular inspections of the works showed little that needed to be added to the list. Some difficulty was experienced with the flowmeter but this was shortly to be connected as soon as the electrical subcontractor had refitted the repaired transmitter.

The remaining site staff have had nearly continuous meetings with the Contractor's quantity surveyors in an endeavour to finalise all the outstanding matters on the final account. New rates were agreed for almost all the altered work and these were being ratified by the VPP Committee as their time allowed. Variation Orders for agreed items were issued. Nearly all quantities were agreed.

Discussion on the Contractor's two remaining claims proceeded slowly but some progress was made to finalise them.

Record drawings were being prepared of the whole contract and work continued on the construction report.

Instrumentation readings were taken regularly and analysed and plotted. In general the instrumentation behaved satisfactorily and showed that the dam was behaving as the design anticipated.

Expenditure during 1985 totalled £657,824 and totalled to the end of the year £4,350,863 including the expenditure on the Lefkara Diversion carried out quickly and economically by the WDD Construction Division in 1982/1983.

#### Maroni Diversion (Contract No.3)

##### Contract Details

Contractor: G.P. Zachariades Ltd  
Contract value: £1,255,554.40 (inc. £70,000 contingencies)  
Contract start date: 2nd May 1984  
Contract completion date: 31st July 1985 (2 weeks extension granted)  
Completion Certificate issued: 3rd August 1985  
End of maintenance period: 3rd August 1986.

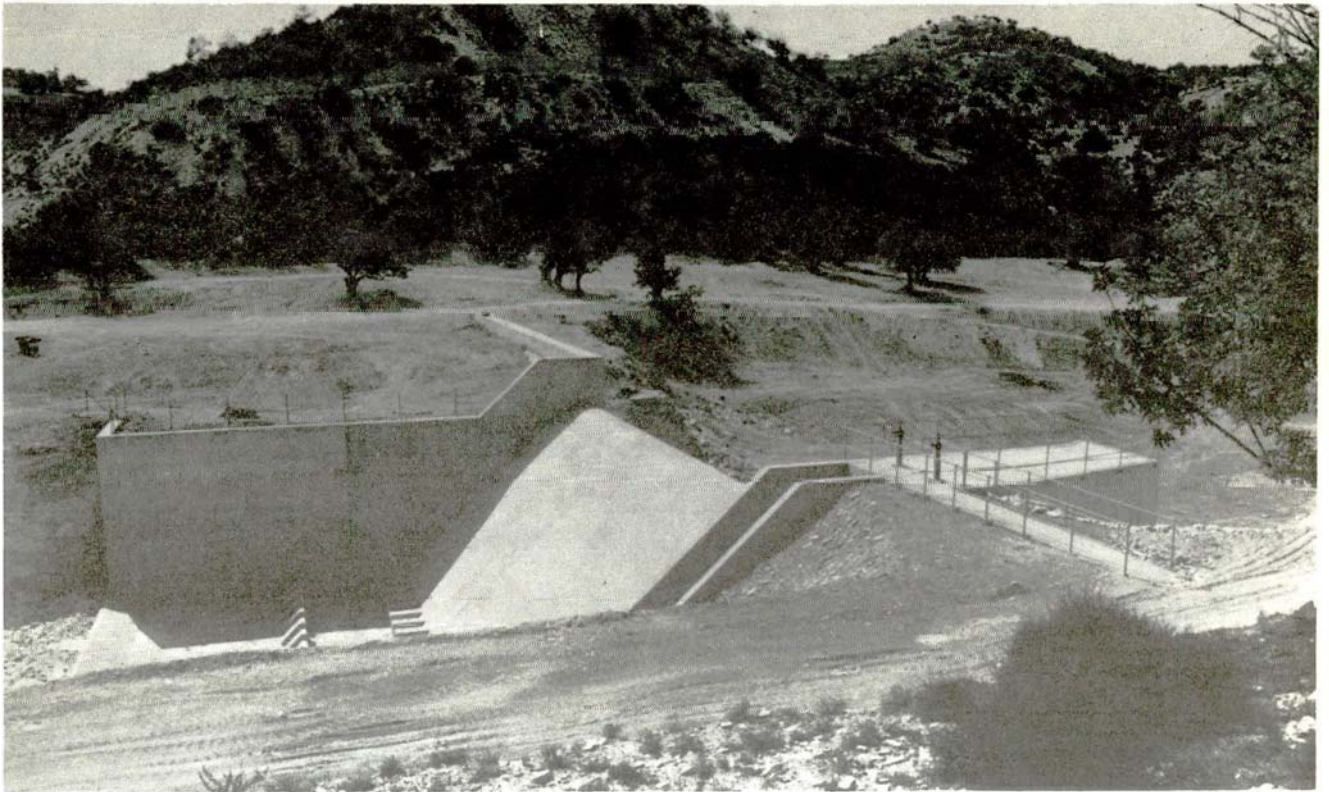
##### Expenditure

Estimated final expenditure (including CPA)      £1,290,000

##### Claims

3 headings in the total sum of £141,259.67. The Chief Resident Engineer has presented his analysis and assessment of these claims in the total sum of £37,838.27 which the Department is considering.





Maroni Diversion Weir. WDD Photo C43EN-9 (8.10.85)



Pendaskinos Irrigation Area. Installation of pipes.  
WDD Photo B96EN-23A (13.3.85).



## Benefits

No water was diverted during 1985 but impounding was commenced and, after initial release to recharge the Maroni gypsum aquifer, diversion to Dhyptomamos dam commenced in mid February 1986.

## Progress

During the first half of 1985 progress on this Contract was rather slow but nevertheless a substantial amount of work was completed in the period. The Contract was completed on time.

On 23rd April 1985 the tunnel broke through and since then the shotcrete lining was completed, the floor laid, the pipe supports installed and the pipeline laid through the tunnel. It was then pressured.

At the weir all concrete work was completed except for the west side additional cut-off wall which was to be installed as a result of rather high water-test readings found in a shallow buried channel in this abutment of the weir. Concrete quality on this continued to be a problem right to the end but very few actual failures of cubes occurred; the strengths were just erratic.

The section of pipeline between Dhyptomamos Dam and PI 21, near Skarinou Bridge, was completed by 13th June 1985 and handed over to the WDD for use as an irrigation connection between the Dam and parts of the Pendaskinos Irrigation area then completed. From PI 21 to PI 10 the main was completed and tested but from PI 10 to PI 6 the main laying awaited stabilisation of the slopes in the bulk excavation cutting at PI 8 - 9. This had been thought to be stable at the end of March 1985 but the necessary blasting to excavate the pipe trench in hard rock at the base of the cutting may have been a contributory cause of a failure of the south slope, which then took some 3 weeks to correct. This section of main was then constructed, however, and with great care. From PI 6 through the tunnel and up to the weir the main was all complete and tested by 30th June.

A completion certificate for the length of main in the Pendaskinos Valley was issued for 13th June 1985 and the whole Contract was completed near the Contract completion date of 31st July 1985. The Contractor applied for two extensions of time but only that for the additional bulk excavation seemed tenable. That for the tunnel did not seem to be appropriate. However, the Contractor did claim extra costs for the tunnel where rock conditions may have been somewhat different from those he expected.

Very little work took place during the second half of 1985 on the site when the works were completed and partly operational.

A small amount of remedial work took place on the roadways where rainfall had caused severe erosion of the banks.

Regular meetings with the Contractor during the period have enabled all the quantities to be agreed and new rates worked out for all the altered items. These were being agreed by the VPP Committee as time allowed and Variation Orders were later issued to the Contractor.

The record drawings were completed and were being checked over.

The construction report was largely completed. Inspections of the tunnel and the bulk excavation cutting have shown no further problems and the small amount of cracking in the shotcrete lining to the tunnel has not increased. With the onset of wetter weather these inspections will continue.

Expenditure during 1985 totalled £513,684 and totalled to the end of the year £1,226,566.

### Pumping Stations Mechanical and Electrical Plant

#### Contract Details

Contractor: Weir Pumps Ltd (UK)  
Contract value: £747,586 (inc. £100,000 contingencies)  
Contract start date: 10th December 1982.  
Pump deliveries due: 31st July 1984  
Plant erection due: November 1984 (Original contract date: August 1984)  
Actual erection start: 7th January 1985 (by agreement with Weir Pumps Ltd)  
Taking Over Certificate issued for  
Tokhni Pumping Station ..... : 8 May 1985  
Taking Over Certificate issued for  
Kornos Pumping Station ..... : 23 December 1985

#### Expenditure

Estimated final expenditure ..... £685,000  
(including C.P.A.)

#### Claims

None to date

#### Benefits (to 31 Dec. 1985)

Volume pumped from Kalavassos Dam 3,674,857 m<sup>3</sup>

#### Progress

The Pumping Station at Tokhni was commissioned during April 1985 and since then has been used to pump water from Kalavassos Dam to Khirokitia Treatment Works. There were a few snags to the final commissioning. The bearings of the pumps showed signs that they had suffered some damage during storage and those on one pump were replaced. The pump plinths were found to be rather too narrow for the method of construction and fixing of the holding down bolts and some modifications were necessary. A new plinth had to be made for the compressors as it proved unsatisfactory to have them bolted direct to the pumphouse floor.

Tokhni pumping station operated satisfactorily during 1985 except for a number of leaks in the station pipework caused, it is thought, by excessive movement at times of surge. This has been added to the short list of outstanding work that Weirs returned to complete, with their sub-contractors during February-March 1986.

At Kornos the pumps and pipework were all erected and the generator and surge vessel placed in position. At a late stage it was decided to reposition the radiator of the generator and this meant that the associated civil works could not allow completion of this work until a later visit to site by Weir's erection superintendent. He left on 13th June 1985 having done all that was possible and necessary at both Tokhni and Kornos. He returned in time to complete and commission Kornos pumping station on 14th December 1985 and the associated generator was commissioned on 21-23rd December 1985. A considerable amount of preparation work was needed before this could be achieved as the incoming off-peak electrical services had to be altered to suit EAC's requirements. The new changeover switch panel was installed in the generator room and cabled up together with the interlocking of the switchgear. All this extra work took some



time to arrange as imported switchgear and cable had to be ordered. The whole installation was approved finally by EAC and pumping to Stavrovouni started on 14th December 1985 and has continued in a virtually trouble free manner ever since.

Some work was outstanding on this Contract at the year end. A list of snags was prepared and sent to Weir Pumps who attended to the items through their sub-contractor in Cyprus. Some malfunctions in the earth-fault system caused periodic trouble and needed locating and rectifying. Some aspects of the generator installation were not wholly satisfactory but were later dealt with. Two pumps needed foreign matter removing from the impellers but all are now operating satisfactorily.

Final painting, along with any outstanding snags, were completed in February/March 1986.

Expenditure during 1985 was £236,917 and the total spent to the end of 1985 was £581,298.

#### Tokhni Pumping Station (Contract 4B) Superstructure

##### Contract Details

Contractor: Water Development Department - Direct Labour  
Estimated cost: £152,000 (excluding power supply)  
Final cost: £190,000 (including power supply)  
Contract start: 24th November 1983  
Substantial completion: March 1985

##### Expenditure

Construction .....	146 902
Electricity Supply .....	41 546
Work to complete (estimate).....	<u>1 552</u>
Total estimated expenditure.....	£190 000

##### General

The pumphouse building was satisfactorily completed but some work remained to be rectified by the PWD after the year end in the car park area and surround to the pumphouse.

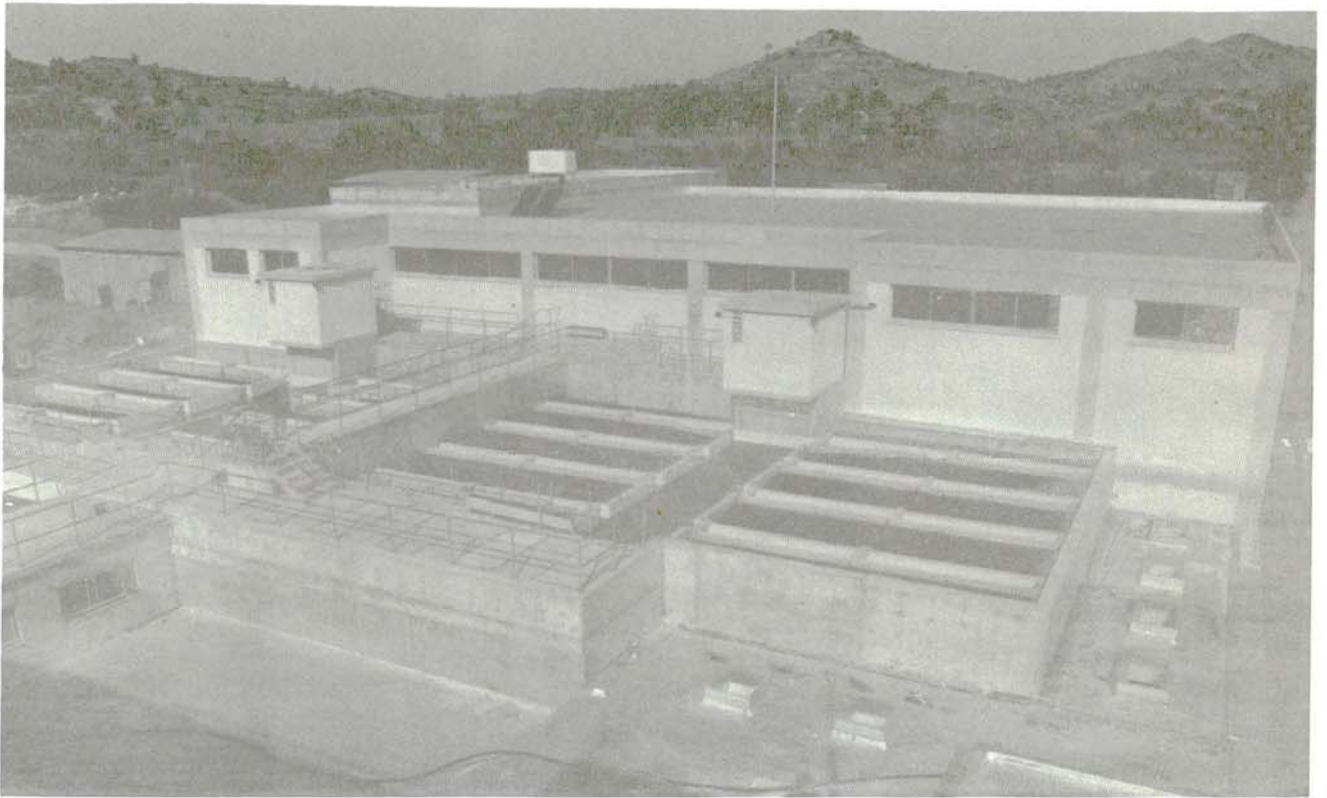
#### Kornos Treatment Works Mechanical and Electrical Plant

##### Contract Details

Contractor: Degremont Laing Ltd (UK)  
Contract value: £810,885 (including £100,000 contingencies)  
Contract start date: 17 November 1982  
Plant delivery date: 16 August 1984  
Actual Plant Erection Start Date: 7 January 1985  
Taking Over Certificate issued for the works: 20 January 1986.

##### Expenditure

Estimated final expenditure  
(including CPA) ..... £770,000



Kornos Treatment Works. WDD Photo C46EN-19 (5.11.85)



Tokhni Pumping Station. WDD Photo B95EN-6 (6.3.85).



## Claims

None to date

## Benefits (to 31 January 1986)

Total treated water into public supply  
starting on the 14 December 1985 ..... 482,170 m<sup>3</sup>

## Progress

Erection started on 7th January and Degremont Laing's site staff were on site continuously during 1985 since then.

Virtually all the equipment needed to complete the installation at Kornos was on site by mid-year.

The electrical panels were manufactured at CYEMS and were inspected in June. A considerable list of points to be rectified was drawn up and these were rectified by the manufacturer.

Good progress was made with the erection of all mechanical equipment and most of this was in position by 30th June. Electrical installation proceeds well also. But the buildings generally were behind programme and it was not possible for D-L to achieve their programme of starting commissioning on 21 July 1985.

After connection of the 24-hour electricity supply on 30 September 1985 it was possible to start the 12-week commissioning period which culminated in the 7-day full trial between 13th and 20th December 1985. This passed off satisfactorily in almost all respects and water has been passed into supply at the specified quality since 14 December 1985.

Initially it was not possible to run the plant at more than around 60% capacity because of difficulties with forming an effective blanket in the clarifiers. At the year end it was also impossible to pump more than this range of flows from Dhypotamos Pumping Station and so was impracticable to test the whole works at the maximum flow for more than a few hours. However by diverting 16000 m<sup>3</sup> per day through one clarifier and filter it has been possible to prove that parts of the works are capable of treating water at a rate of 32,000 m<sup>3</sup> per day as guaranteed by the Contractor. Arrangements continued to be made to prove the works at lower flows and to refine the treatment process and chemical regime in such a way that increases in the flow to the maximum were rendered more certain.

A longish list of minor items requiring attention was drawn up and sent to the contractor and his sub-contractors dealt with these items. A Degremont Laing representative was on site during the three-month running maintenance period which started on 10 January 1986 after a delay caused by the illness of their previous staff member allotted to this post. At the same time the remaining functions of the works, the washwater and sludge plants were commissioned.

Discussions started to determine the final account for this Contract and to finalise the outstanding Variation Orders.

The laboratory equipment was all delivered, unpacked and installed in the laboratory.

Expenditure on this Contract during the year totalled £313,264 while the total to the year end amounted to £666,892.

### Kornos Treatment Works (Contract 5B)

#### Contract Details

Contractor: Ch. Apostolides and Co. Ltd.  
Contract value: £1,324,773 (including £100,000 contingencies)  
Contract start date: 14 November 1983  
Contract completion date: 1 September 1985  
Taking Over Certificate issued for the  
last section of the works: ..... 13 January 1986

#### Expenditure

Estimated cost to completion  
(including CPA) ..... £1,265,000

#### Claims

A large number of vague claims were submitted without any figures. Due to delays and in the absence of any extensions to the contract period the Contractors liability for liquidated damages stood at £78,300 by the year end.

#### Benefits

Total Treated water into public supply  
Starting on 14th December 1985 ..... 482,170 m<sup>3</sup>

#### Progress

The first section of the Works, the filters, were completed on time but the succeeding sections of the works were completed behind programme for various reasons. Thus, although Degremont Laing (D-L) started work some 5 weeks later in the filters than the day they were completed, that float was entirely absorbed and D-L were having to work in sections of the works that were not completed. This was difficult but was achieved by very close liaison with the contractor.

In spite of the difficulties much progress was made in the first half year. Half the raw water reservoir was nearly ready for water testing. The main pipelines were also nearly completed. The filters and pulsator clarifiers were completed together with the chemical basement and the wash-water pumphouse where little remained to be done. The chemical buildings were nearing completion with most floor finishes completed. The pumphouse still had a long way to go, however, as had the administration block.

The works were sufficiently completed to allow them to be brought into almost full operation on 14 December 1985, and the contractor carried out the finishing and remedial works at the year end. Completion certificates were issued during the period for the last half of the raw Water Reservoir and the washwater and Sludge handling plant, but a certificate for the remainder



of the Administration building was delayed until 13 January 1986. The issue of this certificate left only the exterior works uncertified as being substantially completed.

Lists of outstanding work were issued for each of the first four sections of the works and the Contractor was dealing with these lists at the end of the year.

By the end of the year the works were gradually taking shape and the whole site beginning to look as was nearing completion. In most cases, the final standard of finish achieved is up to the desirable high standard.

The RE's staff mainly concentrated on the completion of the works rather than on the completion of the final account but most of the quantities were broadly agreed and final agreement should not prove too difficult.

The Contractor has submitted quite a large number of vague claims for extensions of time but these cannot be analysed until they are submitted in more detail.

Expenditure during 1985 was £557,949 while the total to the end of the year was £1,147,630.

#### Telemetry Contract No.6

##### Contract Details

Contractor: Caramondani Bros with Flutec S.A.  
Contract value: £164 777 (excluding direct labour works)  
Direct labour work: 45 223  
Total estimated cost: £210 000  
Contract start date: 27 September 1985  
Contract period: 11 months

##### Expenditure

Final estimated cost including cable laying by WDD and CPA: £210,000

##### Progress

The Consulting Engineers submitted their report on tenders in March and the award was eventually made to the lowest tenderer, as recommended, after consideration by the Tender Board and Ministerial Committee on tenders.

The further recommendation adopted was that the means of transmission of signals from station to station would be by private buried cable rather than by radio or telephone network.

The cable laying will be carried out by the direct labour organisation of the Water Development Department at an additional cost of about £39,000 the cost of the necessary cable being included in the award price to Caramondani/Flutec.

Drawings and specifications have been submitted by the Contractor and examined in detail by the Consultant. Many aspects of the contractor's proposals were not strictly in accordance with the specification and a large amount of correspondence was needed to persuade the contractor to alter and amend his proposals so that they met or were equivalent to the requirements originally specified. Meetings were held in London to sort out many of the details.

The contractor was manufacturing the various panels and control panels largely in accordance with his originally approved programme. Discussions with the purchaser on the final layout of the Mimic Diagram and the nomenclature for the control panels were largely successful in finalising these and a layout of the mimic diagram was expected shortly after the year end for final approval.

An order for the cable and cable markers was placed when quantities were finally established.

#### Expenditure

There was no expenditure on this contract during 1985.

#### Kalavassos - Khirokitia Pipeline (Contract No.7)

##### Contract Details

Contractor: Water Development Dept. (WDD) - Direct Labour  
WDD estimate for construction and laying: £1,233,000  
Estimated final cost of pipes, valves etc, £1,175,000  
Estimated final cost of construction and laying: £931,000  
Contract start date: 1st Sept. 1983 Commissioning: April 1985

##### Status

The pipeline has been in use since April 1985 carrying water for irrigation and potable purposes from Kalavassos Dam to Khirokitia Treatment Works via Tokhni Pumping Station and to the Vasilikos irrigation area. There have been no problems with the pipeline or Kalavassos Break Pressure Tank both constructed by the Department's direct labour organisation quickly, economically and to high standards.

##### Cost

Total expenditure ..... £2,143,842  
(i.e. approx. £265,000 less than the estimated cost of executing the work by contract)

##### Expenditure

The total expenditure during 1985 was £192,933 and the total to the end of 1985 was £2,143,842.

#### Vasilikos Irrigation Area (840 Hectares)

##### Contract Details

Contractor: Water Development Department (WDD) - Direct Labour



Construction start date: 15th February 1985 (Maroni/Vasilikos connection)  
Estimated final expenditure: £1,950,000  
Original WDD estimate: £2,200,000

All the pipes and fittings were delivered during the first half of the year and deliveries of air valves, sluice valves and float valves were generally completed by the year end.

The Maroni/Vasilikos connection was laid, commissioned and made live since mid June enabling water from Kalavassos Dam to supply the Maroni Irrigation area, to the South East of the Vasilikos area.

The completion of this main conveyor through the Vasilikos irrigation area also enabled temporary line connections to be made ahead of the permanent Vasilikos network to serve greenhouses, existing plantations and other established cultivated plots whose normal source of water, pumped from the Vasilikos river gravels, had already been adversely affected by closure of Kalavassos dam.

The permanent Maroni/Zyyi/Psematismenos network (893 donums) was installed and will be completed by early 1986.

Work started on the laying of the remainder of the Vasilikos network covering the non-consolidated areas (3480 donums) and the remaining areas under land consolidation - Kalavassos/Tokhni (811 donums) and Kalavassos (1000 donums). This work will be progressively installed and commissioned area by area and finally completed by march 1987. Six permanent hydrants out of 123 total were operational by the end of the year.

Benefits (17th June - 31 December 1985)

Irrigation water supplied to:	
Maroni irrigation area .....	233 558 m <sup>3</sup>
Vasilikos irrigation area (existing plantations and temporary connections in the Kalavassos and Mari areas) .....	<u>260 771 m<sup>3</sup></u>
Total irrigation water from Kalavassos dam .....	494 329 m <sup>3</sup>

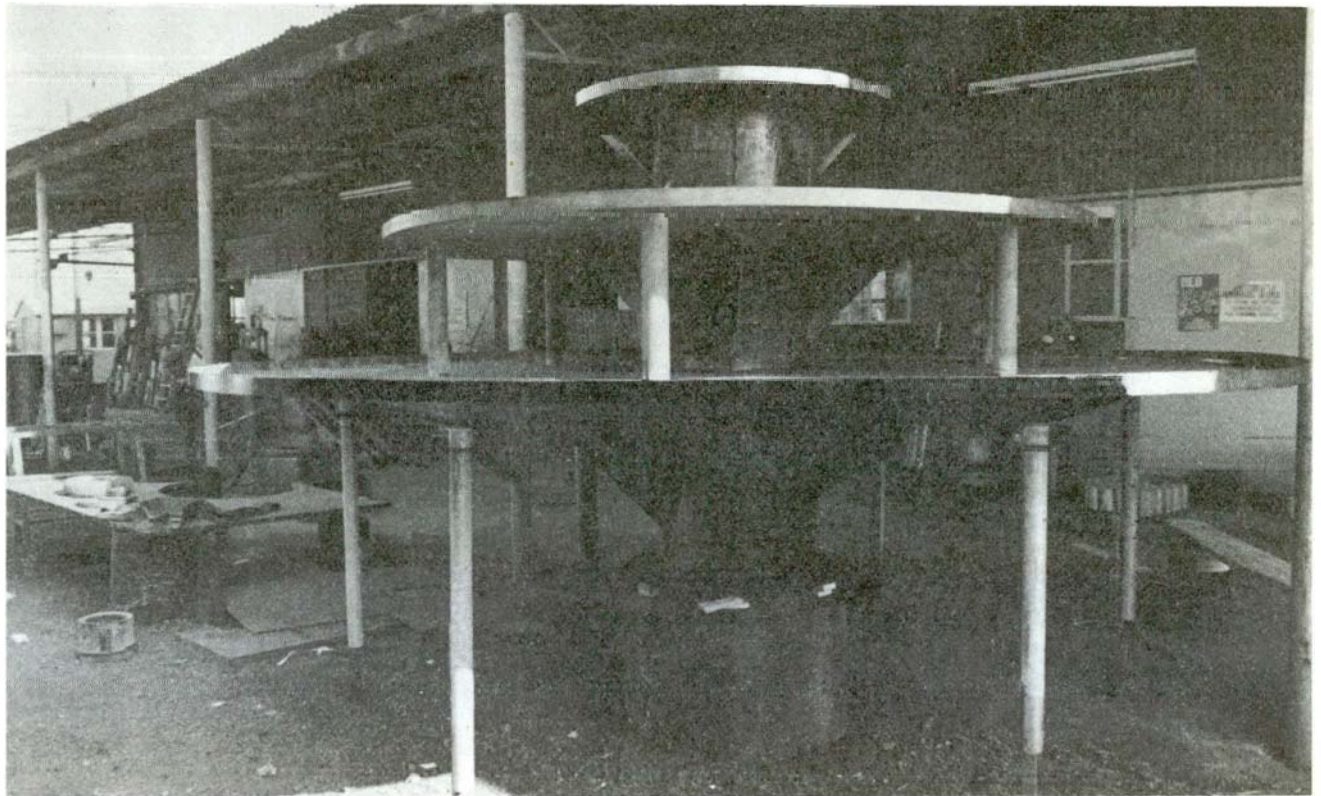
Expenditure

Expenditure on the Vasilikos Irrigation network installation during 1985 was £903,785 and the total expenditure up to the year end was £903,785.

Pendaskinos Irrigation Network - Contract No.9 ( 371 Hectares)

Contract Details

Contractor: Water Development Department - Direct Labour  
Water Development Department estimate, C£1,600,000  
Construction start date: 1st October 1984.  
Estimated final expenditure: C£1,391,000



Cascade aerator constructed at the MES workshop for the Khirokitia Balancing Reservoir. WDD Photo C53 EN-4.



## Status

The installation of the whole of the 2551 donums Pendaskinos network has been completely installed and was operational through a total of 168 hydrants by the year end, though much of it was commissioned in mid June.

A 180 donum extension to the network north of Skarinou bridge neared completion at the year end and work was about to commence on construction of about 7 km of field roads to improve access to the irrigated plots. These should be completed by the end of May 1986.

## Benefits (to 31 December 1985)

Private and Government boreholes in the area continued to make a significant contribution to the irrigation demand in spite of the construction of Dhyptomamos dam.

Irrigation water supplied from the dam totalled 435,558 m<sup>3</sup>

## Farm outlets in use:

Pendaskinos Area: .....	688	(October 1985)
Skarinou Area: .....	60	(February 1986)
Total .....	748	

## New Applications

Applications by plot owners outside the existing irrigation area boundaries for inclusion within the network were being carefully considered by a Departmental Committee. It was expected that an additional 50 donums of land (approx. 7 Ha) would be added to the network as a result of these applications.

## Expenditure

The total expenditure of the materials and installation during 1985 was £892,223 and the total up to the end of 1985 was £1,177,676.

## Maroni Irrigation Area - Contract No.10

### Contract Details

Contractor: Water Development Department - Direct Labour  
Water Development Department estimate - CY£670,000  
Construction start date: 1st October 1984  
Estimated final expenditure Cf 660,000

## Status

The pipe network was completed over the total 1570 donum area and in operation since June 1985. Gravel filters were installed during the second half of the year.

## Benefits (to 31 December 1985)

The total irrigation water supplied from Kalavassos dam was 233,558 m<sup>3</sup>.

## Expenditure

The total expenditure during 1985 was £362,785 and the total expenditure up to the end of 1985 was £641,264.

## VIII/2 KHRYSOXKHOI IRRIGATION PROJECT

By K. Spanos E.E.I  
Project Manager

### General

During the year 1985 construction works on Evretou Dam continued at a satisfactory rate.

Following completion of all geotechnical works in the river valley and excavations for the dam foundations, embankment filling was started with both clay and rockfill placing towards the end of February and by the end of December 1985 the general level of the embankment was 132m on the clay and 129m on the rockfill or about 58% complete. All other works on the dam like draw off works, spillway and groutings were substantially completed by the end of the year 1985.

As regards the Irrigation Networks of the Project tendering have been invited during 1985 for the supply of all necessary materials like pipes, fittings, valves, hydrants, water meters etc., (Contracts KSI, KS2, KS3) as well as for the installation works and construction of farm access roads. (Contract KC2). Awards have been made for the supply Contracts KSI and KS2 of total value of £ 704,704 before the end of the year whilst the award for KS3 and the installation Contract were still pending with the Tender Board.

Tender Documents for the installation of the Main Conveyor and Construction of Ponds (Contract KC3) were completed towards the end of the year 1985.

The supply of the Ductile Iron Pipes for the Main Conveyor is intended to be carried out through an extension of the Southern Conveyor Contract and for this purpose the Department has entered into direct negotiations with Pont-A-Mousson.

Following decision of the Government to expedite implementation of Phase II of the Project which will cover the areas of Argaka-Magounda, Ayia Marina and Pomos, the Department has embarked on the preparation of the necessary detailed design work. The first parts of the Phase II through which Argaka-Magounda existing dam will be connected with Evretou Dam will be completed by the middle of 1988 with Phase I of the Project. The total cost for both Project Phases which will cover about 3,000 ha is estimated to reach the amount of £ 25 million including the cost of on farm equipment.



The Project expenditure during the year 1985 was £ 3,776,820 bringing the total expenditure to £ 7.75 million which represents about 47% of the Project's Phase I implementation costs.

### Organization and Management

There has been very little progress made as regards recruitment of necessary additional management and technical staff in order to complete the full Project requirements in staff. Therefore the Project staff at the end of the year 1985 were the same as in 1984 and comprised of the following:

#### I. Management Staff

- I Executive Engineer I, Project Manager
- I Clerk (On Contract)
- I Clerk/Typist (Hourly)

#### 2. Evretou Dam Supervisory Staff

- (i) From Sir William Halcrow & Partners
  - I Civil Engineer as Resident Engineer, Mr. J. W. Reeves who took over from Mr. D.A.W. Bryant on 23rd July 1985
- (ii) From Water Development Department
  - 3 Executive Engineers I
  - I Executive Engineer II
  - I Technician I
  - 8 Technicians II
  - I Foreman
  - I Clerk/Typist

In addition to the above a considerable number of hourly paid staff on regular or temporary basis was working on the site assisting in the supervision of the works.

#### 3. Other Components of the Project

For the remaining components of the Project, the Main Conveyor, Irrigation Networks, Farm Roads etc., the following staff continued working on their design and preparation of tender documents.

- 2 Executive Engineers
- I Technician II (Topographer )
- I Technician II (Draughtswoman)

Formalities were also in progress for employment of necessary technical staff required for the supervision of the works under Contract KC2 - Irrigation Networks and Farm Roads construction due to start early 1986.

### Progress of Implementations

- I. Evretou Dam Construction Contract No. KC1  
Contractor: Shephard Hill - Zachariades J.V.

### General

Although the progress achieved by the Contractor during the year 1985 has been quite satisfactory the time for completion of the embankment had to be extended due to considerable increase in the quantities of rockfill as a result of a revision of its design in order to accommodate as much as possible the quality of rockfill produced from the quarries. In fact the Engineer has granted to the Contractor 15 weeks extension of time both impounding level and completion of the works. Hence contract completion date was fixed the 25th June 1987 whilst impounding was shifted towards the end of July 1986.

Mr. J.W. Reeves from Consultants Sir William Halcrow and Partners arrived at site on 9th July 1985. Mr. J.W. Reeves took over as Resident Engineer from Mr. D.A.W. Bryant on the 23rd July 1985.

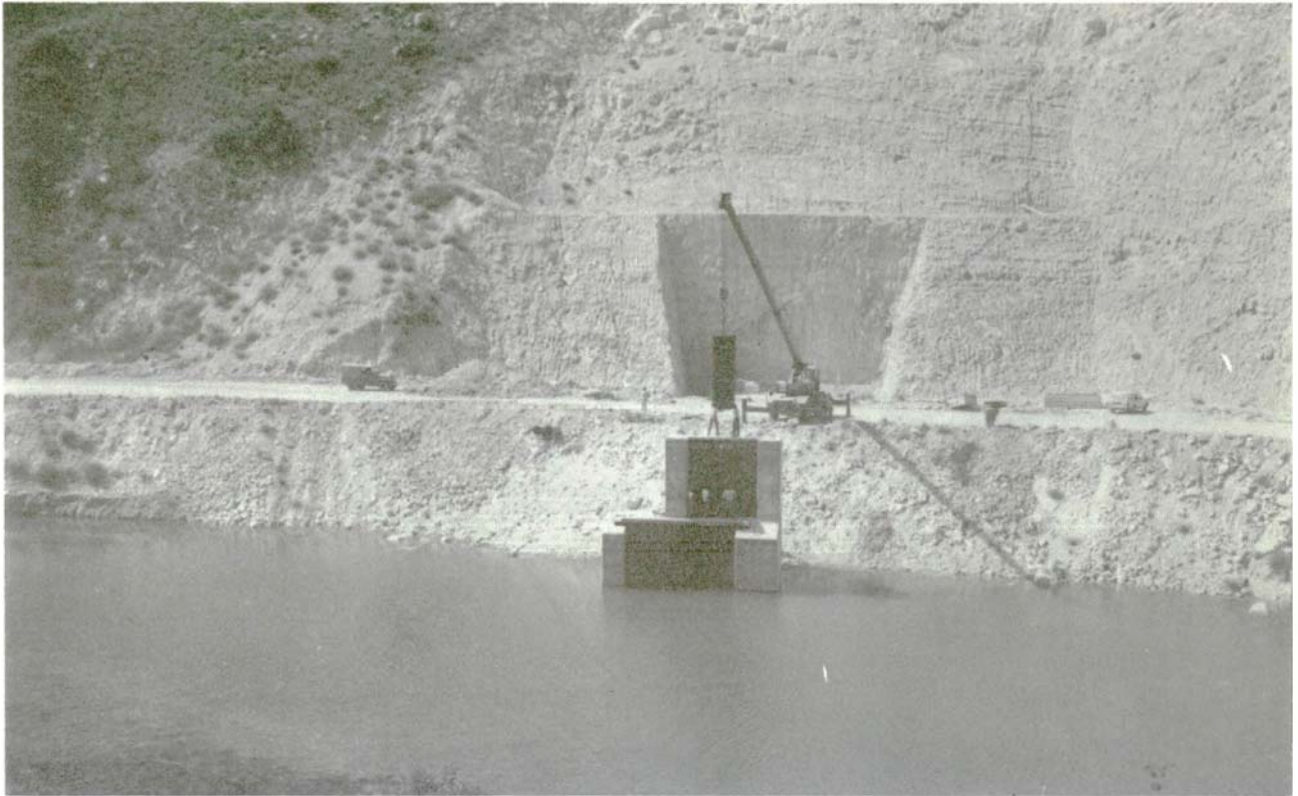
A construction progress chart on page VIII-29 show that about 80% of the works has been completed by the end of December 1985. Details of the progress achieved are given below.

### Tunnel and Draw-Off Works

Installation of the screen guides and of the temporary stoplogs at the intake structure was completed early May 1985. With stopping of the diverted river flow work was resumed on the tunnel consolidation grouting. A total of 1170 m of consolidation grouting holes took 13,538 kg of cement and a further 17,042 kg of cement was injected as cavity grouting.

The ductile iron pipes  $\varnothing$  1200 mm and  $\varnothing$  900 mm and fittings for the irrigation and bottom outlet pipelines have been delivered to site from Pont-A-Mousson in May 1985. Laying of the irrigation ( $\varnothing$  900mm)





Evretou Dam:  
View of intake structure and stoplogs installation.



Evretou Dam:  
Drilling for tunnel consolidation grouting.

and bottom outlet ( $\varnothing$  1200 mm) pipelines in the tunnel was carried out during the month of July 1985 and both were tested successfully to pressures 14.5 bars and 11 bars respectively in September 1985 following the casting of the first stage concrete pipe surround about 200mm above the pipeline invert level. The second and third lift of mass concrete pipe surround to the final tunnel invert level was completed in October 1985. During the same month all valves in the Valve Chamber (2 butterfly valves and 2 gate valves were connected to the pipelines. The fixed cone valve which is to be installed at the end of the bottom outlet pipeline was delivered to site in October. By the end of December the irrigation pipeline downstream of the tunnel was also installed and successfully tested to a pressure of 15 bars.

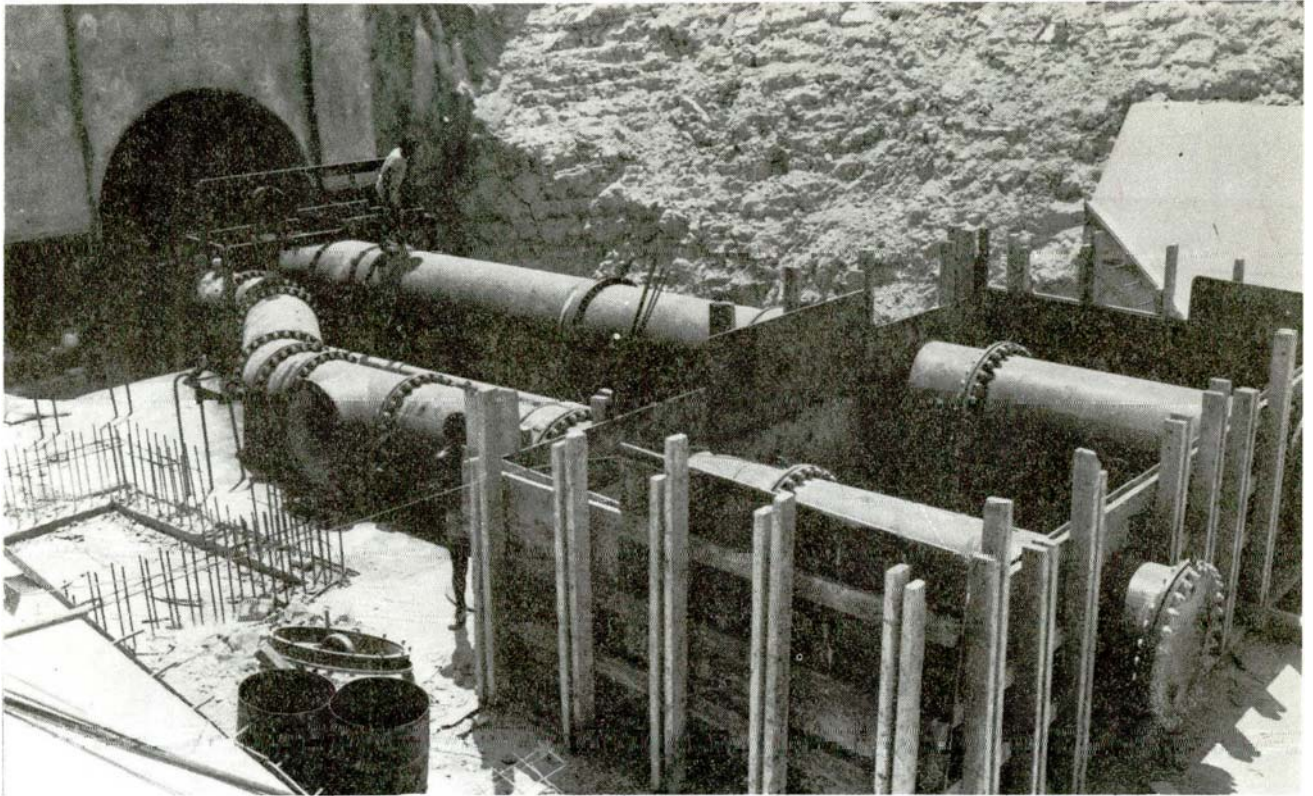
The stoplogs were removed and the screens were lowered into position at the intake structure by the end of October 1985 so that diversion of river flow through the bottom outlet pipeline could take place. First river flow was recorded on the mid November 1985.

#### Embankment

Excavations in the valley floor and at the abutment to prepare embankment foundations were completed by mid February 1985. The total quantities excavated ( $452,000 \text{ m}^3$ ) have far exceeded the original bill quantity of  $273,000 \text{ m}^3$ . The increase was mainly due to poor quality rock encountered on the left abutment and the zone of silty sands found at the downstream left bank side of the old river channel.

Placing of the downstream horizontal medium filter and drainage blanket over was started at the end of February 1985 and completed towards the end of April 1985. In the meantime a start was made on the rockfill placing in the upstream foundations also towards the end of February and was then extended over the completed parts of downstream drainage blanket. Development of the lower quarry which was started in January has produced very limited quantities of the specified class B rockfill and hardly any quantities of class A. The material produced from the lower quarry had a much higher fines (sand and silt) content than specified for Class B rockfill. This material was classified as Class C and contained up to 40% sand particles, between 60 and 80% sand and gravels, and up to 15% boulders larger than 200mm.





Evretou Dam:  
Installation of bottom outlet and irrigation pipeline coming out of tunnel.



Evretou Dam:  
Downstream view of embankment with some view of rock quarry in background.



In March 1985 the Contractor started work on the upper quarry but the quality of rockfill produced although better than the lower quarry was not to the expected one.

In the light of the poorer quality of rock material produced from the quarries the embankment section has been redesigned by the Consulting Engineers with the agreement of the Panel of Experts. The first revised section was produced in mid-May and was finalised after the Panel's site visit in June 1985. The main characteristics of the new design were:

- the slopes are flattened to 1:2.2 upstream, 1:1.9 with two berms 5.0 and 10m wide downstream
- an upstream toe weight to El. 128.0 consisting of random fill material is added,
- the upstream supporting shell is of class C (quarry run) rockfill up to El. 128.0, and the rest to the crest is of Class B rockfill as defined in the specifications, with four 60 cm thick processed gravel drainage layers,
- the downstream supporting shell is of Class C material only, protected against scouring with a layer of class B rockfill 4.0m wide horizontally,
- the upstream slope is protected against wave erosion by rock rip-rap from El. 150 to the crest, and with Class B rockfill below El. 150 to the level of the toe weight,

With the above revisions on the dam section the embankment fill has increased from 970,000 m<sup>3</sup> to 1,420,000 m<sup>3</sup>. The direct effect on the cost of the work including the additional cost due to reduction of the layer thickness during placing from 1.0m to 0.7m was estimated at about of £ 630,000.

Since June 1985 the Contractor continued with rockfill placing on both upstream and downstream shoulders with rock generally of type 'C' being borrowed from lower quarry No. 1. In October 85 the Contractor has opened up quarry No. 4 which is an extension of upper quarry No. 3 where better material was hoped to be found to meet the requirements of rockfill on the upstream shoulder above the drainage layer at 128 m el. This layer consisting of 600mm coarse gravels was placed during the first week of December 1985. Selected material



from the lower quarry together with the best material from the top quarry No. 4 was placed above the drainage layer. By the end of December 1985 the general level of the rockfill reached 129m el. and about 820,000 m<sup>3</sup> of rockfill were placed. Above the level of 128m the upstream slope of the embankment was flattened to 1:2.4 as a further safety precautions due to the fact that quality of materials produced from the quarries was still variable and it was not yet known how much good rock ('B') will be found within the body of quarry No. 4.

The earthfill plastic clay, and filter placing continued steadily during the reporting period with its level being always ahead of the adjacent rockfill. A programme was established by the Contractor for watering the clay in the borrow area with only a little water added on the embankment to raise the moisture content of the clay as to comply with the shear strength requirements.

Due to some serious difficulties faced by the Contractor in producing the gradings required by the original filter specifications, the Consultants have modified the filter design to more simplified arrangements as follows:

- (a) Upstream - a single 4m wide "all in filter" (sandy gravel) with a 2m wide crack sealing filter adjacent to the core above el. 150m.
- (b) Downstream - a 4m wide filter (sandy gravel) and a 3m wide chimney drain (gravel). Up to el. 145 however the original filter arrangement will be retained (1.5m wide very fine filter, 3.0m wide medium filter and 3.0m wide coarse filter) until all the very fine filter brought to the site earlier is used up. The width of the d/s single filter was later on reduced to 3m.

Due to the simplified gradings of the new filter and the reduction in the total volume of the filters required it was estimated that an overall saving of about £ 200,000 would be achieved.

An overall financial review of the Contract taking into account all variations in quantities and specifications which were known by the end of 1985 has indicated an increase to the Contract sum from £ 8,366,588 to about £ 8,500,000.

## Instrumentation

Installation of dam's instrumentation under the supervision of Soil Instruments Ltd has started in June 1985 over the first general level of instrumentation (I10 m) and was completed in July 85 and included hydraulic piezometers, settlement cells and pressure cells. The second level of instrumentation at elevation I25 was installed in November 85.

## Alluvial Grouting

Alluvial grouting with bentonite cement and chemical injection in the 4.2 m deep blanket upstream of the diaphragm wall and the deeper grouting in the vicinity of Panel 3 of the wall were completed by end February 85.

It has been confirmed from the results of the permeability tests carried out that both grouting phases have been very satisfactory and generally the achieved permeabilities were of the order of  $10^{-7}$  m/s.

The total volume of chemical grout take was about 620 ton whilst the bentonite cement reached about 1,000 ton.

## Rock Grouting

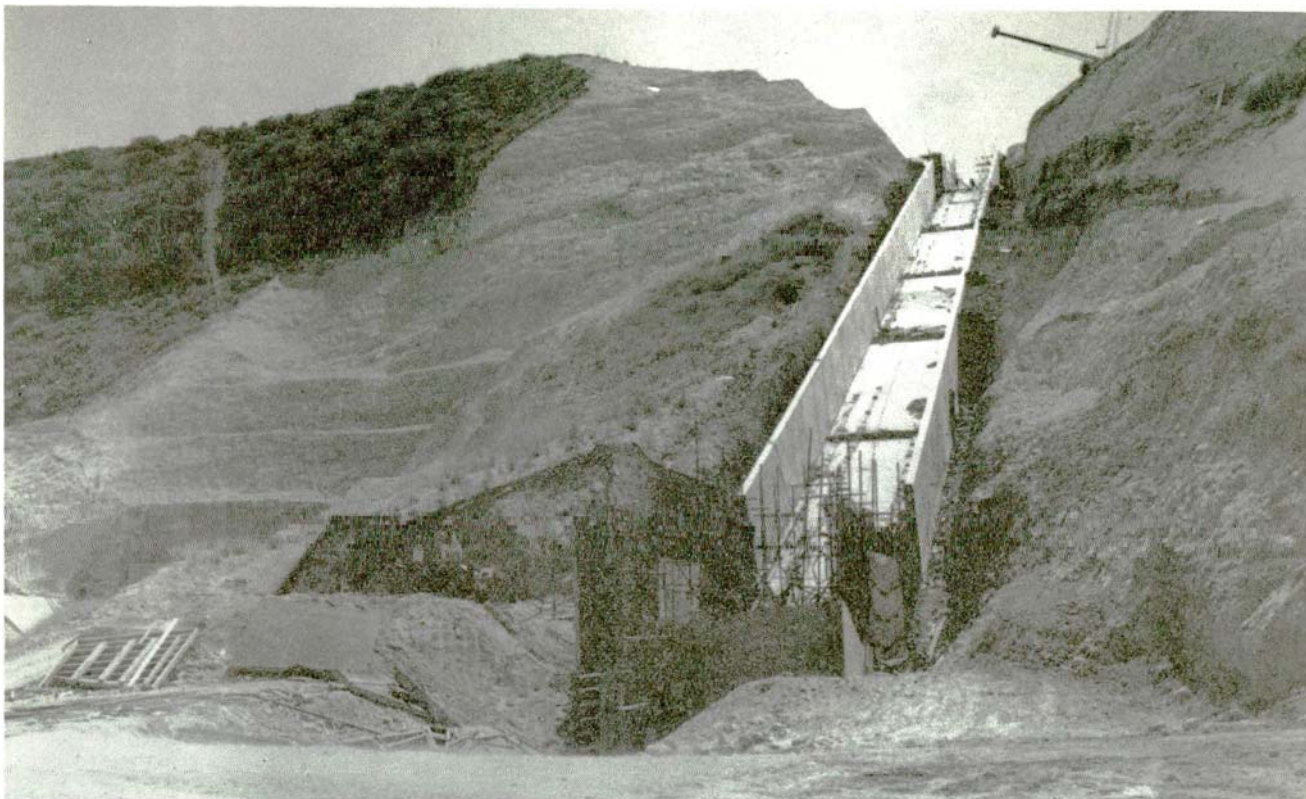
### (a) Right Abutment

Rock grouting in the right abutment was commenced in December 84 and completed by mid June 85. In view of the general competence of the rock forming the right abutment the upstage grouting method was adopted and limited to the vertical holes only. Grout takes were moderate to low ranging from 162 kg/m to 10.0 kg/m. Post grouting water tests were carried out with only two results higher than the target for the curtain from two upper stages which were proved to be localised and the treatment was by grouting the test holes.

### (b) Left Abutment

Rock grouting in the left abutment has been continued steadily during 1985 with variable takes reaching a maximum of 3,000 kg/m in some of the upper stages of outer blanket. Four rows of grouting were made - two rows of shallow consolidation grouting and two inner rows of deep curtain grouting. The curtain depth was 90m average and the spacing between the holes was Primary 6m, Secondary 3m and Tertiary 1.5m. At the lower part of the left abutment high water takes were encountered during testing and consequently rows of quaternary and quinary holes were drilled and grouted





Evretou Dam: Concreting of lower spillway chute  
WDD Photo C37EN-12(10.9.85)



Evretou Dam: Outlet tunnel. WDD Photo C37 EN-15 (10.9.85)

using higher injection pressures due to the low grout takes at about 16 kg/m aiming to reduce Leugeon values down to 10.

By the end of June drilling has started on the steep upper part of the left abutment following the transfer of the movable drilling platform from the right abutment.

#### (c) Left Wing

Progress on the left wing grouting has been slow with primary injection. Very high takes were experienced (over 1,000 kg/m) due to the presence of steeply-dipping tension fissures especially in the upper zones consisting of Pakhna limestones. Thick mixes using sand and sodium silicate from the surplus stock (2% - 3% by volume) have been adopted in an effort to reduce grout travel and hence takes.

Secondary holes were drilled at spacing of 1.5m centre to centre to full curtain depth to cover the underlying lefkara marls as well. Secondary takes were about one third of primary takes in the marl indicating that the primary work was effective and that the ground was still being improved by grouting. Test results have confirmed that grouting over the left wing was quite effective.

#### Spillway

Steady progress has been achieved at the spillway during the reporting period. By March 85 the excavation of the chute and flip-bucket and the mass concreting were completed. Since then concreting of structural slaps of the chute and of its walls has continued up to the end of the year 1985 when all concrete work was completed except the footbridge and one wall pour.

Placing of the rip-rap at the area downstream of the flip bucket was also still to be done and the backfilling behind the upper chute walls. Excavation of the approach channel is to start early in 1986 when all the grouting works in the area are completed.

#### Financial Information

During the year 1985 12 Monthly Payment Certificates have been issued by the Resident Engineer of total value of £ 3,366,341 bringing the cumulative payment to the Contractor at £ 7,156,926. This represents about 78% of the total cost of the work which is now estimated at £ 9.2 million.



2. Irrigation Networks with Farm Access Roads and Main Conveyor with Ponds

The progress achieved on tendering procedures for the various supply and construction contracts in connection with above project components during the reporting period was as detailed below:

2.I. Supply Contracts:

KS.I: Supply of Pipes and fittings for the Irrigation Networks

Tenders for above were invited on 17th May 1985 and received by the 16th July 1985.

The tender prices received were generally below our estimates.

Following evaluation of above tenders by the Department the following awards were made by the Main Tender Board.

- (i) Eternit S.A. Libanaise for supply of A.C. pipes of dia  $\geq 200$ mm for £ 440,814
- (ii) Cosmo Plast of Cyprus for supply of UPVC pipes of dia 80-150mm for £ 104,854
- (iii) S. Nicolaidis for supply of cast iron fittings for £ 87,854 representing Nappco of USA and ISI of Italy.

KS 2: Supply of Valves for the Irrigation Networks

Tenders were received on 4th July 1985 and the following awards were made by the Main Tender Board in November 1985.

<u>Type of Valve</u>	<u>Tenderer</u>	<u>Amount</u>
Butterfly Valves	Silverstrou Kitromilides representing Vanadour of France	£ 6,695
Gate Valves	Byron Potsos representing E. Hawle, Austria	£ 17,108
Air Valves	Caramondani Bros representing Glenfield, UK	£ 21,444
Ball Valves	Caramondani Bros representing VIR Italy	£ 24,555

KS 3: Supply of Hydrants and Water Meters for the Irrigation Networks

Altogether 5 tenders were received on 16th July 1985 for the supply of above items.

Some delay has incurred in evaluating these tenders due to the fact that a lot of additional technical informations were required to be provided by the tenderers in order to enable the Department to complete the evaluation. The Department's recommendations were finally forwarded to the Tender Board in December 1985. Final awards are expected early in 1986. Based on the tender prices received it is anticipated that the value of this contract would be of the order of £ 170,000.

KS 4: Supply of ductile Iron Pipes and Fittings for Main Conveyor

WDD has entered into direct negotiations with Pont-A-Mousson aiming to reach an agreement for the supply of above items at the same prices as Southern Conveyor Contract.

KS 5: Supply of Valves for the Main Conveyor

Tenders have been invited and received on 16 December. Altogether 14 tenders were received which are still being evaluated. The tender prices were generally within our estimates and the value of this contract is expected to be of the order of £ 100,000.

2.2 Construction Contracts

KC 2: Installation of Irrigation Networks and Construction of Farm Roads

Prequalified Contractors have been invited in June 1985 to tender for this Contract. Tenders were opened on 30 September 1985. Ten tenders were received in total out of which five were below C£ 2 million and ranging between £ 1.46 to £ 1.94 million.

Evaluation of the tenders was prepared by the Department and relevant report with recommendations for award was forwarded to the Main Board in December. Award of this Contract is expected to be made before the end of January 1986.



KC 3: Installation of Main Conveyor and Construction of Ponds

Tender documents for this Contract have been modified so that it would include the extension of the Conveyor up to Argaka-Magounda dam and the diversion weir on Magounda river upstream of the dam reservoir. Detailed designs of this part of the Conveyor has been completed by the end of the year 1985. Tenders are expected to be invited in March 1986.

3. Project Expenditure and Updated Estimates

Project expenditure by the end of the year 1985 reached the total of £ 7.75 million of which £ 3.78 million was spent during the year. The total provision included in the 1985 Budget for the Project was £ 4.5 million but due to the delay in starting works on the installation of Irrigation Networks and supply of necessary goods the annual expenditures were lower than anticipated.

The table below gives a breakdown of the expenditures up to the end of 1985 and the latest estimate for the total cost of Phase I and II of the Project.

TABLE VIII-6  
Project Costs and Revised Estimates

ITEM	PHASE I		PHASE II
	Total Expenditure up to 31/12/85	Revised Estimate of Total Cost	Present Estimate
		CE I,000	
1. Evretou Dam	7,104	9,200	-
2. Upper Khrysokhou Diversion	-	-	-
3. Main Conveyor and Branches	-	1,900	2,800
4. Irrigation Networks	-	3,000	1,200
5. Groundwater Development	-	300	-
6. On-Farm Works	-	3,500	1,600
7. Land Acquisition	177	300	-
8. Project Management	98	320	200
9. Evretou Dam Supervision	371	550	-
TOTAL	7,750	19,070	5,800

KHRYSOIKHOU IRRIGATION PROJECT

EVRETOU DAM

CONSTRUCTION PROGRESS

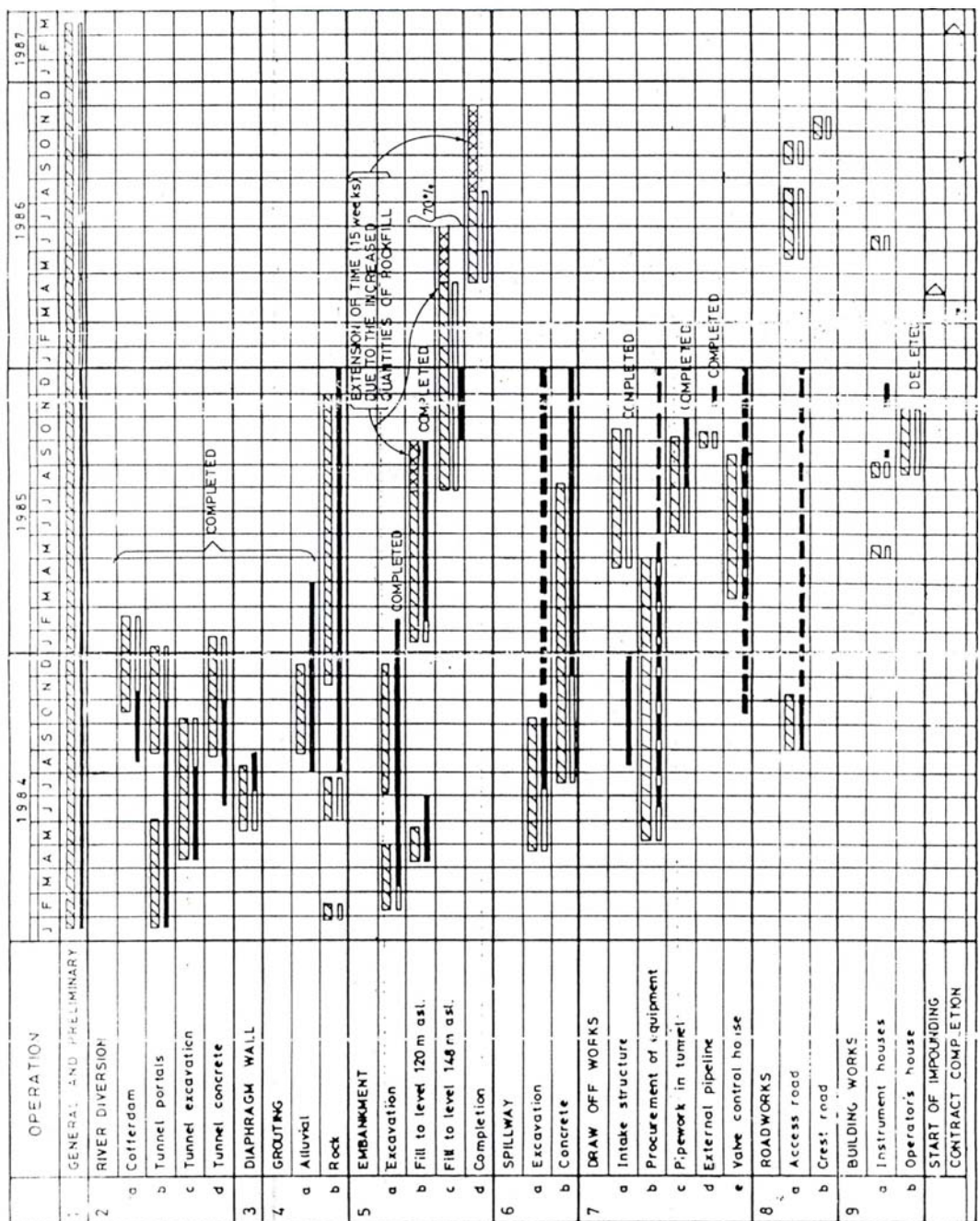
TO 31 DECEMBER 1985

KEY Contractors Clause 14 Programme

Completed to date

Actual period worked

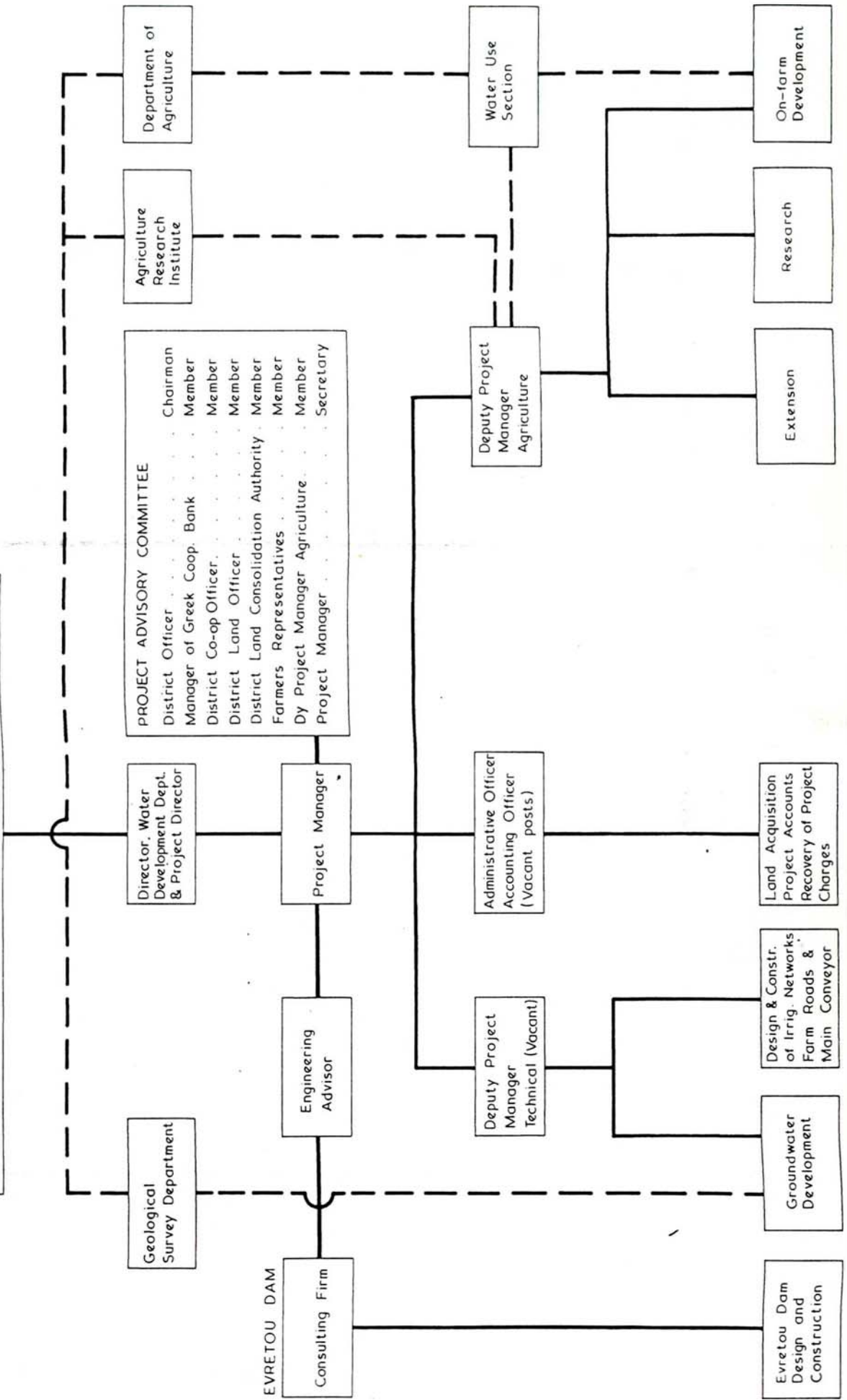
Extension of time





# Water Development Department KHRYOSOKHOU IRRIGATION PROJECT Project Organization Chart

**PROJECT POLICY AND COORDINATION COMMITTEE**  
 Director General, Ministry of Agriculture and Natural Resources . . . . . Chairman  
 Director General, Ministry of Interior . . . . . Member  
 Director General, Ministry of Commerce and Industry . . . . . Member  
 Director General Planning Bureau . . . . . Member



SOUTHERN CONVEYOR PROJECT  
KOURIS DAM

by  
Dr Christodoulou, PWE  
Project Manager

Kouris Dam constitutes the most substantial part of the Southern Conveyor Project. It is located near Alassa village about 20 km North east of Limassol. It is a clay core earthfill dam, 103 m high, with a 560 m long crest and a reservoir capacity of 115 MCM gross which makes it the largest dam in Cyprus.

The spillway discharge is 2000 m<sup>3</sup>/sec. and the volume of the embankment is estimated to be 9,325,000 m<sup>3</sup>.

The dam is designed by SOGREAH Consulting Engineers, France, in association with HYDROCONSULT, Cyprus.

Construction of the dam has been undertaken by Impregilo SpA, Italy in joint venture with Ioannou and Paraskevaides, Cyprus, for the sum of £19,954,512.

Construction commenced on September 1st 1984 and it will be completed by August 1988 while impounding will begin in September 1987.

Construction works during the year under review have progressed smoothly and broadly according to the approved programme of Contractor and no major delays have been encountered.

Construction progress

Temporary works and services have been completed. Tunnel galleries and the intake shaft, have been excavated and temporary access roads have been constructed.

Rock excavation works for the core foundation area, the dam shoulders above elevation 150 m and the perimetral gallery were completed. Excavations on both abutments continued.

During excavation for the core foundation in the riverbed area weak compressible bands of bentonitic sandy silty material have been uncovered. The bands were interbedded with layers of hard rock. Concern was expressed for the safety of the dam due to presence of these beds.

The Engineer requested further investigations to assess the problem and propose the necessary modifications to the original design.

In order to establish the extent, continuity and properties of the weak beds 22 exploration boreholes both upstream and downstream of the dam axis were drilled and rock samples were taken for laboratory analysis.

Furthermore a row of 22 pressure relief holes were drilled below the downstream filter to prevent the build up of pressure underneath the downstream shoulder.



In view of the results obtained and in order to secure the safety of the dam the stability of the downstream supporting shell was thoroughly checked. Preliminary computation by the Engineer indicated that satisfactory stability of both slopes can be achieved if toe weights of adequate size are added to the upstream and downstream shoulders. Further to the solution presented by the Engineer, the Panel of Experts suggested and the Engineer agreed to include in the additional design studies risk analyses applying a probabilistic approach to design for dynamic loading under full reservoir head.

During the spillway excavation a mass of disturbed rock was revealed, posing an unfavourable aspect to the stability of the spillway. Comprehensive investigations were carried out and remedial measures were taken including increase reinforcement in the spillway retaining wall.

Monitoring of the spillway excavation slope continues.

Grouting on the left abutment and the reverbed is substantially completed.

The cofferdam was completed while construction of part of the embankment u/s reached elevation of about 180 m above mean sea level.

Installation of piezometers begun during the last months of 1985.

Construction of the Delivery Chamber as well as the permanent steel lining of the section of the tunnel upstream the delivery chamber have been completed while lining and other construction on the drawoff works continued.

For summary of Kouris Dam expenditure see Table VIII-8 under chapter VIII/4.

## SECOND PHASE

### General

The principal features of the second phase of the Southern Conveyor Project are:

Part I Dhiarizos Diversion, conveying water from the Dhiarizos River by a 15.8km long tunnel to Kouris Reservoir, collecting water from the Khapoti en route.

Part II Irrigation Distribution Systems with pressurised distribution networks following land consolidation at:

(a) Akrotiri	-	gross irrigation area, 1755ha approx.
(b) Pareklisha	-	" " " 320ha "
(c) Mazotos	-	" " " 660ha "
(d) Kiti	-	" " " 1600ha "

Part III Domestic Water Supply Works consisting of water treatment works at Limassol and Tersephanou and a treated water conveyance system (including inter alia a pumping station and the necessary balancing reservoirs) from Tersephanou works to an existing service reservoir in Nicosia.

### Progress of the Works

In April 1985 the Council of Ministers decided to begin the process of implementation of the second phase of the SCP one year ahead of schedule, i.e. in early 1987 instead of 1988. Following that decision, proposals for consultancy services were invited by the Water Development Department from a short list of sixteen (16) prequalified Consulting Firms.

The tender for the consultancy services for all three parts of the second phase were awarded to ENERGOPROJEKT CONSULTING ENGINEERS - BEOGRAD, YUGOSLAVIA, in association with G G Levas, Civil Engineers, Cyprus, for the sum of US\$1,039,200. The relative agreement was signed in November 1985.

### Implementation Schedule

	Detailed Designs Tender Procedure	Implementation Period
Part I Dhiarizos Diversion	1985-Mid 1987	Mid 1987-1990
Part II Irrigation Distribution Systems		
a. Akrotiri	1988 - 1987	1987 - 1990
b. Kiti	1987 - 1989	1989 - 1990
c. Mazotos	1988 - 1990	1991 - 1992
d. Pareklisha	1989 - 1991	1992 - 1992
Part III Domestic Water Supply Works		
a. Limassol Treatment Works	1986 - 1988	1988 - 1990
b. Tersephanou Treatment Works and Conveyance System	1986 - 1988	1988 - 1990

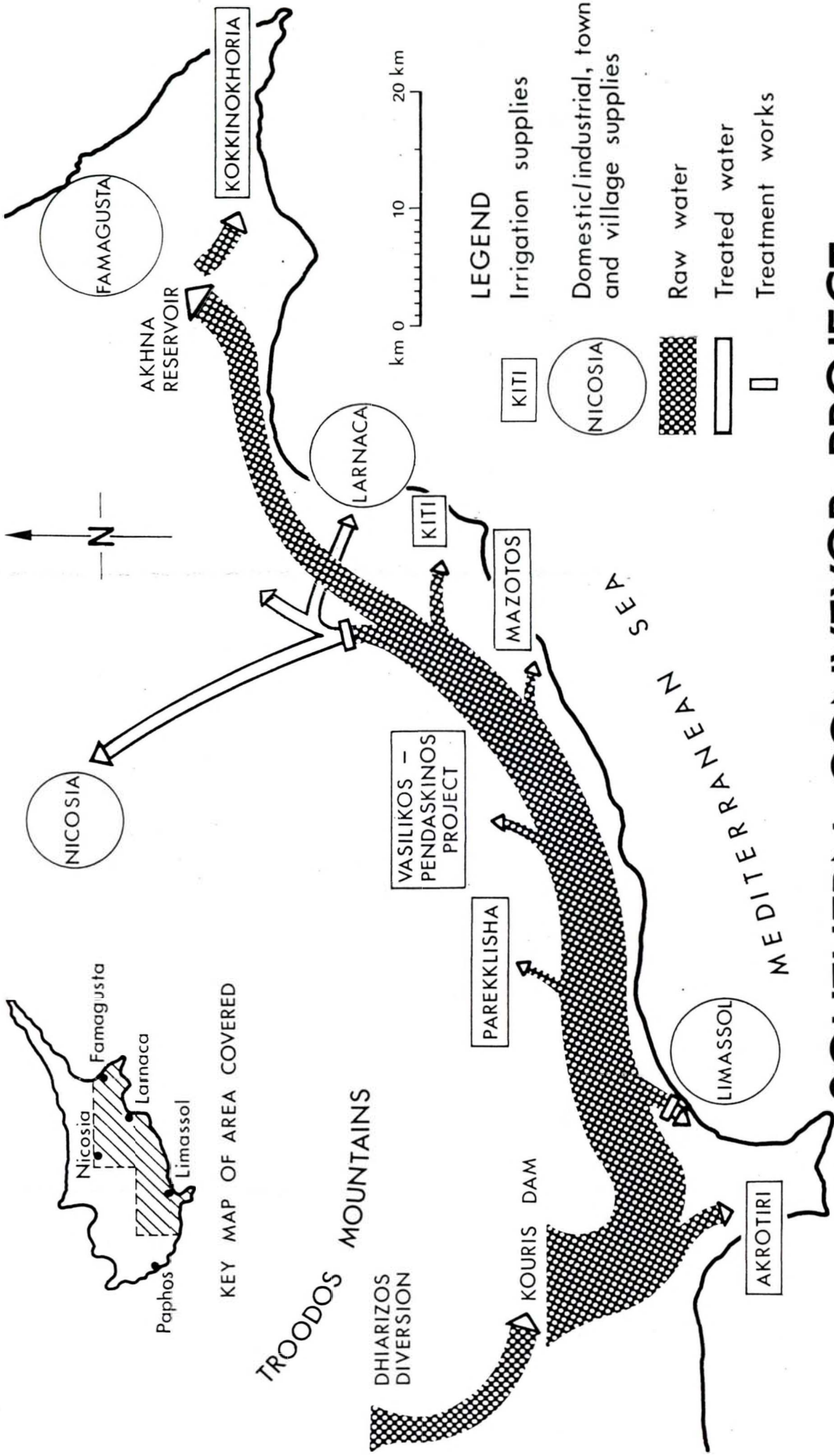


Costs and Financing

The estimated annual cost of Phase 2 in million cyprus Pounds are:

1987	1988	1989	1990	1991	1992	Total
3.69	14.77	12.96	12.21	8.01	5.72	57.36

Financing of the second phase is expected to be achieved through a loan from the World Bank. Appraisal of the Project is expected to be done in the second half of 1986.



# SOUTHERN CONVEYOR PROJECT

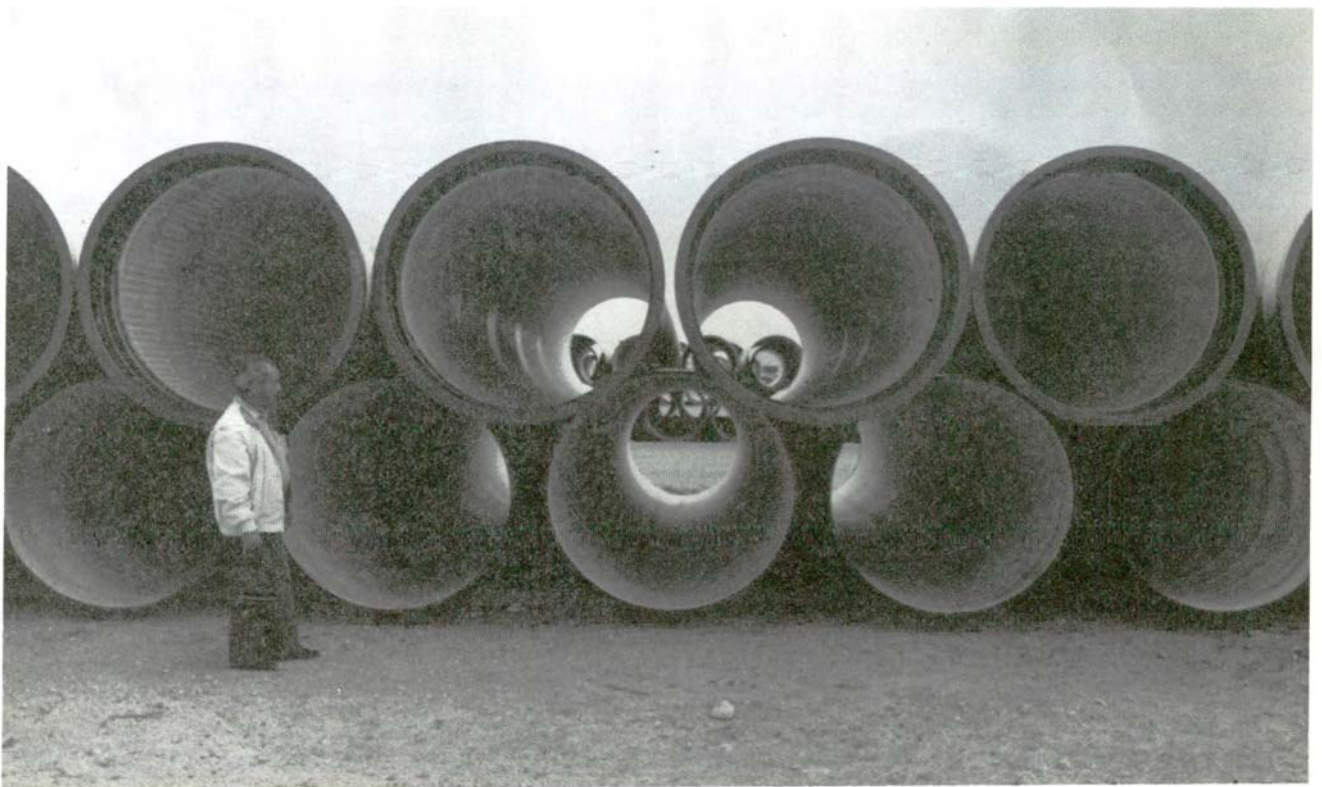
Diagrammatic Representation of Water Distribution

1st and 2nd Phase





Kouris Dam under construction. WDD Photo C60EN-1(24.1.86)



Store of pipes for the Main Conveyor at Ormidhia. WDD Photo C51EN19.

VIII/ 4 SOUTHERN CONVEYOR PROJECT  
Main Conveyor and Kokkinokhoria Irrigation System  
By D M Patsalides, EEI

GENERAL

Objective

The purpose of the Southern Conveyor Project (SCP) for Water Resources Development is to collect and store surplus water from the south catchments of the island and convey this water eastwards, to areas of demand for both domestic water supply and irrigation.

The main SCP objectives at full development of the project would be:

- (a) To secure a safe domestic water supply until at least the year 2010 to the four major population areas of Cyprus (Nicosia, Limassol, Larnaca and Famagusta).
- (b) To provide irrigation water in order to maintain present agricultural production in Kokkinokhoria and to expand irrigated agriculture in four other areas along the southern coast of the island.

Phasing of the Project

It has been decided to implement the project in two phases because of its large size and the high financial cost.

Phase I of the Project

Phase I includes the construction of Kouris Dam, the Main Conveyor, Akhna Dam, the Kokkinokhoria Irrigation network, the extension of Khirokitia Treatment Works.

All other works would be postponed to Phase II.

Phase I project components and contracts

The Phase I project components have been divided to the following civil and supply contracts.

(a) Civil Contracts

- Kouris Dam ..... Contract No. C1
- Main Conveyor (Kouris to Mari) ..... Contract No. C2
- Main Conveyor (Mari to Akhna Dam) ..... Contract No. C3
- Akhna Dam ..... Contract No. C4
- Kokkinokhoria Irrigation System, Construction of  
balancing reservoirs ..... Contract No. C5(A)
- Construction of Main Network ..... Contract No. C5(B)
- Construction of central distribution reservoirs ... Contract No. C5(C)
- Construction of pumping stations ..... Contract No. C6
- Construction of secondary network ..... Contract No. C7
- Construction of domestic water supply main ..... Contract No. C8
- Project control centre at Khirokitia ..... Contract No. C9



(b) Supply Contracts

- Pipes and Fittings for the Main Conveyor (Limassol Bypass and EAC section) .....	Contract No. S1(a)
- Pipes and fittings for the Main Conveyor and connection to Vasilikos-Pendaskinos Project (VPP)	Contract No. S1(b)
- Valves for the Main Conveyor and Connection to VPP	Contract No. S2
- Pumping Plant and Ancillary Equipment for Kokkinokhoria Irrigation Network .....	Contract No. S3
- AC pipes and fittings for Kokkinokhoria Irrigation network, 200 mm to 800 mm dia .....	Contract No. S4(a)
- UPVC pipes and fittings for Kokkinokhoria Irrigation network, 80 mm to 150 mm dia .....	Contract No. S4(b)
- Cast Iron fittings and couplings for Kokkinokhoria Irrigation network .....	Contract No. S4(c)
- UPVC pipes and fittings for Kokkinokhoria Irrigation network extensions .....	Contract No. S4(d)
- Cast Iron fittings and couplings for Kokkinokhoria Irrigation network, extensions .....	Contract No. S4(e)
- Butterfly, gate and float valves for Kokkinokhoria Irrigation network .....	Contract No. S5(a)
- Air valves for kokkinokhoria Irrigation Network .	Contract No. S5(b)
- Irrigation hydrants for Kokkinokhoria Irrigation network .....	Contract No. S6
- Ultrasonic flowmeters for the Main Conveyor and Kokkinokhoria Irrigation network .....	Contract No. S7
- Telemetry .....	Contract No. S8
- Pipes and fittings for domestic water supply ....	Contract No. S9
- Valves for domestic water supply .....	Contract No. S10
- Pumps for domestic water supply, Yermasoyia and Tersephanou aquifer works .....	Contract No. S11
- Fittings for Kokkinokhoria main Irrigation network	Contract No. S12
- AC pipes for Kokkinokhoria secondary network ...	Contract No. S13

STAFF

Managing Team

- Mr K C Hassabis, Asst Director WDD has been appointed Project Manager of the Main Conveyor and Irrigation Networks.
- Dr C A Christodoulou, Principal Water Engineer WDD has been appointed Project Manager for Kouris Dam.
- Mr D M Patsalides, Executive Engineer I, has been appointed Deputy Project Manager (Eng) while Mr A Ioannou, Agricultural Officer I, Department of Agriculture, has been appointed Deputy Project Manager (Agr.).

Supervisory Staff

The appropriate supervisory staff consisting of engineers, technicians (surveyors, laboratory technicians etc) have been transferred from Headquarters and Vasilikos Pendaskinos Project to SCP.

CONSULTING ENGINEERS

- SIR WILLIAM HALCROW AND PARTNERS in association with Balfours, continued their duties in connection with tender evaluation and award of supply

contracts for the Main Conveyor and Kokkinokhoria Irrigation Area and evaluation of contract C4 for Akhna Dam and site supervision of Contract No. C2/C3 for the installation of the Main Conveyor. Head Office staff visited Cyprus in October to coincide with the Panel of Expert's visit to review the design of Akhna Dam.

#### PANEL OF EXPERTS

The members of the panel for Akhna Dam are:

Prof. E Nonveiller  
 Dr J Newberry  
 Mr A A Abidi  
 Mr C A Konteatis

During the reporting period, the panel of Experts met twice. The first visit took place between the 11th and 16th of February and the 2nd took place on the 21st October.

#### FOREIGN FINANCIERS

In order to meet part of the enormous cost of the Project Government has secured the following loans:

- \$27,000,000 from the International Bank for Reconstruction and Development (IBRD) to cover 40% of the cost of construction of Kouris Dam, 64% of the cost for Akhna Dam, Consultant's fees (100%) and Office Equipment (95%).
- KD2,940,000 from the Kuwait Fund for Arab Economic Development (KFAED) to meet expenditure for the supply of pipes and fittings for Kokkinokhoria Irrigation Network and the construction of Kokkinokhoria Irrigation Network and Pumping Stations. Supply contracts are financed at a rate ranging between 50% to 100% whilst construction contracts are financed at the rate of 50%.
- ECU's30,200,000 from the European Investment Bank (EIB) to meet 60% of the cost for the construction of Kouris Dam.
- DM78,074,566 from Consortium of French Banks to meet 85% of the contract price for the supply of ductile pipes and fittings for the Main Conveyor.

During 1985 disbursements were made by three financiers. The Disbursement Situation for each loan at the end of 1985 is given below in table VIII-7 .

TABLE VIII-7  
 LOAN DISBURSEMENTS

<u>Financier</u>	<u>Loan</u>	<u>Total Disbursements</u>	<u>Balance Undisbursed</u>
IBRD .....	\$27,000,000	\$928,018,46	\$26,071,961.54
KFAED .....	KD2,940,000	-	KD2,940,000
EIB .....	ECU's30,200,000	ECU's4,738,412	ECU's25,461,588
Consortium of French Banks .....	DM78,074,566	DM11,423,670	DM66,650,896



## PROGRESS ON PROJECT IMPLEMENTATION

### Kouris Dam - Contract C1

Please see chapter VIII, Section III of this report.

#### Main Conveyer (Kouris to Akhna) Contract C2/C3

Contractor : Cybarco-Shand (Cyprus-UK)  
Commencement date : 17th October, 1985  
Completion date : 4th February, 1987  
Contract Price : £6,157,031

Following the signing of the Contract Agreement and issue of the Engineer's Order to commence on the 17th of October, 1985, the Contractor started a lengthy mobilization period, during which the Engineer's office and the Material Testing Laboratory at the Pipe Storage Area at Ayios Athanasios, Limassol, were constructed and equipped. During this period the Contractor established his facilities at Ayios Athanasios and imported the majority of his plant from U.K.

One co-ordination meeting with pipes and valves suppliers was held on 12th December, 1985.

### Akhna Dam Contract No. C4

Following the issue of Tender Documents on 30th September 1985 the Tenders' Site visit and Pre-Bid conference were held on 30th October. Four tender amendments were issued and the date for submission of tenders was fixed as 8th February, 1986.

### Kokkinokhoria Main Distribution Network Contract No. C5

Redesign of the irrigation system in view of the increase to 9,000 ha and the amalgamation of pumping stations continued throughout the period. Formal approval of the extension of the irrigation area was given by the Council of Ministers on 31st October, 1985.

Redesign of the Main Network, Balancing Reservoirs and Central Distribution Point Reservoirs was undertaken jointly by the Department & Sir William Halcrow & Partners.

In order to meet project priorities to fit in with ongoing design work, it was decided to sub-divide contract C5 as follows:

- C5A - Balancing Reservoirs - by Contract
- C5B - Main Network (pipelines) - by force account
- C5C1 - Central Distribution Point Reservoirs (first and third stage completion) - by contract.
- C5C2 - Central Distribution Point Reservoirs (Second and fourth stage completion) - by contract

### Kokkinokhoria Pumping Stations Contract No. C6

Redesign of the pumping stations buildings in view of the new amalgamated scheme is due to commence early next year.

### Kokkinokhoria Secondary Distribution Contract C7

Design <sup>by WDD</sup> of new areas of secondary networks, as well as redesign of the original secondary networks, to suit the amalgamated scheme are under way. Construction will be undertaken by the Water Development using direct labour (force Account).

## Supply Contracts

### - Pipes and fittings for the Main Conveyor - Contract S1(b)

Contractor : Pont -a- Mousson (France)  
Commencement date: 22nd August, 1985  
Completion date : 22nd August, 1987  
Contract Price : £19,382,266

Two shipments of pipes and fittings were made. The first shipment arrived in Limassol on the 18th November, 1985 and the second shipment arrived in Larnaca on the 14th December, 1985. The first co-ordination meeting, attended by representatives of the purchaser, the supply Contractor, the installation Contractor and the Consulting Engineers was held on the 12th December, 1985.

### - Valves for the Main Conveyor - Contract S2

Contractor : Caramondani Bros Ltd (N'sia)  
Manufacturer : Glenfield & Kennedy (UK)  
Commencement date: 8th May 1985  
Completion date : 8th January, 1987

Valve drawing have been approved and the first shipment of valves are expected to arrive early next year. The first co-ordination meeting attended by representatives of the Purchaser, the Supply Contractor, the Installation Contractor and the Consulting Engineers, was held on the 12th December, 1985.

### - Pumping Plant for Kokkinokhoria Irrigation Network-Contract S3 Redesign of the pumps to take account the extended irrigation area and amalgamation of the pumping stations has been undertaken jointly by the Department & Sir William Halcrow & Ptns.

### - Pipes and Fittings for Kokkinokhoria Irrigation Network Contract S4

The Consulting Engineer's Tender Evaluation Report was reviewed by the Departmental Tender Committee on 4th October. The committee's recommendation was considered by the Main Tender Board on 29th October. Further meetings of the Main Tender Board were held on 8th and 15th November, and the following awards were made after a Ministerial Committee meeting of 17th December.

- a) Large diameter asbestos-cement pipes to Amiantit S.A. of Greece (C£890,456 - 12 month delivery)
- b) Small diameter UPVC pipes to Kosmo-Plast Ltd of Cyprus (C£167,743-24 month delivery)
- c) Small diameter fittings and couplings to Phanos Epiphaniou Ltd of Cyprus to be supplied by Fundiciones Metalicas S.A. of Spain (C£33,889 - 4 month delivery).



- Valve for Kokkinokhoria Irrigation Network

Contract S5(a) - Butterfly, gate and float valves

Contractor : Pipeline Engineering Gmbh (W Germany)  
Manufacturer : VAG (West Germany)  
Commencement date : 24th September, 1985  
Completion date : 24th September, 1987  
Contract Price : C£176,717

Drawings have been submitted and approved. The Contract proposed alternative float valves (krombach) as the original supplier could not supply valves to meet the new requirement of the amalgamate scheme.

Contract S5(b) - Air Valves

Contractor )  
Manufacturer ) : Guest and Chrimes (UK)  
Commencement date : 1st November, 1985  
Completion date : 1st November, 1987  
Contract price : C£44,857

Drawings have been submitted and approved, and the first consignment of valves for the requirement of 50% of the original irrigation area should be ready for shipment early next year.

Hydrants for Kokkinokhoria Irrigation Network Contract S6

Review of the draft tender document was held pending completion of the irrigation network and the consequent changes to quantities.

Flowmeters for the Main conveyer - Contract S7

The Consulting Engineers' Tender Evaluation Report was reviewed by the Departmental Tender Committee on 12th November, 1985. Further clarifications were obtained from the four lowest tenders and the contract for the supply of ultrasonic flowmeters was awarded to Bestobell Sparling of UK for £58,639 and delivery in 12 months.

Telemetry Contract S8

The draft tender document is to be revised in accordance with the current redesign of the Kokkinokhoria Irrigation Network.

Fittings for Kokkinokhoria Main Network Contract S12

Tender documents were made available for collection.

PROJECT EXPENDITURE

The project expenditure for Phase 1 of the project works reached the figure of £12,993,805 out of which £9,459,821 incurred in 1985.

Detailed analysis of the expenditure incurred is given on table VIII-8

TABLE VIII-8

## SOUTHERN CONVEYOR PROJECT

<u>Ser No</u>	<u>Description</u>	<u>Expenditure in 1985</u>	<u>Expenditure up to 1985</u>
		£	£
<u>PHASE 1</u>			
Part A of the Project			
Kouris Dam			
1.	Kouris Dam construction .....	4 653 964	6 807 629
2.	Kouris Dam supervision/administration of construction .....	161 546	180 657
3.	Surveys and investigations .....	36 394	93 957
4.	Removal and relocation of CYTA, telecommu- nication network .....	15 856	36 256
5.	Construction of two water flowgauges on Kouris and Zyghos river .....	-	22 933
6.	Removal & Relocation of EAC High Voltage .	75 000	75 000
7.	Acquisition of land .....	1 407 405	1 438 541
8.	Improvement to the road Lofou-Ayios Therapon	3 685	3 685
9.	Removal and relocation Alassa village ....	-	65 884
10.	SOGREAH consultancy services for Kouris dam	130 417	231 523
11.	Panel of Experts consultancy services for Kouris Dam .....	10 102	12 001
	Total part 'A' of Project .....	6 494 369	8 968 066
Part B of the Project			
Main Conveyor			
1.	Supply of pipes and fitting for EAC and Limassol by-pass section .....	CR( 1 530)	562 653
2.	Supply of pipes and fittings for the Main Conveyor .....	1 509 630	1 509 630
3.	Preliminary Constractional works (by PWD) on the new L'ssol road .....	85 021	85 021
4.	Laying of Main Conveyor at EAC section - constructional works .....	2 114	115 582
5.	Laying of main conveyor at Limassol by - pass section - constructional works .....	4 564	109 950
6.	Laying of main conveyor on two crossings of Limassol road (Ypsonas - Erimi) .....	-	6 000
7.	Construction and Laying of Main Conveyor form Kouris to Akhna .....	615 703	615 703
8.	Construction of Vasilikos (Kalavasos) Balancing Reservoir .....	84 710	84 710
9.	Construction of L'ssol Storage Area .....	68 669	68 669



TABLE VIII-8 (cont.)

<u>Ser No</u>	<u>Description</u>	<u>Expenditure in 1985</u> £	<u>Expenditure up to 1985</u> £
10.	Construction of Larnaca Storage Area .....	90 388	90 388
11.	Construction of Ormidhia Storage Area ...	34 452	34 452
12.	Administration of Main Conveyor .....	8 904	23 961
13.	Surveys and Investigations (Topography/ Laboratory) .....	21 104	21 104
14.	Acquisition of Land .....	272 538	272 538
15.	"Sir William Halcrow and partners" Consultancy Fees .....	109 567	347 278
	Total Part 'B' of Project .....	<u>£2 905 834</u>	<u>£3 947 639</u>
	Part C of the Project		
	Akhna Dam		
1	Construction of Akhna Dam .....	-	-
2	Supervision/Administration .....	-	-
3	British Hydromechanics Research Association Consultancy Services for Akhna Dam Hydraulic Model Testing .....	-	12 905
	Total part 'C' of Project .....	-	<u>£12 905</u>
	Part 'D' of the Project		
	Kokkinokhoria Irrigation Distribution System		
1.	Supply of valves for K.I.A. Network .....	18 474	18 474
2.	Land Consolidation .....	10 426	10 426
	Total part 'D' of Project .....	<u>£28 900</u>	<u>£28 900</u>
	Part 'E' of the Project		
	Development of Domestic Water Supply		
1.	"Howard Humphreys and J Theodoulou" Consultancy Services for the preparation of the study for the location of Limassol Water Treatment Plant .....	3 723	3 723
	Total part 'E' of Project .....	<u>£3 723</u>	<u>£3 723</u>

TABLE VIII-8 (cont.)

<u>Ser No</u>	<u>Description</u>	<u>Expenditure in 1985</u> £	<u>Expenditure up to 1985</u> £
	Part 'F' of the Project		
	Central Control System		
1	Installation of Telemetry System .....	-	-
	Part 'G' of the Project		
	Institutional Restructuring : Preparatory Engineering Work		
1	W G SCHVLZ of California USA consultancy Services for the preparation of a study for the Establishment of a National Water Entity .....	-	5 577
	Total part 'G' of the Project .....	-	£5 577
	Part 'H' of the Project		
	Building and Equipment		
1	Purchase of Laboratory Equipment .....	10 409	10 409
2	Purchase of two field vehicles for Kouris Dam .....	7 900	7 900
3	Purchase of two vehicles for Main Conveyor	6 075	6 075
4	Purchase of radio telecommunication equipment for Kouris Dam .....	2 611	2 611
	Total part 'H' of Project .....	£26 995	£26 995
	Total of Phase 1	£9 459 821	£12 993 805
	<u>Phase 2 of the Project</u>		
1	"Energoprojekt" Consulting and Engineering Co. of Yugoslavia for the design and supervision of the schemes of phase 2.	38 204	
	Total - Phase 2	38 204	
	Grand Total	£9 498 025	



IX DIVISION OF OPERATION AND MAINTENANCE-  
TOWN WATER SUPPLY

by  
C C Artemis  
Senior Water Engineer  
Head of Division

Introduction

The main activities of this Division are the administration, operation and maintenance of Government Town Water Supply Schemes and Rural Regional Water Supply Schemes. Presently, the following Government schemes are in operation.

- All sources of supply and conveyance systems for the water supply of Nicosia town and suburbs
- The (non potable) water supply system of Government residences and institutions in Nicosia.
- The Central Water Supply System consisting of:
  - (a) the Larnaca-Famagusta Water Supply Scheme which is the main source of water supply of the towns of Famagusta and Larnaca and of over 30 communities and refugee housing estates in the above two districts and
  - (b) the Nicosia Water Supply component of the Vasilikos Pendaskinos Project. This component comprises Dhypotamos Pumping Station, Kornos Water Treatment Works and Pumping Station, Stavrovouni Balancing Reservoir and the pipeline from Dhypotamos Pumping Station to Nicosia.
- The Government Rural Water Supply Schemes, namely:

- (a) Paphos Lower Villages Regional Water Supply Scheme
- (b) Arminou Regional Water Supply Scheme
- (c) Timi Water Supply Scheme
- (d) Ambelitis Water Supply Scheme
- (e) Phrenaros pumping station and rising main for Paralimni and Ayia Napa water supplies.

Another activity of this Division is its participation in the administration of the Nicosia, Limassol, Famagusta and Larnaca Water Boards. Senior officers of the Division and the District Engineers attend water board meetings as representatives of the Director of the Department. In its capacity as a member of the Water Boards this Department acts as their technical adviser and also undertakes, other commitments permitting, the design and construction work for major developments in their distribution systems.

#### Water Supply Situation in General

The rainfall during the winter season 1984-1985 was again unsatisfactory and had an adverse effect on the riverflows. Consequently, the volume of water impounded in the dams was very small. Due to the low rainfall, the recharge of the aquifers was also poor which aggravated further the yield of boreholes. Nevertheless, the water supply of the towns, especially that of Nicosia and Larnaca towns which depend mainly on surface water, was maintained at satisfactory levels due to the increased quantities which could be made available from Kalavastos Dam which came on stream in April and the extension of Khirokitia Water Treatment Plant. With the extension of the Plant, which provided for two additional filters and two sedimentation tanks, the capacity of the plant increased from 22,000m<sup>3</sup>/day to 32,000m<sup>3</sup>/day.

A significant contribution was also the production of the boreholes of the 1982/84 emergency schemes which in 1985 was 2.687MCM.

The scheme which was introduced in 1982 for subsidising the drilling of private boreholes for the irrigation of gardens and other secondary uses, continued during 1985. The scheme covers consumers in the areas of supply of Nicosia, Limassol and Larnaca water boards. The scheme provided for a £50 subsidy for new boreholes.

A total of 2,462 applications were received by the end of the year under review, of which 1,993 were approved and the subsidy was paid to 1,318 applicants totalling £65,900. The total number of private boreholes subsidised and other relevant information is given in Table IX-1 below:

Table IX-1  
DETAILS OF THE BOREHOLE SUBSIDY SCHEME

Town	Year	Total number of applications received	Total number of applications approved	Total number of applications subsidised
Nicosia	1982	847	689	375
	1983	525	410	332
	1984	482	388	291
	1985	275	215	128



Town	Year	Total number of applications received	Total number of applications aproved	Total number of applications subsidised
Limassol	1983	4	4	4
	1984	6	6	6
	1985	3	3	3
Larnaca	1983	167	144	82
	1984	103	90	59
	1985	50	44	38
Totals		2 462	1 993	1 318

#### Nicosia Town

The major problem of the town is the shortage of water. Nevertheless, the town enjoyed a satisfactory supply due to the increased quantities which were made available during the summer months from Kalavastos Dam through Khirokitia Treatment Plant. Restrictions on the water supply of the town were imposed only for a short period in the summer, i.e. from 24.6.1985 to 19.8.1985.

#### Limassol Town

The production of the Water Board owned sources met the water demand of the town satisfactorily and the town enjoyed an unrestricted supply throughout the year except for a limited number of consumers at high places where the supply was interrupted for some hours a day during the summer months.

#### Larnanca Town

The water supply of the town is supplemented from the Central Water Supply System. The supply to the town was continuous throughout the year due to the increased quantities made available from the Central Water Supply System. The total quantity of water supplied to the town from this system during 1985 was 2.793MCM, which was 0.326MCM greater than that of 1984.

#### Paphos Town

The town experienced a water shortage problem during the summer months and restrictions on the supply were imposed. The water supply of the town was supplemented from the Paphos Lower Village Water Supply Scheme with a quantity of 92,012 m<sup>3</sup> of water.

Table IX-2 gives some useful statistical data on the water supply of the towns over the last fourteen years.

Table IX-2  
URBAN WATER SUPPLY IN CYPRUS

Year	Consumers*		Input into System (at Service Reservoir Outlets) m <sup>3</sup> **	Consumers		Input into System (at Service Reservoir Outlets) m <sup>3</sup>
	Number at end of year	Increase %		Number at end of year	Increase %	
	Nicosia			Limassol		
1972	17 601	-	7 564 804	17 927	-	4 952 521
1973	18 989	7.9	7 460 286	19 015	6.1	4 999 405
1974	20 796	9.5	7 550 913	19 435	2.2	4 990 401
1975	21 978	5.7	7 532 363	19 800	4.1	4 175 035
1976	23 628	7.5	8 137 580	20 305	2.6	5 181 567
1977	25 646	8.5	8 551 570	20 989	3.4	5 935 146
1978	27 944	9.0	8 307 170	21 908	4.4	6 342 758
1979	30 337	8.6	8 559 184	23 840	8.8	6 560 782
1980	34 181	12.7	9 152 909	26 416	10.8	7 214 542
1981	35 366	3.5	8 676 120	28 392	7.5	7 411 301
1982	37 513	6.1	9 001 875	30 311	6.7	7 692 378
1983	39 554	5.4	8 984 890	31 885	5.2	7 711 306
1984	41 297	4.4	9 450 498	34 034	6.7	7 831 767
1985	42 412	2.7	10 393 365	37 621	10.5	8 443 089
	Larnaca			Paphos		
1972	5 812	-	1 659 680	-	-	-
1973	5 950	2.4	1 313 750	-	-	-
1974	6 065	1.9	1 528 990	2 258	-	669 191
1975	6 023	0.7	1 819 820	2 332	3.3	645 228
1976	7 515	24.7	2 015 900	2 500	7.2	777 800
1977	8 133	8.3	2 315 590	2 706	8.2	808 772
1978	9 513	17.0	2 523 680	2 939	8.6	889 668
1979	10 578	11.2	2 669 100	3 851	31.0	973 361
1980	11 776	11.3	2 593 540	4 413	14.6	1 119 059***
1981	13 487	14.5	2 931 690	4 921	11.5	1 200 597***
1982	15 047	11.6	2 770 700	5 602	13.8	1 247 972***
1983	16 453	9.3	2 471 510	6 155	9.9	1 293 881***
1984	17 150	4.1	2 900 270	6 685	7.9	1 434 666***
1985	17 564	2.4	3 474 580	-	-	-

\* Due to lack of information on the number of consumers in the Turkish occupied sector the figures in this column now refer to the Government controlled area only.

\*\* These figures cover the whole of Nicosia.

\*\*\* These figures have been corrected by subtracting quantities supplied to Mandria Village en route.

#### New Unified Bulk Water Rate

In February this Department prepared and submitted to Government a detailed review of the unit cost of water supplied by Government to bulk consumers in the Nicosia, Larnaca and Famagusta Areas for the years 1983, 1984 and 1985.



It was evident from the review that the existing bulk water rates would be inadequate to cover the full cost of the water and proposals were put forward for the upward revision of the rates and the adoption of a unified bulk water rate which would be adequate to cover the rising cost of water.

The Council of Ministers considered the proposals at its meeting of 19.9.85 and by its decision no 26.275 adopted a unified bulk water rate of 21.7 cents per cubic meter effective as of 1.11.1985.

All bulk consumers are charged with the new rate as from the above date with the exception of the Nicosia Water Board which is charged at a rate of 16.3 cents per cubic meter (i.e. 75% of the Unified Bulk Water Rate) to compensate it for the fact that 25% of the water purchased by the Board from Government is consumed in the Turkish sector of the Town without the Board being able to recover its cost from the consumers concerned.

## NICOSIA WATER SUPPLY

### Institutional Arrangements

The water supply of Nicosia town and suburbs is faced jointly by three authorities:

- the Water Development Department which is responsible for all sources and conveyors upto the service reservoirs and sells the water in bulk to the Nicosia Water Board.
- the Nicosia Water Board which has the responsibility for the distribution of water to Nicosia town and suburbs, and,
- the Nicosia Water Commission which has the responsibility for the distribution of water to the old town of Nicosia within the walls. The Commission operates its own sources which are the boreholes P1 and P2 and the Arab Ahmet chain of wells. Use of the two boreholes for water supply was discontinued during the year.

Several important sources and conveyance systems serving the town of Nicosia are located within the occupied area. These sources are the Morphou-Pendayia boreholes which make a very significant contribution to the total water requirements of the capital and the Dhikomo boreholes and Sykhari Adit. There is a common distribution system for the whole of the town which serves both the Greek and Turkish sectors. There are service reservoirs in both sectors. The water supply of the whole town thus operates as a single unified system and the cooperation of both sides is necessary to achieve the desired results.

The Government provides spare parts or replaces pumping units installed on sources of the systems within the area under Turkish occupation and also provides the Turkish side with repair materials for the pipelines conveying water to Nicosia in order to keep up a continuous supply to the town.

The contribution of the United Nations personnel, in providing liaison between the two sides, is much appreciated.

### Demand Estimates

For many years now restrictions have had to be imposed on the hours of supply to the consumers of Nicosia. For this reason the unrestricted demand of the town is not known. Nevertheless, it is estimated that the demand, for 1985, was of the order of 13.45MCM per annum, which corresponds to an average daily

demand, throughout the year, of 35,600 m<sup>3</sup>. The seasonal variation in demand would push this figure to about 42,700 m<sup>3</sup> immediately upon the lifting of restrictions during the summer months, with single day maximum peaks as high as 49,800 m<sup>3</sup>. This assumes an average daily consumption of 650 l/day per consumer meter.

However, the above estimated demands may not be realistic. It is believed that the restrictions imposed on the water supply of the town for many years and the campaigns to save water, together with the introduction of increased water rates by the Nicosia Water Board in recent years have depressed the water supply demand of the consumers. The theoretical unrestricted demand given above may therefore take a few years of unrestricted supply to develop.

### Sources and Production

The main water supply sources of Nicosia town and their production over the years 1979 to 1985 are given in Table IX-3.

Table IX-3  
NICOSIA WATER SUPPLY SYSTEM  
YIELD OF SOURCES IN MCM PER ANNUM 1979-85

Source	1979	1980	1981	1982	1983	1984	1985
1 Morphou Bay Scheme	3.232	3.343	3.252	3.198	3.230	3.486	3.280
2 Dhikomo-Sykhari	1.007	0.960	0.501	0.198	0.112	NIL	NIL
3 Paliometokho-Kokkinotrimithia							
Dhenia Airport	0.659	0.548	0.568	0.565	0.466	0.451	0.431
4 Tseri	1.028	0.940	0.891	0.812	0.788	0.763	0.686
5 Dhali	--	0.294	0.268	0.017	NIL	NIL	NIL
6 Peristerona-Akaki	0.211	1.195	1.316	1.040	0.936	0.906	1.087
7 Laxia-Athalassa-Makedonitissa	0.401	0.296	0.367	0.268	0.358	0.232	0.142
8 Nicosia Water Commission Sources	0.633	0.768	0.689	0.521	0.453	0.390	0.419
9 Purchased from Private BHs	2.013	1.528	1.866	2.101	1.669	1.277	1.114
10 Lefkara Dam (CWSS)	--	--	--	0.891	0.042	0.339	2.556
11 1982-84 Emergency Schemes							
(a) Stavrovouni	--	--	--	0.277	0.862	1.364	0.849
(b) Dhenia	--	--	--	0.314	0.389	0.278	0.182
(c) Dhali-Kattoudhia-Yeri	--	--	--	--	0.276	0.645	0.547
	9.184	9.878	9.718	10.202	9.581	10.131	11.293

During 1985, the total quantity of water produced was 11.293MCM of which 9.760MCM came from Government sources, 0.409MCM was the yield of the Nicosia Water Commission sources and 1.114MCM was purchased from private boreholes.

### Restrictions on Water Supply

Of the total 1985 production of 11.293MCM, 10.633MCM were delivered to Nicosia, 0.602MCM were consumed en-route by a number of communities and other consumers connected to the system and the remaining 0.061MCM unaccounted for.

Compared, therefore, to the estimated theoretical unrestricted demand of 13.45MCM, there was a theoretical deficit of 2.82MCM or 21% for the year. The total quantity conveyed to Nicosia from Khirokitia Treatment Works in 1985 was 2.556MCM which is by 2.217MCM greater than that conveyed in 1984. Due to the increased quantities made available to the town, restrictions on the supply



had to be imposed only for a short period in the summer, from 24.6.1985 to 19.8.1985, and provided for 24 hours supply every 48 hours.

The lack of information on population served in the Turkish controlled part of the area of supply makes it difficult to calculate accurate figures for per capita consumption of the town. Nevertheless, based on information available on the number of consumers within the Government controlled part of the area of supply and assuming an average of 3.2 persons per consumer connection, it is estimated that an average supply of 161 l/capita/day or 515 l per day per consumer meter, was delivered to the service reservoirs of the town, this year.

#### Villages and other Consumers served by the Nicosia Water Supply System

Table IX-4 below gives the communities and other consumers served by the Nicosia Water Supply System and the quantities supplied to them over the years 1979-1985.

Table IX-4  
NICOSIA WATER SUPPLY SYSTEM  
VILLAGES AND OTHER CONSUMERS SERVED

Community Served	Consumption in MCM						
	1979	1980	1981	1982	1983	1984	1985
Kokkinotrimithia	0.050	0.057	0.063	0.091	0.082	0.086	0.068
Mammari-Dhenia	0.046	0.064	0.040	--	--	--	0.037
Mosphiloti	--	--	--	0.017	0.052	0.049	0.049
Psevdhas	--	--	--	0.009	0.031	0.018	0.025
Pyrga	--	--	--	0.006	0.021	0.024	0.026
Lymbia, Sha, Kornos regional W.S. Scheme	--	--	--	0.018	0.060	0.043	0.042
Alambra	--	--	--	0.004	0.014	0.021	0.010
Dhali	--	--	--	--	0.009	0.059	0.047
Various camps industries and miscellaneous consumers	0.024	0.034	0.041	0.049	0.083	0.100	0.157
Totals	0.120	0.155	0.144	0.194	0.352	0.400	0.461

#### Water Supply Prospects

The operation of the first phase of the Nicosia Water Supply component of the Vasilikos-Pendaskinos Project in 1982 and the Yermasoyia-Vasilikos Project in 1983 proved invaluable short term contributions to the solution of the water shortage problem of Nicosia and Larnaca towns.

However, due to the continuous increase in demand for water and the equally continuous reduction in the yield of the boreholes presently supplying Nicosia, the water shortage problem will persist until the Vasilikos-Pendaskinos Project, becomes fully operational in 1986. The operation of this project, however, is likely to solve the water shortage of the capita for a few years, after which deficits will again develop.

The answer to the long term solution of the water shortage problem is the Southern Conveyor Project which will become operational toward the end of the present decade. This project is planned to meet the water supply requirements not only of Nicosia but also those of Limassol, Larnaca, Famagusta and of a number of communities upto the year 2010.

## New Schemes

### Tokhni Pumping Station

During the year under review, Tokhni Pumping Station and associated conveyor pipelines which form part of the Vasilikos-Pendaskinos Project, were completed and put into operation in April. The object of this Pumping Station, of a capacity of 1,750m<sup>3</sup>/hr, is to supply raw water from Kalavassos Dam to Khirokitia Treatment Works.

The total cost of the Pumping Station was £520,000. Analytically, the cost of civil works was £193,000 and that of the mechanical and electrical equipment was £327,000.

### Extension of Khirokitia Treatment Plant

With the ever increasing demand from this source of supply, the extension of the Treatment Plant became imperative. Work on the extension started early in 1985 and was completed and put into commission in August of the same year. The extension provided for the construction of two sedimentation tanks, two filters and a raw water balancing reservoir of 8,500m<sup>3</sup> capacity. This extension increased the production capacity of the plant from 22,000m<sup>3</sup>/day to 32,000m<sup>3</sup>/day. The total cost of the extension was £249,681.

### Expenditure and Revenue

A statement showing expenditure for the operation and maintenance of sources and conveyors and revenue from the sale of water for the year 1985 is given in table IX-5.

Table IX-5  
NICOSIA WATER SUPPLY  
EXPENDITURE AND REVENUE ACCOUNT FOR 1985

#### Expenditure

##### Morphou Bay Scheme

	£
Maintennace expenses .....	--
Electricity.....	327 874
Wages.....	18 890
Miscellaneous expenses.....	--
	<hr/>
Total.....	£346 854

##### Tseri Scheme

Maintenance expenses.....	1 078
Electricity and fuel.....	39 844
Wages.....	17 529
Miscellaneous expenses.....	353
	<hr/>
Total.....	£58 804

##### Peristerona-Akaki Scheme

Maintenance expenses.....	£ 2 657
---------------------------	------------



	£
Electricity and fuel.....	78 907
Wages.....	15 484
Miscellaneous expenses.....	441
	<hr/>
Total.....	£97 489
 Kokkini Trimithia-Paleometokho Installations	
Maintenance expenses.....	7 821
Electricity and fuel.....	58 570
Wages.....	44 337
Miscellaneous expenses.....	1 245
	<hr/>
Total .....	£111 973
 Dhali-Laxia Installations	
Maintenance expenses .....	553
Electricity .....	7 789
Wages .....	--
Miscellaneous expenses .....	176
	<hr/>
Total .....	£8 518
 Maintenance Expenses of Civil Engineering Works	
Motor Transport expenses .....	5 096
Wages .....	17 794
Purchase of materials & equipment .....	2 814
Miscellaneous expenses .....	4 377
	<hr/>
Total .....	£30 081
Purchase of Water from Private Sources .....	£82 167
 Yeri-Dhali-Kattoudhia Emergency Scheme	
Maintenance expenses .....	4 543
Electricity and fuel .....	26 388
Wages .....	8 007
Miscellaneous expenses .....	77
	<hr/>
Total .....	£39 015
 Pyrga-Stavrovouni Emergency Scheme	
Maintenance expenses .....	6 004
Electricity and fuel .....	56 382
Wages .....	11 440
Miscellaneous expenses .....	1 230
	<hr/>
Total .....	£75 056

Dhypotamos-Lakatamia-Installations

	£
Maintenance expenses .....	999
Electricity .....	60 952
Wages .....	13 613
Miscellaneous expenses .....	1 646
	<hr/>
Total .....	£77 210

Kornos Water Treatment Works and Pumping Station

Maintenance expenses .....	--
Electricity .....	--
Wages .....	1 673
Miscellaneous expenses .....	18 153
	<hr/>
Total .....	£19 826

GRAND TOTAL ..... £946 993

Revenue

Revenue Generated

	£
Value of water delivered to Nicosia Water Board*.....	1 466 937
Value of water delivered directly to other consumers in 1985 ..	86 173
	<hr/>

Total value of water delivered in 1985 ..... £1 533 110

Amount actually collected in 1985 in respect of water delivered in 1985 .....	951 764
Amount outstanding on 31.12.85 for water delivered in 1985 ....	601 346

Amount outstanding by 31.12.84 .....	488 344
Less amount collected in 1985 in respect of water delivered before 31.12.1984 .....	429 462
Amount outstanding on 31.12.1985 for water delivered before 31.12.84 .....	58 882
	<hr/>

Total amount outstanding on 31.12.1985 ..... £660 228

Total amount collected in 1985 ..... £1 381 226

This statement does not include for the amortization of the Government installations and equipment of the system. The amortization cost of these installations and equipment is estimated at £503,950 annually as given in Table IX-6. Without taking into account office overheads the profit for the year 1985 amounts to £102,167. If outstanding payments are not considered as revenue then there is a deficit of £499,179.

\* This figure is calculated at the actual rates at which the Water Board is charged. As from 1.3.1982 these rates represent only about 75% of the actual cost of the water. The balance is a government grant to the Water Board on account of the quantity it supplies to the turkish-occupied sector of Nicosia for which no payment is received by the Board.



Table IX-6  
NICOSIA WATER SUPPLY  
AMORTIZATION COSTS

Installations	Capital costs £	Discount rate	Period (years)	Annual Amortization Cost £
Pre-1982 installations	1 748 300	8%	Varies	107 760
Vasilikos-Pendaskinos Project 1st Phase				
- Civil works	2 650 000	9%	40	246 344
- E & M plant	350 000	9%	15	43 420
1982 Emergency Schemes				
Dhenia	90 000	9%	5	23 138
Stavrovouni	78 000	9%	5	20 053
1983 Emergency Schemes (Pyrga-Stavrovouni-Yeri-Dhali-Kattoudhia)				
	75 100	9%	5	19 307
1984 Emergency Schemes (Pyrga-Dhali-Kattoudhia)				
	17 767	9%	5	4 567
Total .....				£503 950

#### Water Supply to Government Residences and Institutions in Nicosia

In addition to the water supplied for domestic use by the Nicosia Water Board, Government houses, offices and other institutions are supplied free of charge with water for irrigation and cleaning purposes by a separate water supply system. The sources of this system are four boreholes situated within the inhabited area of Nicosia. The total quantity of water produced from these sources during 1985 was 113,700 m<sup>3</sup> which met satisfactorily the demand. The total expenditure, (which is borne by Government) for the operation and maintenance of this system for 1985 was £10,584 as follows:

	£
- Electricity .....	1 990
- Wages .....	7 092
- Maintenance .....	69
- Miscellaneous expenses .....	1 433
Total	£10 584

Note: Expenditure under the heading "Wages" includes also the wages for the maintenance and repairs to large water meters which are carried out by the same gang operating this system.

#### CENTRAL WATER SUPPLY SYSTEM

##### The System

The Central Water Supply System (CWSS) is the former Famagusta Water Supply Scheme which has gradually been enlarged with the addition of new sources and the connection of new demand centres to a point where it serves the Towns of Nicosia, Larnaca and Famagusta and more than 35 communities in the respective districts.

The system provides both underground water being pumped from several boreholes in the areas of Khirokitia, Skarinou, Alethriko, Anglisidhes and Klavdhia villages and surface water from Lefkara dam, Yermasoyia dam and from Kalavastos dam as from April, 1985.

The water from Kalavastos dam is conveyed by gravity along a pipeline to Tokhni pumping station and from there it is pumped to the Khirokitia Treatment Works.

The surface water is being treated at the khirokitia Treatment Works which has been extended and its capacity increased to 32,000 m<sup>3</sup> /day. Treated and borehole water is conveyed along a 70 km pipeline from khirokitia upto Phrenaros reservoir south of Famagusta.

Borehole sources and communities are connected at various points along the Famagusta pipeline which in effect forms the backbone of the CWSS.

During 1985 the Khirokitia Treatment Works was in operation continuously because demand of water by the communities served could not at any time be met from the various underground sources alone.

The water held in storage in the Lefkara dam reservoir on 1st January 1985 was 394,000 m<sup>3</sup> representing 2.84% of the reservoir capacity and by the end of the year the total water storage was 697,000 m<sup>3</sup> representing 5.03% of the reservoir capacity. The total inflow during the year was 2,656,000 m<sup>3</sup> and the total drawoff for domestic purpose was 2,020,000 m<sup>3</sup>.

The water held in storage in the Yermasoyia dam reservoir on 1st January, 1985 was 3,026,000 m<sup>3</sup> representing 22.25% of the reservoir capacity and by the end of the year the total water storage was 5,044,000 m<sup>3</sup> representing 37.09% of the reservoir capacity. The total inflow during the year was 11,931,000 m<sup>3</sup> and the total drawoff including water for irrigation, domestic, recharge and evaporation was 9,913,000 m<sup>3</sup>.

The drawoff quantity for domestic purpose was 2,812,710 m<sup>3</sup>.

The water held in storage in the Kalavastos dam reservoir in April, 1985 was 5 289 000 m<sup>3</sup> representing 30.9% of the reservoir capacity and by the end of the year the total water storage was 1,696,000 m<sup>3</sup> representing 9.9% of the reservoir capacity. The draw off quantity for domestic purposes as from 17th April was 3,674,857 m<sup>3</sup>

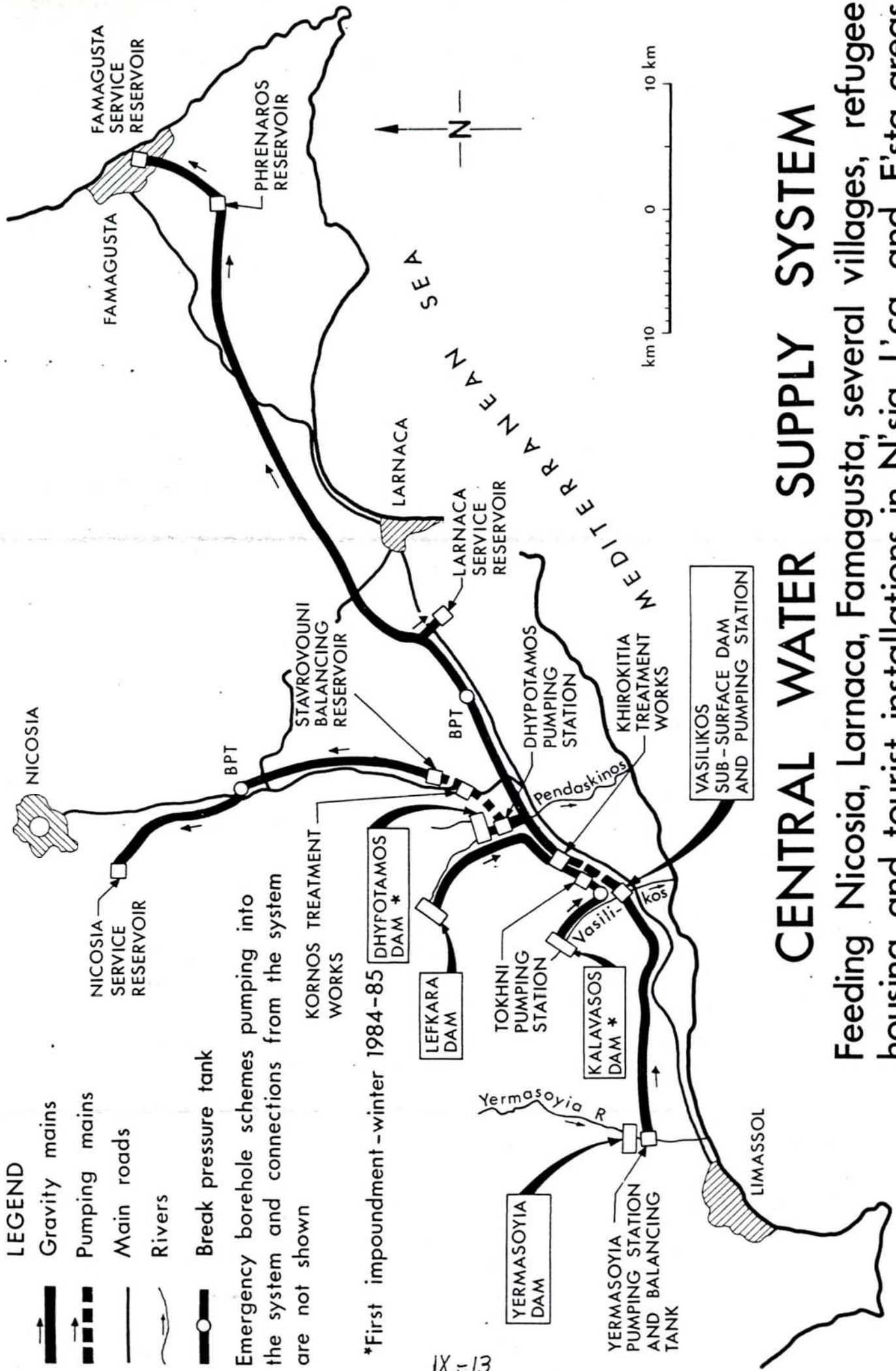
The total quantity of water pumped and/or treated from all sources of this scheme during 1985 was 9,546,414 m<sup>3</sup> (including losses and quantities supplied to Akrounda-Phinikaria local irrigators) and the total consumption was 9,360,504 m<sup>3</sup>.

The total demand on the system during 1985 was 9.36MCM compared to 6.5MCM during 1984. The apparent sudden increase in demand is due to the increased quantities conveyed to Nicosia.

#### Sources and Production

The main sources of the Central Water Supply System and their production over the years 1980 to 1985 are given in table IX-7.





**LEGEND**

- Gravity mains
- Pumping mains
- Main roads
- ~ Rivers
- Break pressure tank

Emergency borehole schemes pumping into the system and connections from the system are not shown

\*First impoundment - winter 1984-85

# CENTRAL WATER SUPPLY SYSTEM

Feeding Nicosia, Larnaca, Famagusta, several villages, refugee housing and tourist installations in N'isia, L'ca, and F'sta areas

Table IX-7  
CENTRAL WATER SUPPLY SYSTEM  
YIELD OF SOURCES IN MCM PER ANNUM 1980-1985

Source	Year					
	1980	1981	1982	1983	1984	1985
Khirokitia Treat.Works						
- Drawing from Yermasoyia	--	--	--	1.957	2.487	2.646
- Drawing from Lefkara Dam	2.107	3.035	4.325	1.429	1.618	1.901
- Drawing from Vasilikos Subsurface Dam	--	--	--	0.001	0.745	0.001
- Drawing from Kalavasos Dam	--	--	--	--	--	3.456
Sub-total Khirokitia Treatment Works	2.107	3.035	4.325	3.387	4.850	8.004
Vasilikos & Old BHs						
- Vasilikos Sub-surface dam	0.833	0.762	0.449	0.366	--	0.001
- Boreholes						
Psematismenos group	0.124(1)	0.101(1)	0.127(1)	0.116(1)	--	--
Khirokitia group	0.278(2)	0.243(2)	0.206(2)	0.168(2)	0.139(2)	0.081(2)
Alethriko group	0.338(2)	0.158(2)	0.158(2)	0.093(2)	0.062(2)	0.061(1)
Sub-total Vasilikos & old boreholes	1.573	1.505	0.940	0.743	0.201	0.143
Yermasoyia dam (for irrigation)	--	--	--	0.232	0.281	0.290(4)
1982-83 Emerg.Schemes						
Tokhni	--	--	0.038(1)	--	--	--
Skarinou	--	--	0.190(2)	0.337(6)	0.345(4)	0.202(4)
Menoyia	--	--	0.078(2)	--	--	--
Alethriko	--	--	0.064(1)	0.159(1)	0.245(3)	0.220(3)
Klavdhia	--	--	0.349(4)	0.507(5)	0.400(5)	0.365(3)
Khirokitia	--	--	--	0.123(1)	0.095(1)	0.087(1)
Anglisidhes	--	--	--	--	0.222(1)	0.235(1)
Sub-total Emerg.Schemes	--	--	0.719	1.126	1.307	1.109
Totals	3.680	4.540	5.984	5.488	6.639	9.546

Note: Figures in parentheses indicate the number of boreholes. The quantities for the treatment works production are given net of treatment losses.

The total quantity of water produced shows an increase of 43.7% in 1985 over the corresponding 1984 figure.

#### Bulk Consumption

Table IX-8 shows the bulk consumption of the various communities served by the CWSS over the years 1980-85.



Table IX-8  
CENTRAL WATER SUPPLY SYSTEM  
BULK CONSUMPTION IN MCM PER ANNUM 1980-1985

Community Served	Consumption from CWSS in MCM					
	1980	1981	1982	1983	1984	1985
Nicosia (via Dhypotamos)	--	0.014	0.891	0.042	0.339	2.290
Larnaca	0.796	1.182	1.446	2.111	2.467	2.793
Famagusta	1.017	1.058	1.060	0.985	0.986	0.983
<hr/>						
Sub-total Towns	1.813	2.254	3.397	3.138	3.792	6.066
Western Region Villages						
Pano Lefkara	0.033	0.025	0.044	0.042	0.052	0.076
Kato Lefkara	0.009	0.009	0.010	0.008	0.009	0.008
Kato Dhrys	0.010	0.009	0.008	0.008	0.007	0.008
Vavla	0.008	0.007	0.007	0.008	0.007	0.007
Alethriko	0.017	0.018	0.028	0.029	0.028	0.026
Mazotos	0.026	0.035	0.042	0.031	0.041	0.049
Kivisil	0.020	0.019	0.020	0.021	0.023	0.025
Tokhni	0.041	0.031	0.035	0.025	0.027	0.030
Menoyia	--	--	--	0.002	0.005	0.005
Khirokitia	0.019	0.024	0.033	0.024	0.027	0.019
Maroni	0.027	0.031	0.039	0.031	0.037	0.039
Zyyi	0.019	0.029	0.029	0.026	0.028	0.032
Psematismenos	0.010	0.012	0.013	0.011	0.013	0.011
Kophinou	--	--	--	--	0.001	0.034
Alpanda-Anaphotia	--	--	--	0.005	0.033	0.037
Meneou-Dhromolaxia-Tersephanou	--	--	--	0.107	0.239	0.434
Klavdhia	--	--	0.001	0.020	0.022	0.036
Kalokhorio	--	--	--	0.041	0.019	--
<hr/>						
Sub-total Western Villages	0.239	0.249	0.309	0.439	0.618	0.876
Eastern Villages						
Aradippou	0.097	0.175	0.131	0.104	0.231	0.282
Xylymbou	0.154	0.158	0.158	0.121	0.117	0.128
Dherinia	0.147	0.153	0.152	0.137	0.149	0.174
Avgorou	0.113	0.134	0.133	0.121	0.120	0.130
Phrenaros	0.015	0.051	0.053	0.014	0.036	0.054
Livadhia	0.085	0.104	0.134	0.127	0.128	0.134
Voroklini	0.059	0.062	0.065	0.064	0.070	0.074
Sotira	0.082	0.097	0.091	0.073	0.088	0.110
Paralimni	0.127	0.210	0.207	0.247	0.302	0.383
Ayia Napa	0.049	0.161	0.217	0.255	0.336	0.426
Kellia	0.018	0.015	0.024	0.025	0.025	0.017
Troulli	0.033	0.036	0.038	0.036	0.041	0.041
Aradippou-Livestock area	0.020	0.021	0.017	0.011	0.017	0.001
Anzio Camp	0.082	0.084	0.047	0.013	0.027	0.025
Akhna Forest	0.103	0.095	0.098	0.097	0.091	0.093
Displaced Persons Service	--	--	--	--	--	--
Pyla	--	--	--	0.008	0.027	0.041
<hr/>						
Sub-total Eastern Villages	1.184	1.556	1.565	1.453	1.805	2.113
Irrigators & Minor Consumers	0.047	0.055	0.076	0.305	0.294	0.306
<hr/>						
Grand Total	3.283	4.114	5.347	5.335	6.509	9.361

## Expenditure and Revenue

A statement showing expenditure and revenue of the Central Water Supply System for the year 1985 is shown in table IX-9 below. Operation of the Vasilikos Pendaskinos-First Phase supplying water to Nicosia is not included here as it is included in the accounts of the Nicosia System.

Table IX-9  
NICOSIA-LARNACA-FAMAGUSTA  
CENTRAL WATER SUPPLY SYSTEM

### EXPENDITURE AND REVENUE ACCOUNTS FOR 1985

#### Expenditure

	£
Khirokitia and Lefkara Installations	
Electricity .....	8 562
Wages .....	50 452
Materials and others .....	34 193
	<hr/>
Total .....	£93 207
Yermasoyia-Vasilikos Pumping and Maintenance Expenses	
Electricity .....	309 640
Wages .....	37 620
Materials and others .....	2 352
	<hr/>
Total .....	£349 612
Pumping and Maintenance Expenses	
Electricity .....	72 559
Wages .....	36 125
Materials and others .....	17 539
	<hr/>
Total .....	£126 223
Khirokitia-Lefkara Regional Water Supply Scheme	
Electricity .....	29 256
Maintenance .....	1 004
	<hr/>
Total .....	£30 260
Maintenance expenses for Civil Engineering Works	
Wages .....	11 721
Materials and others .....	3 281
	<hr/>
Total .....	£15 002



Kalavassos Dam and Tokhni Pumping Station Installations

	£
Electricity .....	51 249
Wages .....	9 784
Materials and others .....	211
	<hr/>
Total .....	£61 244
	<hr/>
GRAND TOTAL .....	£675 548

REVENUE

Revenue Generated in 1985

Value of water delivered to Larnaca Water Board in 1985 .....	515 595
Value of water delivered to Famagusta area occupied by Turks in 1985 .....	182 051
Value of water delivered to Nicosia Water Board in 1985 .....	330 870
Value of water delivered to other consumers in 1985 .....	547 875
	<hr/>
*Total value of water delivered in 1985 .....	£1 576 391

Amount actually collected in 1985 in respect of water delivered in 1985 .....	574 727
*Amount outstanding on 31.12.1985 for water delivered in 1985 ...	1 001 664
**Amount outstanding on 31.12.1984 .....	1 097 997
Less amount collected in 1985 in respect of water delivered before 31.12.1984 .....	280 261
	<hr/>
	817 736
***Total amount outstanding by 31.12.1985 .....	£1 819 400

\* Includes an amount of £182,051 representing the value of 982,890 m<sup>3</sup> of water supplied to Famagusta area occupied by Turks.

\*\* Includes an amount of £784,319 representing the value of 10,068,729 m<sup>3</sup> of water supplied to Famagusta area occupied by Turks during the years 1974-1984.

\*\*\* Includes an amount of £966,370 representing the value of 11,051,619 m<sup>3</sup> of water supplied to Famagusta area occupied by Turks during the years 1974-1985.

Notes on expenditure and revenue account of the Central Water Supply System for 1985.

(a) This statement does not include for the amortization cost of the installations of the CWSS. Details of capital costs and annual amortization are given in table IX-10 below. It is seen from the table that the total annual amortization cost of the system rose to £979,580 due to the completion and commissioning of major new works.

Table IX-10  
LARNACA-FAMAGUSTA-CENTRAL WATER SUPPLY SYSTEM  
AMORTIZATION COSTS OF CAPITAL INVESTEMENTS

Installations	Year compl.	Capital Cost £	Period Years	Capital Recovery at 9%	Annual Amortization Cost £
Vasilikos & Khirokitia BHs Conveyors	1970	239 800	40	0.09296	22 290
Khirokitia Phrenaros pipeline	1970	879 300	40	0.09296	81 740
Lefkara Dam	1974	1 266 600	40	0.09296	117 740
Lefkara-Khirokitia pipeline	1974	367 000	40	0.09296	34 120
Khirokitia Treatment Works	1974	227 200	40	0.09296	21 120
Yermasoyia Dam	1968	(950 000)			
- Charged to W.S.		330 430	40	0.09296	30 720
Yermasoyia Conveyor	1982	950 000	10	0.15582	148 030
Emergency BHs	1983	175 777	5	0.25709	45 190
Khirokitia Treatment Works extension:					
- Civil	1985	136 955	40	0.09296	12 730
- M & E	1985	112 726	20	0.10955	12 350
Kalavassos Dam	1985	(6 358 000)			
- 40% charged to W.S.		2 543 200	40	0.09296	236 420
Kalavassos pipeline	1985	(2 194 000)			
- 40% charged to W.S.		1 633 000	40	0.09296	151 800
Tokhni Pumping Station:					
- Civil	1985	193 000	40	0.09296	17 940
- M & E	1985	327 000	20	0.10955	35 820
- Vehicles for VPP (part)	1985	45 000	5	0.25709	11 570
<b>Totals</b>		<b>£9 426 988</b>			<b>£979 580</b>

(b) Expenditure under the heading "Khirokitia and Lefkara installations" refers to Khirokitia treatment Works and Lefkara Dam.

The total quantity of water treated during the year reached 8,004,009 m<sup>3</sup> and the unit running cost was 1.16 cents/m<sup>3</sup>.

(c) Expenditure under the heading "Yermasoyia-Vasilikos pumping and maintenance expenses" refers to the running expenses of Yermasoyia Boosting Station, Vasilikos Boosting Station and Vasilikos Subsurface dam pumping scheme.

(d) Expenditure under the heading "Pumping and maintenance expenses" refers to the following installations:

- \* BHs no. 11/69, 4/69 in the Khirokitia area
- \* BH no. 45/73 in the Alethriko area

#### 1982-1983 Emergency Scheme Installations

- \* BHs no. 114/80, 127/80, 112/80, 38/82, 16/79 in the Klavdhia area.
- \* BHs no. 73/80, 15/83, 75/83 in the Alethriko area.
- \* BHs no. 133/80, 80/83, 55/83, 63/83 in the Skarinou area.
- \* BH no. 45/61 in the Khirokitia area.
- \* BH no. 141/83 in the Anglisidhes area.



The total quantity produced by these sources during 1985 was 1,251,209 m<sup>3</sup>.

The unit cost of pumping and maintenance was therefore 10.09 cents/m<sup>3</sup>.

(e) Expenditure under the heading "Khirokitia-Lefkara regional Water Supply Scheme" refers to the running expenses of two boosters, pumping treated water to Pano Lefkara, Kato Lefkara, Kato Dhrys and Vavla villages.

The total quantity of water boosted during the year was 99,625 m<sup>3</sup>.

(f) Expenditure under the heading "Maintenance Expenses for Civil Engineering Works" refers to maintenance expenses for the Yermasoyia-Khirokitia, Lefkara-Khirokitia, Tokhni-Khirokitia and Khirokitia-Phrenaros mains.

(g) Expenditure under the heading "Kalavassos Dam and Tokhni Pumping Station Installations" refers to the running expenses of four boosters at Tokhni pumping station pumping raw water from Kalavassos dam to Khirokitia Reservoir.

#### Chemical Laboratory of Khirokitia Water Treatment Works

The Khirokitia water Treatment Works were commissioned in 1974. For the period 1974-78 the operators at the works carried out some simple chemical tests, (analyses) of the water to check its chlorine content, turbidity, pH and conductivity.

In early 1978 the WDD set up a modern chemical laboratory at Khirokitia Water Treatment Works which was to cater for the needs of the treatment plant and to a large extent of WDD in respect of Drinking Water Supplies.

The laboratory is presently staffed with two persons only one chemist and one labourer who works as a laboratory assistant. The laboratory undertakes all the chemical analyses of drinking water and carries out chemical tests for water conductivity, pH, total dissolved solids, total hardness, chlorides, sulphates, carbonates, fluoride, nitrite, bicarbonates, nitrates, sodium, potassium, calcium and magnesium. All the bacteriological tests of raw and drinking water are presently being carried out by the State General Laboratory in Nicosia.

Samples of water from existing boreholes and reservoirs being used for urban water supply are collected monthly by the WDD District Offices and are tested at the laboratory. Also samples of the water used for village water supply are tested annually.

In addition to the above analyses, the laboratory also carries out several chemical tests in connection with new projects undertaken by the WDD (Such as the Vasilikos-Pendaskinos Project, the Southern Conveyor Project etc.) and in cases where water from a new borehole will be used for drinking purposes.

During the year 1985, 2,272 chemical analyses of drinking water, were carried out, at the laboratory of Khirokitia Water Treatment Works. Details of the chemical analyses are shown in table no.IX-11.

In addition to the chemical analyses mentioned above, samples of water from the Yermasoyia and Lefkara Dams were collected monthly, and jar tests for estimating coagulant dosing requirements were carried out.

Table IX-11  
SUMMARY OF CHEMICAL ANALYSES

Month	Number of chemical analyses						Total
	Larnaca	Nicosia	Limassol	Paphos	Polis	Khirokitia	
January	42	16	--	80	116	35	289
February	20	50	17	3	--	27	117
March	8	40	--	--	--	257	305
April	15	9	18	3	--	109	154
May	--	70	19	--	--	128	217
June	14	1	--	--	63	92	170
July	30	40	21	--	--	33	124
August	12	28	31	20	--	131	222
September	19	65	15	--	--	25	124
October	--	43	--	102	59	--	204
November	32	38	15	--	--	31	116
December	9	64	16	--	--	141	230
Total	201	464	152	208	238	1 009	2 272

#### TOWN WATER BOARDS

##### NICOSIA WATER BOARD

The water shortage problem was much less acute this year and restrictions on the supply of the town were imposed only for a short period in summer from 24.6.85 to 19.8.85. This was made possible due to the increased quantity which was made available to this Board from Khirokitia Treatment Works.

The Water Board entered into an agreement with Thames Water Authority of the U.K. and a Leak Detection and Monitoring System is being set up to minimize the losses in the distribution system. The unaccounted for water in its area of supply now, is as high as 28%.

##### New Schemes

The construction work, for the installation of a trunk main commencing from Lakatamia Reservoir and terminating at Platy Area, east of the town, commenced in mid 1985 and is expected to be completed in Summer 1986. The object of this pipeline is to improve the water supply of the quarters en-route, where an underpressure supply has been observed for the last few years.

The total cost of the scheme is estimated at £316,000.

##### Water Supply Data

- Total quantity of water delivered to the service reservoirs or directly into the distribution system .....	10 633 110 m <sup>3</sup>
- Total quantity of water consumed as registered by area meters (including Nicosia Water Commission) .....	10 393 365 m <sup>3</sup>
- Total consumption during 1985 as registered by individual consumers meters in the Greek sector only .....	5 858 289 m <sup>3</sup>
- Unaccounted for water .....	27.97%



- Maximum daily summer consumption (Based on area meter readings and including Nicosia Water Commission. Registered on 9.9.1985 continuous supply) .....	38 491 m <sup>3</sup>
- Total number of consumers on 31.12.84 (Greek sector only)....	41 297 no
- Total number of consumers connected in 1985 .....	1 170 no
- Total number of consumers on 31.12.1985 .....	42 412 no
- Average number of consumers during 1985 .....	41 854 no
- Average gross supply per consumer .....	515 l/day
- Extension of distribution system (100mm, 150mm and 250mm A.C. pipes and 300mm ductile Iron pipes).....	3 420 m
- Total length of distribution system as at 31.12.1985 .....	541 307 m
- Total number of Fire Hydrants installed during 1985 .....	4 no

From the information available, the quantity of Water supplied to the area of Nicosia under Turkish control was 2.568MCM or 25.86% (As registered by area meters).

#### Limassol Water Board

The Water Board Sources met satisfactorily the water demand and the town enjoyed a satisfactory supply throughout the year 1985.

However, due to the undercapacity of the distribution system, the water supply of the high parts of the town was interrupted during the peak hours of consumption.

The improvement of the distribution system and service reservoirs were studied by Consulting Engineers and their report was submitted in 1981. The estimated cost of the improvement works proposed by their report is £2.34 million and envisages the construction of two new service reservoirs and the laying of a number of trunk mains within the distribution system for improving its conveyance capacity.

During the year under review the Board installed a trunk main of ductile iron pipes of 450 and 400 mm and of total length 3,452 m at a total cost of £200,000 to improve the water supply of Omonia, Ayios Ioannis and Zakaki quarters. This trunk main was envisaged in the Consultants report.

During the year, the areas of Zakaki and Ayia Phyla were included in the Limassol Water Board Area of Supply.

#### Water Supply Data

- Total quantity of water produced from all sources during 1985 .....	8 484 834 m <sup>3</sup>
- Total quantity of water consumed as registered by area meters	8 443 089 m <sup>3</sup>
- Total consumption during 1985 as registered by individual consumers meters .....	6 599 323 m <sup>3</sup>
- Unaccounted for water .....	22.2%

- Maximum daily summer consumption (registered by area meters on 24.7.85) .....	32 709 m <sup>3</sup>
- Total number of consumers connected in 1985 .....	3 587 no
- Total number of consumers on 31.12.1985 .....	37 621 no
and on 31.12.1984 .....	34 034 no
- Average number of consumers during 1985 .....	35 827 no
- Average gross supply per consumer .....	649 l/day
- Extension of distribution system (100mm, 150mm, 200mm and 250mm A.C. pipes and 300mm, 400mm, 450mm, 500mm and 600mm ductile iron pipes) .....	33 046 m
- Total length of distribution system as at 31.12.1985 .....	426 665 m
- Total number of Fire Hydrants installed during 1985 .....	102 no
- Total number of Fire Hydrants installed as at 31.12.1985 ....	1 459 no

#### Famagusta Water Board

Since the Turkish occupation of Famagusta town in 1974, the Cyprus Government is supplying water free of charge to the Turkish residents of the town. The total quantity of water supplied during 1985 was 0.983MCM.

#### Larnaca Water Board

The water supply of this town is supplemented by 80% of its total water requirements from the Central Water Supply System. The total quantity of water delivered to Larnaca Water Board from this system during 1985 was 2.793MCM, which is greater by 0.326MCM than that of 1984.

Due to the increased quantities delivered to this Board the water supply of the town was continuous throughout the year.

Towards the end of 1985, the Water Board of Larnaca entered into an agreement with Thames Water Authority of the U.K. for the setting up of a Leak Detection and Monitoring System to minimize the losses in its distribution system which now stand as high as 29.4%.

#### Water Supply Data

- Total quantity of water produced from all sources during 1985	3 486 391 m <sup>3</sup>
- Total quantity of water delivered to the service reservoirs of directly into the distribution system (Reservoir Outlet) ....	3 359 520 m <sup>3</sup>
- Total quantity of water consumed as registered by area meters	3 474 580 m <sup>3</sup>
- Total consumption during 1985 as registered by individual consumers meters .....	2 462 632 m <sup>3</sup>
- Unaccounted for water .....	29.36%



- Maximum daily summer consumption (Based on area meter readings registered on 26.8.85) .....	12 560 m <sup>3</sup>
- Total number of consumers connected in 1985 .....	1 191 no
- Total number of consumers on 31.12.1985 .....	17 979 no
and on 31.12.1984 .....	17 150 no
- Average number of consumers during 1985 .....	17 564 no
- Average gross supply per consumer .....	544 l/day
- Extension of distribution system (100mm, 150mm, 200mm and 250mm A.C.pipes) .....	5 964 m
- Total number of Fire Hydrants installed during 1985 .....	25 no
- Total number of Fire Hydrants installed as at 31.12.1985 ....	778 no

#### Paphos Water Supply

The water supply of the town is administered by the Municipality. Although the capacity of the Municipality's sources could meet the demand, carrying capacity limitations of the main conveyor pipeline, have necessitated the augmentation of the town's supply from the "Paphos Lower Villages" Government Water Supply Scheme by 92,012 m<sup>3</sup>. Despite this augmentation, the demand during the summer months could not be met and restrictions on the supply were imposed. The restrictions provided for a supply every other day.

#### Water Supply Data

- Total quantity of water produced from all sources during 1985	1 569 668 m <sup>3</sup>
- Total quantity delivered en route .....	33 579 m <sup>3</sup>
- Total quantity of water delivered to the service reservoir or directly into the distribution system .....	1 535 789 m <sup>3</sup>
- Total consumption during 1985 as registered by individual consumers meters .....	1 131 271 m <sup>3</sup>
- Unaccounted for water .....	25.79%
- Average daily summer consumption (July-Sept.) .....	4 085 m <sup>3</sup>
- Total number of consumers connected in 1985 .....	621 no
- Total number of consumers on 31.12.1985 .....	7 306 no
and on 31.12.1984 .....	6 685 no
- Average number of consumers during 1985 .....	6 995 no
- Average gross supply per consumer .....	602 l/day
- Extension of distribution system (100mm, 150mm, and 200 A.C.pipes)	6 846 m
- Total length of distribution system as at 31.12.1985 .....	147 594 m
- Total number of Fire Hydrants installed during 1985 .....	76 no
- Total number of Fire Hydrants installed as at 31.12.1985 ....	160 no

GOVERNMENT REGIONAL WATER SUPPLY SCHEMES

These schemes supply water to rural population on a regional basis. Water is supplied in bulk to the service reservoir of each community and the distribution is the responsibility of the village water supply committee. These schemes are composed of the sources, balancing tanks, conveyor pipelines and associated pumping installations and are wholly financed by Government. These schemes operate with automatic control equipment. Periodic supervision as well as maintenance work are carried out by the District Offices of the Department. During 1985 the following regional schemes were in operation.

Paphos Lower Villages

This scheme supplies water to 21 communities, to Mesoyi Industrial Estate, Anatoliko Industrial Estate, Paphos Airport and supplements the Paphos Town water supply.

The sources of this scheme are BHs 57/72, 56/75, 67/84 in Xeropotamos river and BH 7/85 near Armou village. This last borehole was put into operation on a temporary basis with pumping equipment made available through the Departmental workshop to supplement the sources of the scheme which were adversely effected by the drought.

The total quantity of water supplied from these sources during 1985 was 706,289 m<sup>3</sup>.

The total expenditure for the operation and maintenance of the scheme was £58,725 and the revenue generated was £38,846. More details on expenditure and revenue are given on table IX-12 below:

Table IX-12

PAPHOS LOWER VILLAGES REGIONAL WATER SUPPLY SCHEME

EXPENDITURE AND REVENUE ACCOUNT FOR 1985

Expenditure

	£
Electricity cost .....	51 714
Maintenance expenses .....	7 011
	-----
Total .....	£58 725

Revenue

	£
Amount collected for 1985 .....	22 584
Outstanding accounts for 1985 .....	16 262
	-----
Total .....	£38 846
Outstanding accounts by 31.12.1984 .....	17 158
Less amount collected in 1985 .....	3 030
	-----
Total .....	£14 128
Total amount outstanding by 31.12.1985 .....	£30 390



This statement does not include for the amortization of the capital expenditure of the schemes. The amortization cost of the installations is estimated at £32,147 p.a. Without taking into account administration expenses and other overheads, the total deficit for the year 1985 amounts to £52,326.

#### Arminou Regional Scheme

This scheme supplies water to eight communities. The source of this scheme is BH 56/72 in Dhiarizos river near Arminou village. The total quantity of water distributed to the eight villages in 1985 was 49,446 m<sup>3</sup>. An additional quantity of 10,581 m<sup>3</sup> was supplied for irrigation to individuals from Mesana and Kedhares. The total expenditure for the operation and maintenance of this scheme was £11,498 while the revenue generated for the same year was £2,917. More details on revenue and expenditure are given in table IX-13.

Table IX-13  
ARMINOU REGIONAL SCHEME

#### EXPENDITURE AND REVENUE ACCOUNT FOR 1985

##### Expenditure

	£
Electricity cost .....	5 000
Maintenance expenses .....	6 498
	<hr/>
Total .....	£11 498

##### Revenue

	£
Amount collected for the year 1985 .....	1 150
Amount outstanding for 1985 .....	1 767
	<hr/>
Total .....	£2 917
Outstanding account by 31.12.84 .....	4 690
Less amount collected in 1985 .....	298
	<hr/>
Total .....	£4 392
Total amount outstanding by 31.12.1985 .....	£6 159

This statement does not include for the amortization cost of capital expenditure of the scheme. The amortization cost of the installations is estimated at £6,895 p.a. The total deficit for the year, without taking into account administration expenses and other overheads, amounts to £15,476.

#### Timi Water Supply Scheme

This scheme supplies water to Timi village only. The source is 2821, and the total quantity of water produced during 1985 was 26,662 m<sup>3</sup>.

The total expenditure for the operation and maintenance of the scheme was £1,144 and the revenue generated was £534. The total amount outstanding by 31.12.1985 was £673.

### Ambelitis Water Supply Scheme

This scheme supplies water to Ambelitis village only. The source of the scheme is Kefalovrysos spring near Vrecha village. The water is conveyed to the village storage tank by a booster pump installed near the spring.

The total quantity of water pumped in 1985 was 58,721 m<sup>3</sup> and the total expenditure for the operation and maintenance of the scheme was £3,535.

### Amathus Scheme

This scheme has been established under the Government Water Works Law to supply water to Amathus Tourist Development Area. The scheme is administered by a committee composed of the Director General of the Ministry of Interior as Chairman and the Directors General of the Ministries of Agriculture and Natural Resources, Finance, Communications and Works and Commerce and Industry, as members. The scheme is operated by the Limassol District Engineer of the Department in cooperation with the District Officer, Limassol.

The sources of this scheme are two boreholes, 946 and 933 situated in Yermasoyia River. The total quantity of water distributed during 1985 was 557,928 m<sup>3</sup>. The total cost for the operation and maintenance of the scheme was £30,638 and the revenue generated for the same year was £160,598.

More details on expenditure and revenue are given on Table IX-14.

Table IX-14

#### AMATHUS WATER SUPPLY SCHEME EXPENDITURE AND REVENUE ACCOUNT FOR 1985

##### Expenditure

	£
Electricity cost .....	13 575
Maintenance expenses .....	7 252
Compensations .....	9 811
	<hr/>
Total .....	£30 638

##### Revenue

	£
Sale of water .....	27 896
Connection fees .....	132 702
	<hr/>
Total .....	£160 598

### Moutayiaka Regional Scheme

This scheme supplies water to 10 communities of a total population of 12,850 persons. The sources of the scheme are two boreholes, 64/64 (Hydr.No.287) and 180/59 (Hydr.no.8) situated in Yermasoyia River. The operation and maintenance of the scheme is the responsibility of the District Officer, Limassol.

The total quantity of water distributed to these ten communities in 1985 was 636,250 m<sup>3</sup> as given below:



Villages	Consumption m <sup>3</sup>
Ayia Phyla .....	326 590
Polemidhia .....	8 080
Ayios Athanasios .....	132 590
Moutayiaka .....	64 005
Ayios Tykhonas .....	31 520
Parekklisha .....	45 750
Moni - Moni camp.....	9 390
Monagroulli .....	11 640
Armenokhori .....	4 570
Phinikaria .....	2 115
<hr/>	
Total .....	636 250 m <sup>3</sup>

The total expenditure for the operation and maintenance of this scheme was £65,751 and the revenue generated was £70,000.

More details on expenditure and revenue are given on Table IX-15 below:

Table IX-15

MOUTAYIAKA REGIONAL WATER SUPPLY SCHEME  
EXPENDITURE AND REVENUE ACCOUNT FOR 1985

Expenditure

	£
Electricity cost .....	54 118
Operation and maintenance .....	11 633
<hr/>	
Total .....	£65 751

Revenue

	£
Amount collected in 1985 .....	31 755
Amount outstanding by 31.12.1985 .....	38 245
<hr/>	
Total .....	£70 000

Outstanding amount by 31.12.1984 .....	39 030
Less amount collected in 1985 .....	31 030
Total amount outstanding for water delivered before 1985 .....	7 826
Total amount outstanding by 31.12.1985 .....	£46 071

Yermasoyia Water Supply Scheme

This scheme supplies water to Yermasoyia village and Potamos tis Yermasoyias with a total population of 5,000 persons during winter and 15,000 persons during summer. This scheme supplies also a number of hotels and other tourist installations in the coastal area of Potamos tis Yermasoyias.

The sources of the scheme are four boreholes, 63/64, 25/72, 72/75 and 107/61 situated in Yermasoyia river, and Ayios Photis spring.

The operation and maintenance of this scheme is the responsibility of Yermasoyia Improvement Board.

The total quantity of water produced during 1985 was 881,300 m<sup>3</sup> and the total water consumption was 661,492 m<sup>3</sup>.

The total expenditure for the operation and maintenance of this scheme was £52,195 while the revenue generated was £136,771.

More details on expenditure and revenue are given on table IX-16 below:

Table IX-16  
YERMASOYIA WATER SUPPLY SCHEME  
EXPENDITURE AND REVENUE ACCOUNT FOR 1985

Expenditure

	£
Electricity cost .....	32 912
Maintenance .....	19 283
	<hr/>
Total .....	£52 195

Revenue

	£
Sale of water .....	99 662
Connection fees .....	19 409
Capital expenditure .....	9 200
Amount outstanding for 1985 .....	8 500
	<hr/>
Total .....	£136 771



X DIVISION OF OPERATION AND MAINTENANCE OF IRRIGATIONS PROJECTS

By

N Tsiourtis  
Senior Water Engineer

Introduction

This Division includes the Branches dealing with:

- \* The management, operation and maintenance of Government Waterworks.
- \* The maintenance of contributory irrigation projects

During 1985 the Division consisted of the following staff:

- 1 Senior Water Engineer - Head
- 2 Topographer Irrigation Engineers class I
- 1 Senior Superintendent
- 2 Senior Technicians
- 1 Technician I
- 1 Chief Foreman
- 1 Technician II
- 9 Total Staff

Definitions

Government Waterworks: These are the projects constructed under the Government Waterworks Law Cap. 341. These projects are listed in Tables X-1 and X-7.

Contributory Irrigation Works: These are projects constructed under the Irrigation Division Law Cap. 342. A list of these projects is given in Tables X-6 and X-6a.

MANAGEMENT AND OPERATION PROCEDURES

The management and operation of the various categories waterworks are carried out as follows:

- 1 Government Waterworks - (i) Irrigation Projects

The management and operation of these projects are carried out by:

- (a) Waterworks Committees established according to the provision of the relevant Law. The Waterworks Committees are usually composed of the following:

Chairman

District Officer of the district in which the projects are situated

Members

Director of the Water Development Department or his representative. Director of the Land and Surveys Department or his representative. Two or more members elected by the farmers.

The Committee is responsible for the overall administration and management of the Government Waterworks Projects such as:

- \* to make recommendations on the development, conservation, management and efficient use of the available water resources of the project.
- \* to manage and operate the project with a view to:
  - improve the standard of agricultural practices
  - improve the methods of irrigation
  - increase the revenue from land and water utilization to the full economic value
  - to sell the water at the nominal rates approved by the Government and see that the fees and charges are collected (See Table X-1).

(b) The Director of the Water Development Department who undertakes to operate, manage and maintain the Government waterworks. The only projects whose operation and maintenance are solely the responsibility of the Director of the WDD are the Paphos Irrigation Project, and the Khrysokhou Valley BH Scheme, Xyliatos dam and Vasilikos Pendaskinos Project.

The Committees and the Director of WDD have their own budgets, approved by the Minister of Finance and the Council of Ministers accordingly.

The water selling rates approved by the Council of Ministers are shown on Table X-3.

1 Government Waterworks - (ii) Recharge Works

These are managed directly by the Water Development Department (See Table X-7)

2 Contributory Irrigation Projects (Major and Small)

The operation of the contributory projects is carried out by the Irrigation Division Committees. These committees are chaired by the District Officer and members to committees are beneficiaries elected by the general assembly meetings of the Irrigation Division beneficiaries. The Water Development Department in such cases gives technical advice both to the District Officer and to the Committees.

The costs of the operation of these projects is born in total by the beneficiaries



## MAINTENANCE PROCEDURES

The maintenance of the irrigation waterworks is carried out by the Water Development Department but depending on the type of the Project the expenses are either paid in full by the Government or are shared between the Government and the Irrigation Division. The procedure is as follows:

A Government Waterworks: The maintenance of these projects is carried out by the Water Development Department being the Government's Agency for waterworks and the costs are borne in full by the Government. By the term maintenance we mean routine dam and pipeline maintenance, valves and watermeters repairs or replacements, painting of metal works or woodworks etc.

B Contributory Irrigation Projects: The maintenance of these projects is carried out by the Water Development Department but the costs are shared between the Government and the specific Irrigation Division usually at a ratio of 2 to 1. Some maintenance or repair works are carried out by the respective I D directly.

## WATER DEVELOPMENT DATA

Cyprus is an island and all available water resources are those that result from overall precipitation. The total precipitation in an average year is estimated at 4,600 MCM, where 1,270 MCM/annum are lost in the form of evaporation, 900 MCM/a are lost in the form of evapotranspiration from cultivated crops, 1,480 MCM/a are lost in the form of evapotranspiration from forest pasture and grass and irrigated crops. The annual surface runoff is estimated at 600 MCM and the groundwater and springs another 350 MCM. As it is seen from the above only 950 MCM or 21% of the total precipitation are available for development both surface and groundwater. The groundwater resources being easier to develop are at present overpumped. The annual extraction from the boreholes is estimated at 370 MCM and the total springs yield is around 30 MCM. Out of these quantities 300 MCM are used for irrigation where the rest 100 MCM are used for domestic and industrial uses.

The surface water resources being much more expensive to <sup>be</sup> developed, remained undeveloped until the beginning of the 1960's. By the beginning of 1960 the total water storage capacity of dams all over the island amounted to 6.2 MCM commanding an area of 11,400 donums of irrigated land. Soon after this (after independence) the Government

of the Republic started a construction program to develop as much as possible more surface water resources. Many projects were constructed which increased the water storage capacity of dams, to 148.5 MCM, 130.5 MCM for irrigation and domestic water supply and the rest 18.0 MCM for recharge purposes where the commanded area has risen to 130,601 donums.

Details on the projects and the rate of storage development are given in Drg. No. AG/IR/55 "Cyprus Dam Projects and Regional Development" and Drg No. AG/G/57 "progress in Dam Construction". (See chapter I)

#### SUMMARY OF MANAGEMENT, OPERATION AND MAINTENANCE DATA

The overall average precipitation during the hydrological year under review was 496 mm or 93% of the 30 year average of the Government controlled area, where the total volume of water available in the dams from project boreholes and river diversions in the Government controlled area amounted to 74.212 MCM. From this quantity 31.499 MCM were used for irrigation, 8.807 MCM were used for domestic water supplies, 3.758 MCM were used for recharge 0.981 MCM seeped through or below the dams and another 4.830 MCM was lost as evaporation. The rest 24.337 MCM remained in the dams for over year storage or lost in the distribution system or as overflow. Projects in the Turkish occupied area are not included here as we cannot collect the necessary information.

The total area commanded by the irrigation projects is estimated at 130,248 donums where an estimated area of 59,480 donums, has been irrigated, planted with citrus, bananas, deciduous, vegetables, potatoes etc.

Maintenance works totalling £266,821 were carried out on fifty-eight projects. these include routine maintenance on the dam structures and the distribution systems. For the Government irrigation/works a total of £239,661 were spent where for the recharge works an amount of £2,201 was spent. The rest £24,959 were spent on the contributory projects, £7,866 for Pitsilia and £17,093 for the other.

#### Government Waterworks - Irrigation Projects

In the year under review, the total quantity available from Government irrigation projects reached the figure of 68.970 MCM.



From this total, a quantity of 39.702 MCM or 57.6% was utilized, 27.137 MCM for irrigation, 8.807 MCM for the domestic water supply and 3.758 MCM for recharge purposes. The rest of the water remained in storage or lost in the form of overflow. In the same period 4.219 MCM were lost in the form of evaporation where another 0.946 MCM were lost as seepage or deep percolation (see Table X-1).

The irrigation water was used to irrigate fully or partly 51,100 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes, cereals and olives (See Table X-2).

The gross income from the sale of water amounted to £895,386 being the income from the sale of water at the rates shown on Table IX-3. The operational expenses amounted to £150,216 being the cost for the payment of the watermen, and the bill collectors etc., which amounted to 0.9 cents/m<sup>3</sup> of water sold or 0.7 cents/m<sup>3</sup> of water utilized. The maintenance expenses on government projects amounted to £239,661 i.e. 1.0 cents/m<sup>3</sup> of water sold or 0.6 cents/m<sup>3</sup> of water utilized. The power expenses amounted to £380,785 i.e. 1.6 cents/m<sup>3</sup> of water sold or 1.2 cents/m<sup>3</sup> of water utilized.

The total annual operation, maintenance and power expenses amounted to £770,662 which amounts to 3.2 cents/m<sup>3</sup> of water sold or 2.3 cents/m<sup>3</sup> of water utilized.

Evaporation losses from the reservoirs amounted to 4.219 MCM or 7.2% of the total storage capacity available. The seepage losses were estimated at 0.946 MCM or 1.6% of the total storage, mostly from the Polemidhia and Yermasoyia dams.

The overall water utilization and land utilization indexes are 57.6% and 58.6% respectively. Of the 27.137 MCM used for irrigation 24.020 MCM was sold at the nominal rates, (88.3%) where the rest 3.179 MCM, (11.7%) was given free of charge as water rights or overflows.

A summary of the above data in detail is given in Tables X-1, X-4, and X-5 where more details are given for each project under separate headings.

Table X-5 gives data on the operation and maintenance of the government irrigation projects for the last 10 years.

Table X-8 gives data on the operation and maintenance for the last two years.

### Government Waterworks - Recharge Works

On the island there are about 32 recharge works of total capacity 18.063 MCM. Out of these projects 19 of total capacity 15.534 MCM or 86.0% of the total recharge capacity are situated in the Turkish occupied areas. On these, no government control is possible and no data on their use is available. For the projects in the Government controlled area no water was collected for the year under review. For information on individual projects in the Government control areas see Tables X-7 and X-11.

### Contributory Irrigation Projects

In general there are 68 contributory irrigation projects with total capacity 9.566 MCM commanding an area of 43,103 donums. Nine projects of total capacity 5.296 MCM or 55.4% of the total capacity of contributory schemes, commanding an area of about 22,630 donums are situated in the Turkish occupied area and on which no data are collected. Forty one projects of total capacity 2.193 MCM, commanding an area of 7,459 donums, belong to the Pitsilia Project. During the year under review the total water collected from the contributory schemes amounted to 5.261 MCM out of which 4.300 MCM were used for the irrigation of 8,380 donums where the rest were lost in the form of evaporation or remained in the dams and/or ponds for over year storage. See Tables X-6 and X-6a, for details.

### COST OF OPERATION ON SOME GOVERNMENT WATERWORKS

The operational cost of a number of important projects are shown on Table X-9. This table shows the running costs (O+M and Power) and the unit cost of water.



TABLE X-1 GOVERNMENT WATERWORKS - IRRIGATION PROJECTS - DATA FOR 1985

Ser. No.	Project	Capacity M <sup>3</sup> x10 <sup>3</sup>	Area Commanded donums	Water Available* in storage M <sup>3</sup> x10 <sup>3</sup>	Water available** from other sources M <sup>3</sup> x10 <sup>3</sup>	Total water avail- able M <sup>3</sup> x10 <sup>3</sup>	Water used for irrigation M <sup>3</sup> x10 <sup>3</sup>	Water used for D.S. M <sup>3</sup> x10 <sup>3</sup>	Water used for recharge M <sup>3</sup> x10 <sup>3</sup>	Total Quantity Used M <sup>3</sup> x10 <sup>3</sup>	Evaporation Losses M <sup>3</sup> x10 <sup>3</sup>	Seepage Losses M <sup>3</sup> x10 <sup>3</sup>	Area irrigated donums	Water Utilized Index %	Land Utilized Index %
1	Argaka	990	2 340	1 471	154	1 625	1 311	NIL	NIL	1 311	84	4	1 638	80.7	70.0
2	Ayia Marina	300	1 500	371	-	371	289	NIL	NIL	289	27	32	302	77.9	20.1
3	Kalopanayiotis	363	450	467	-	467	241	NIL	NIL	241	31	150	450	51.6	100.0
4	Kiti	1 610	6 200	NIL	-	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
5	Lefkara	13 850	615	2 802	-	2 802	91	1 835	NIL	1 926	237	17	170	68.4	27.6
6	Pomos	860	2 850	1 052	106	1 158	875	NIL	NIL	875	67	111	939	75.6	32.9
7	Polemihia (3 430)	13 500	15 440	15 866	2 143	18 009	5 159	3 032	3 758	11 949	1 318	476	15 440	66.4	100.0
8	Yermasoyia														
9	Athalassa	791	310	19	-	19	19	NIL	NIL	19	2	NIL	35	100.0	1.1
10	Paphos Pr Dams	53 180	38 355	28 067	6 228	34 295	16 247	NIL	NIL	16 247	2 355	50	25 615	47.4	66.8
11	Kha-Potami (Diversien)		4 235	-	929	929	929	NIL	NIL	929	-	-	4 235	100.0	100.0
12	Khrysoxhou Valley BHs		1 770	-	460	460	460	NIL	NIL	460	-	-	846	100.0	47.8
13	Xyliatos	1 220	2 300	1 322	-	1 322	587	NIL	NIL	587	98	106	1 430	44.3	62.2
14	Kalavasos	17 100	8 000	5 548	-	5 548	494	3 675	NIL	4 169	NA	NA	NA	75.1	NA
15	Dhyopotamos	13 700	2 780	1 965	-	1 965	435	265	NIL	700	NA	NA	NA	35.6	NA
	Total	120 894	87 145	58 950	10 020	68 970	27 137	8 807	3 758	39 702	4 219	946	51 100	57.6	58.6

\* This the water that possibly may be utilized: storage and overflow or seepage that may be utilized after deducting evaporation and seepage losses.

\*\* River Diversion and/or Borehole extraction used in project area

TABLE X-2 - GOVERNMENT WATERWORKS - CROPS AND AREAS IRRIGATED

Ser. No.	Crop	Area in donums
1	Citrus .....	14 234
2	Bananas .....	3 800
3	Vines .....	11 080
4	Deciduous .....	1 077
5	Vegetables .....	5 365
6	Potatoes .....	2 899
7	Cereals .....	185
8	Olives .....	198
9	Ground-Nuts .....	6 327
10	Seasonal .....	4 396
11	Tobacco .....	422
12	Avocados.....	446
13	Alfa-Alfa .....	671
	Total .....	<u>51 100</u>



TABLE X-3 - GOVERNMENT WATERWORKS - APPROVED IRRIGATION WATER CHARGES  
IN CENTS/M<sup>3</sup>

Scr. No.	Project	Overflow	Industrial	Flat Rate Cents/m <sup>3</sup>
1	Argaka .....	Free	-	3.0
2	Ayia Marina .....	-	-	3.0
3	Kalopanayiotis .....	-	-	3.5
4	Kiti .....	-	-	-
5	Lefkara .....	-	-	3.5
6	Pomos .....	0.5	-	3.0
7	Polemiðhia .....	-	-	3.0, 3.5
8	Yermascyia .....	-	-	3.0, 3.5
9	Athalassa .....	-	-	-
10	Paphos .....	-	9,13	3.5, 4.0
11	Kna-Potami .....	-	-	Free
12	Khrysokhou Valley .....	-	-	4.0
13	Xyliatos .....	-	-	3.0
14	Kalavastos .....	-	-	Free
15	Dhypotamos .....	-	-	Free

TABLE X-4 - GOVERNMENT WATERWORKS - DATA ON MANAGEMENT, OPERATION AND MAINTENANCE OF IRRIGATION PROJECTS

Ser. No.	Project	Dam reservoir capacity	Area commanded	Water available for storage	Water available from other sources	Total available water	Water used	Water available	Area irrigated	Gross income	Expenditure			Total	Net Profit
											Power	Operat.	Maint.		
1	Argaka	990	2340	1471	154	1625	1311	887	1638	26572	3907	6038	4035	13980	12592
2	Avia Marina	300	1500	371	-	371	289	289	302	8320	-	4920	1423	6343	1977
3	Kalopanayiotis	363	450	467	-	467	241	241	450	8448	-	2552	1300	3852	4596
4	Kiti	1610	6200	NIL	-	NIL	NIL	NIL	NIL	NIL	-	NIL	371	371	-371
5	Lefkara	13850	615	2802	-	2802	1926	91	170	3185	-	*	1311	1311	1874
6	Pomos	860	2850	1052	106	1158	875	875	939	23970	3058	10184	2560	15802	8168
7	Polemithia	3430)		15866	2143	18009	11949	4282	15440	144784	65575	68463	20651	154689	-9905
8	Yermasoyia	13500)	15440												
9	Athalassa	791	310	19	-	19	19	NIL	35	NIL	NIL	NIL	NIL	NIL	NIL
10	Paphos	53180	38355	28067	6228	34295	16247	16247	25615	641291	293356	48470	194439	536265	105026
11	Kha-Potami (Diversion)		4235	-	929	929	929	NIL	4235	NIL	NIL	-	775	775	-775
12	Khrysokhou Valley BHs		1770	-	460	460	460	460	846	18404	14889	4339	8811	28039	-9635
13	Xyliatos	1220	2300	1322	-	1322	587	587	1430	17615	-	5250	3985	9235	8380
14	Kalavastos (VPP)	17100	8000	5548	-	5548	4169	46	NA	2058	-	***	-	-	2797
15	Dhypotamos (VPP)	13700	2780	1965	-	1965	700	16	NA	739	-	***	-	-	-
TOTAL		120894	87145	58931	10020	68970	39702	24020	51100	895386	380785	150216	239661	770662	124724

\* These costs are included in the Lefkara dam in the report on DWS  
 \*\* River Diversion and/or borehole extraction used in project area.  
 \*\*\* Operation expenses were covered by the constructional costs

- 1 Diversion on river
- 2 Groundwater Scheme



TABLE X-5 - GOVERNMENT WATERWORKS - DATA ON WATER USE FOR THE LAST 10 YEARS

Ser. No.	Description	Unit	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	Capacity .....	1000m <sup>3</sup>	37 890	37 890	38 061	37 874	37 874	37 874	89 874	91 094	91 094	120 89
2	Water available .....	"	28 000	32 003	27 380	28 282	34 408	50 660	35 278	37 441	55 019	68 95
3	Water utilized for irrigation .....	"	8 388	9 704	9 457	10 847	27 109	19 634	20 858	21 814	23 270	27 43
4	Water used for DWS .....	"	1 365	2 058	2 856	2 936	2 210	3 356	4 793	3 831	4 429	8 80
5	Water used for recharge .....	"	6 016	3 323	1 982	1 623	6 579	14 627	2 648	2 999	3 199	3 75
6	Total water used .....	"	15 769	15 085	14 295	15 426	23 609	37 617	28 299	28 644	30 898	39 70
7	Evaporation losses .....	"	2 570	2 662	2 683	2 409	2 587	2 618	2 646	3 218	3 789	4 21
8	Seepage losses .....	"	428	359	3 367	1 024	5 087	5 424	973	873	747	94
9	Water sold .....	"	73 747	93 485	8 447	12 642	11 748	18 644	19 542	20 101	21 210	24 02
10	Gross income .....	£	6 624	7 999	101 367	128 281	169 418	253 307	433 214	520 441	688 686	895 38
11	Power cost .....	£	-	-	-	-	-	117 689	215 577	247 838	355 186	380 78
12	Operation cost .....	£	18 627	34 500	33 592	55 197	84 496	207 738	119 906	264 039	212 831	150 21
13	Maintenance cost .....	£	4 496	8 059	8 165	7 202	18 563	50 539	76 131	100 069	160 771	239 60
14	Total expenditure .....	£	23 123	42 559	41 757	62 399	103 059	258 277	411 614	611 946	728 788	770 66
15	Net income .....	£	50 264	50 926	59 610	65 882	68 159	-4 838	21 600	-91,505	-40 102	124 72
16	Area irrigated .....	donums	17 376	15 459	14 905	20 084	27 109	37 340	39 509	45 678	50 055	51 10

TABLE X-6 DATA ON CONTRIBUTORY IRRIGATION WORKS

Ser. No.	Project	Capacity m <sup>3</sup> x10 <sup>3</sup>	Yield m <sup>3</sup> /h	Area commanded donoms	Water available for utilization m <sup>3</sup> x10 <sup>3</sup>	Water used for irrigation m <sup>3</sup> x10 <sup>3</sup>	Water used for DWS m <sup>3</sup> x10 <sup>3</sup>	Water used for recharge m <sup>3</sup> x10 <sup>3</sup>	Total quantity used m <sup>3</sup> x10 <sup>3</sup>	Evaporation Losses m <sup>3</sup> x10 <sup>3</sup>	Seepage Losses m <sup>3</sup> x10 <sup>3</sup>	Area irrigated donoms
1	Akrounda	22	-	60	22	20	-	-	20	2	-	60**
2*	Galini	22	-	1 300	-	-	-	-	-	-	-	-
3*	Geyneli	1 000	-	850	-	-	-	-	-	-	-	-
4*	Gypsos	113	-	638	-	-	-	-	-	-	-	-
5	Kalo Khorio (Klirou)	32	-	1 350	29	29	-	-	29	3	-	64
6	Kandou	38	-	563	38	31	-	-	31	3	-	67
7*	Kanli	1 100	-	4 000	-	-	-	-	-	-	-	-
8*	Lefka Marathasa	368	-	1 300	368	331	-	-	331	37	-	441
9*	Lefka Kafizes	113	-	770	113	102	-	-	102	11	-	136
10	Lymbia	220	-	940	220	77	-	-	77	18	-	81
11	Lythrodontas Upper	32	-	115	32	29	-	-	29	3	-	115
12	Lythrodontas Lower	32	-	115	32	29	-	-	29	3	-	115
13*	Mia Milea	330	-	1 300	-	-	-	-	-	-	-	-
14*	Morphou	2 000	-	6 740	-	-	-	-	-	-	-	-
15*	Ovgos	250	-	6 370	-	-	-	-	-	-	-	-
16	Pakhyamos	43	-	400	43	40	-	-	40	3	-	89
17	Palekhori (Kambi)	620	-	1 000	620	373	-	-	373	50	-	638
18	Pera Pedhi	55	-	195	55	44	-	-	44	4	-	57
19	Petra Upper	10)	-	4 690	10	9	-	-	9	1	-	69
20	Petra Lower	25)	-	-	25	22	-	-	22	3	-	-
21	Prodromos	110	-	170	76	70	-	-	70	6	-	92
22	Pyrgos	283	-	1 600	283	260	-	-	260	23	-	347
23	Trimiklini	340	-	650	340	313	-	-	313	27	-	406
24**	Kambos	-	70	270	34	11	-	-	30	-	7	135
25**	Chakistra	-	70	330	79	39	-	-	54	-	26	300
26**	Yerakies	-	70	216	22	13	-	-	19	-	2	110
27	Khirokitia Pond & B/H	205	100	350	205	157	-	-	157	14	-	350
	Total	7 363	418	35 644	2 441	1 999	-	-	1 999	211	35	3 672

\* Project in Turkish occupied areas



TABLE X-6a DATA ON CONTRIBUTORY IRRIGATION WORKS OF THE PITSILIA PROJECT

Ser. No.	Project	Capacity M <sup>3</sup> x 10 <sup>3</sup> /day	Annual Pumpage M <sup>3</sup> x 10 <sup>3</sup>	Area commanded donums	Water available for utilization M <sup>3</sup> x 10 <sup>3</sup>	Water used for irrigation from dam M <sup>3</sup> x 10 <sup>3</sup>	Water used for irrigation from drehles M <sup>3</sup> x 10 <sup>3</sup>	Water used for DWS M <sup>3</sup> x 10 <sup>3</sup>	Total quantity used M <sup>3</sup> x 10 <sup>3</sup>	Evaporation and Other losses M <sup>3</sup> x 10 <sup>3</sup>	Area irrigated donums
1	Agros Dam & B/H .....	72	70	354	69	51	14	*	65	4	148
2	Akapnou-Ephtagonia Pond	132	-	185	104	86	-	-	86	28	139
3	Arakapas Dam .....	128	-	219	260	227	-	-	227	107	219
4	Arakapas I .....	192	-	285	163	90	-	-	90	29	152
5	Ayii Vavatsinias (dam) ..	53	-	180	48)	25	-	-	25	5)	106
6	Ayii Vavatsinias (pond) ..	55	-	150	51)	28	-	-	28	4)	150
7	Ephtagonia I .....	92	-	175	84	78	-	-	78	8	175
8	Ephtagonia II .....	127	-	90	171	164	-	-	164	10	90
9	Ephtagonia III .....	65	-	300	54	39	-	-	39	11	260
10	Kato Mylos pond & B/H ..	104	62	140	127	82	30	-	112	7	140
11	Khandria .....	70	-	80	65	59	-	-	59	5	80
12	Kyperounda I .....	53	-	516	45	41	-	-	41	14	442
13	Kyperounda II .....	273	-	149	229	199	-	-	199	44	18
14	Lagoudhera .....	70	-	110	51	8	-	-	8	19	110
15	Melini .....	59	-	92	64	85	-	-	45	10	56
16	Agridhia .....	59	-	480	55	24	-	-	24	8	480
17	Pelendria pond & B/H ...	123	160	92	226	82	126	-	208	23	13
18	Arakapas B/H "Angoulos"	-	50	180	8	-	8	-	8	-	110
19	Arakapas B/Hs "Scoli"	-	90	63	68	-	68	-	68	-	21
20	Polystypos B/H .....	-	15	198	10	-	10	-	10	-	145
21	Potamitissa B/Hs .....	-	120	393	58	-	58	-	58	-	198
22	Kalon Khorion B/Hs .....	-	125	94	81	-	81	-	81	-	94
23	Ayios Theodoros B/Hs ..	-	65	135	**	-	-	-	-	-	121
24	Ora Pond & B/Hs .....	62	42	62	62	62	7	-	69	11	62

TABLE X-6a DATA ON CONTRIBUTORY IRRIGATION WORKS OF THE PITSIILIA PROJECT (Continued)

Ser. No	Project	Capacity m <sup>3</sup> x10 <sup>3</sup>	Annual Pumpage m <sup>3</sup> x10 <sup>3</sup>	Area commanded donums	Water available for utilization m <sup>3</sup> x10 <sup>3</sup>	Water used for irrigation from dam m <sup>3</sup> x10 <sup>3</sup>	Water used for irrigation from boreholes m <sup>3</sup> x 10 <sup>3</sup>	Water used for DWS m <sup>3</sup> x 10 <sup>3</sup>	Total quantity used m <sup>3</sup> x10 <sup>3</sup>	Evaporation and other losses m <sup>3</sup> x10 <sup>3</sup>	Area irrigated donums
25	Pharmakas I )	21	-	135	18	11	-	-	11	2	15
26	Pharmakas II )	61	-	190	46	29	-	-	29	15	39
27	Arakapas II	119	-	62	103	48	-	-	48	16	76
28	Ayii Vavatsinias II	44	-	300	31	3	-	-	3	7	5
29	Dhierona I	159	-	95	179	128	-	-	128	13	171
30	Dhierona B/H	-	54	90	34	-	34	-	34	-	58
31	Sykopetra B/H	-	45	300	14	-	14	-	14	-	26
32	Ayios Konstantinos B/Hs	-	116	265	48	-	48	-	48	-	90
33	Louvaras B/Hs	-	140	100	73	-	73	-	73	-	138
34	Ayii Vavatsinias B/H	-	50	160	22	-	22	-	22	-	44
35	Askas B/H	-	60	75	26	-	26	-	26	-	59
36	Alona B/H	-	50	45	8	-	8	-	8	-	12
37	Lagoudhera B/H	-	25	180	2	-	2	-	2	-	4
38	Agros B/H	-	82	198	14	-	14	-	14	-	30
39	Dhymes B/H	-	80	504	41	-	41	-	41	-	95
40***	Kato Amiantos scheme	-	56	100	1	-	1	-	1	-	504
41	Zoopiyi B/H	-	49	100	7	-	7	-	7	-	16
Total		2193	1606	7459	2820	1609	692	-	2301	400	4849

\* Some quantity of the water from the borehole was given for DWS

\*\* Water utilization from the river flow

\*\*\* Borehole and river diversion scheme



TABLE X-7

## GOVERNMENT WATERWORKS, RECHARGE WORKS DATA FOR 1985

Ser. No.	Project	Capacity $m^3 \times 10^3$	Water available $m^3 \times 10^3$	Water used for recharge $m^3 \times 10^3$	Water lost in evaporation $m^3 \times 10^3$
1*	Kouklia .....	4 545	-	-	-
2	Ayios Loucas .....	455	-	-	-
3	Sotira .....	77	Nil	Nil	Nil
4	Paralimmi Panayia.....	45	Nil	Nil	Nil
5	Paralimmi .....	115	Nil	Nil	Nil
6	Ayia Napa .....	55	Nil	Nil	Nil
7*	Famagusta Antiflood.....	50	-	-	-
8	Phrenaros.....	160	Nil	Nil	Nil
9	Dherinia.....	23	Nil	Nil	Nil
10	Avgorou.....	68	Nil	Nil	Nil
11*	Kondea.....	82	-	-	-
12	Xylophaghou.....	86	Nil	Nil	Nil
13*	Lysi.....	77	-	-	-
14*	Ayios Yeoryios (K).....	68	-	-	-
15*	Ayios Epiktitos.....	34	-	-	-
16*	Akanthou.....	45	-	-	-
17**	Akhna.....	40	Nil	Nil	Nil
18	Xylotymbou.....	50	Nil	Nil	Nil
19*	Syngrasis.....	1 115	-	-	-
20*	Ayios Yeoryios (F).....	190	-	-	-
21*	Famagusta Recharge.....	165	-	-	-
22*	Ayios Nicolaos Fam.....	1 365	-	-	-
23	Paralimmi Lake.....	1 365	Nil	Nil	Nil
24*	Fresh Water Lake.....	4 545	-	-	-
25*	Makrasyka.....	195	-	-	-
26*	Akhna Mesaoria .....	90	Nil	Nil	Nil
27	Vrysoulles Fam.....	140	-	-	-
28*	Morphou Recharge.....	130	-	-	-
29*	Morphou Protopapas.....	90	-	-	-
30	Ormidhia (Vathys).....	100	Nil	Nil	Nil
31*	Masari.....	2 273	-	-	-
32	Liopetri.....	325	Nil	Nil	Nil
Total.....		18 063	Nil	Nil	Nil

\* Projects in Turkish occupied area.

\*\* Some of the dams of the project are in Turkish occupied area.

TABLE X-8 - GOVERNMENT WATERWORKS - DATA ON MANAGEMENT AND OPERATION OF IRRIGATION PROJECTS FOR THE LAST TWO YEARS

Item No	Data	Unit	1984	1985	% change on 1984
1	Capacity .....	1000m <sup>3</sup>	90 094	120 894	+34.2
2	Water available .....	"	41 635	68 951	+65.6
3	Water utilized for irrigation .	"	23 270	27 137	+16.6
4	Water utilized for DWS .....	"	4 429	8 807	+98.8
5	Water utilized for recharge ...	"	3 199	3 758	+17.5
6	Total water used .....	"	30 898	39 702	+28.5
7	Evaporation losses .....	"	3 789	4 219	+11.3
8	Seepage losses .....	"	747	946	+26.6
9	Water sold .....	"	21 210	24 020	+13.2
10	Gross income .....		688 686	895 386	+30.0
11	Power cost .....		355 186	380 785	+ 7.2
12	Operation cost .....		212 831	150 216	-29.0
13	Maintenance cost .....		160 771	239 661	+49.0
14	Total expenses .....		728 788	770 662	+ 5.7
15	Net income .....		-40 102	121 724	-
16	Area irrigated .....	donums	50 055	51 100	+ 2.1
17	Area commanded .....	"	76 810	87 145	+13.4

The decrease of Operation Costs and the increase of Maintenance Costs are due to changes of the Accounting system.



TABLE X-9 - GOVERNMENT WATERWORKS - IRRIGATION PROJECTS - COST OF WATER

Ser No	Project	Water sold m <sup>3</sup>	Total water utilized m <sup>3</sup>	Operation & Maintenance cost £	Power cost £	Total annual cost £	Cost of water <sup>1</sup> sold water cent/m <sup>3</sup>	Cost of water <sup>1</sup> total utilized cent/m <sup>3</sup>
1	Argaka.....	885 736	1 310 789	10 073	3 907	13 980	1.6	1.1
2	Ayia Marina.....	289 356	289 356	6 343	-	6 343	2.2	2.2
3	Kalopanayiotis .....	241 383	241 383	3 852	-	3 852	1.6	1.6
4	Kiti.....	NIL	NIL	371	-	371	-	-
5	Pomos .....	875 200	875 200	12 744	3 058	15 802	1.8	1.8
6	Polemihia) .....	4 282 303	11 949 452	89 114	65 575	154 689	3.6	1.3
7	Yermasoyia) .....							
8	Paphos .....	16 247 026	16 247 026	242 909	293 356	536 265	3.3	3.3
9	Khrysokhou valley.....	460 091	460 091	13 150	14 889	28 039	6.1	6.1
10	Xyliatos.....	587 155	586 211	9 235	-	9 235	1.6	1.6
	Total.....	23 868 250	31 959 508	237 791	380 785	768 576	3.2	2.4

1 It does not include capital cost

TABLE X-10 - CONTRIBUTORY IRRIGATION WORKS - MAINTENANCE COSTS

Ser No	Project	Maintenance cost		Total cost £
		Govt Contrib. £	ID Contrib. £	
1	Palekchori dam .....	295	147	442
2	Pakhyammos dam (Special case) .	258	-	258
3	Prodromos dam .....	822	411	1 233
4	Pyrgos dam .....	531	265	796
5	Kalokhorio dam .....	78	39	117
6*	Lymbia dam .....	55	-	55
7	Kambos )			
8	Chakistra ) .....	14 192	-	14 192
9	Yerakies )			
	Total .....	<u>£16 231</u>	<u>£862</u>	<u>£17 093</u>

\* It operates like a government project

CONTRIBUTORY IRRIGATION WORKS OF THE PITSILIA PROJECT - MAINTENANCE DETAILS

1. Ayii Vavatsinias pond 1. Repairing of water meters and flow regulators. Cleaning of drainage channels, embankment and filters.
2. Ayii Vavatsinias pond 2. Cleaning of drainage channels and filters.
3. Melini pond. Cleaning of drainage channels, embankment and filters.
4. Ephtagonia pond 1. Repairing of the eroded embankment. Cleaning of drainage channels. Repairing of water meters.
5. Ephtagonia pond 2. Repairing of the eroded embankment and one water meter. Cleaning of drainage channels.
6. Ephtagonia pond 3. Repairing of the eroded embankment and water meters.
7. Akapnou-Ephtagonia pond. Repairing of the eroded embankment. Cleaning of drainage channels. Repairing of a breakage to main pipeline.
8. Ora pond. Cleaning of drainage channels and filters.
9. Arakapas pond 1. Repairing of main water meter and maintaining of flow regulators.
10. Arakapas pond 2. Cleaning of filters.



- 11 Dhieronon pond. Repairing of water meters and flow regulators. Cleaning and repairing of filters. Repairing and cleaning of main pipeline.
- 12 Kyperounda pond 2. Repairing of the eroded embankment. Cleaning of drainage channels and the access road. Repairing of sluice valves. Cleaning of filters. Repairing and maintaining of flow regulators.
- 13 Khandria pond. Cleaning of drainage channels. Repairing of the eroded part of the embankment. Repairing of water meters and flow regulators. Installation of new outlets. Repairings to damages.
- 14 Agriidhia pond. Repairing of the eroded part of the embankment. Cleaning of drainage channels and access road. Repairing of water meters and filters. Cleaning and repairing the diversion weir. Repairing of the domestic water supply pipeline.
- 15 Kato Mylos pond and BH No 66/76. Cleaning of drainage channels. Repairing of water meters and flow regulators. Repairing of the pump.
- 16 Pelendria pond and BH No 53/76.
- 17 Pharmakas pond 1. Cleaning of drainage channels.
- 18 Pharmakas pond 2. Cleaning of drainage channels. Repairing of the main pipeline. Maintaining of water meters.
- 19 Dhieronon BH No 14/82. Repairing of water meters. Repairing and maintaining of flow regulators. Replacement of outlets. Repairing of manholes.
- 20 Arakapas BH Nos 106/76 and 107/76. Repairing of the electrosubmersible pumps, flow regulators and water meters.
- 21 Arakapas BH No 124/76. Repairing of water meters and flow regulator.
- 22 Louvaras EH No 22/77. Repairing of flow regulators.
- 23 Ayios Konstantinos BH Nos 123/76 and 8/81. Repairing of flow regulators.
- 24 Kato Amiantos BH No 31/76. Experimental use of filters for cleaning from asbestos dust.

TABLE X-10a- CONTRIBUTORY IRRIGATIONS WORKS OF THE PITSILIA PROJECT  
MAINTENANCE COSTS

Ser No	Project	Maintenance cost		Total cost £
		Govt. Contrib. £	ID Contrib. £	
1	Ayii Vavatsinias pond 1 and dam ..	313	157	470
2	Ayii Vavatsinias pond 2 .....	33	17	50
3	Melini pond .....	147	73	220
4	Ephtagonia pond 1 .....	200	100	300
5	Ephtagonia pond 2 .....	220	110	330
6	Ephtagonia pond 3 .....	173	87	260
7	Akapnou-Ephtagonia pond .....	167	83	250

8	Ora Pond .....	120	60	180
9	Arakapas Pond 1 .....	40	20	60
10	Arakapas Pond 2 .....	80	40	120
11	Dhieronas Pond .....	240	120	360
12	Kyperounda Pond 2 .....	1087	543	1630
13	Khandria Pond .....	147	409	556
14	Agridhia Pond .....	580	290	870
15	Kato Mylos Pond and BH No 66/76 .....	113	57	170
16	Pelendria Pond and BH No 53/76 .....	+ 600	300	90
17	Pharmakas Pond 1 .....	+ 133	67	200
18	Pharmakas Pond 2 .....	147	73	220
19	Dhieronas BH No 14/82 .....	67	33	100
20	Arakapas BH Nos 106/76 and 107/76 .....	667	333	1000
21	Arakapas BH No 124/76 .....	67	33	100
22	Louvaras BH No 22/77 .....	67	33	100
23	Ayios Konstantinos BH Nos 123/76 & 8/81 .....	33	17	50
24	Kato Amiantos BH No 31/76 .....	+ 120	60	180
Total .....		£5561	£3115	£7866

CONTRIBUTORY IRRIGATION WORKS - MAINTENANCE DETAILS

- 1 Palekchori Dam. Cleaning and maintaining of "Maroullena" diversion weir. Repairings to pipelines, hydrants and main sluice valve. Replacement of main water meter. Painting of metal structures. Removing of avalanched rocks from the embankment.
- 2 Pakhyamos Dam. Painting of metal structures. Repairing of pipelines. Installation of main water meter and constructing of concrete manhole.
- 3 Prodromos Dam. Repairs to distribution system and replacing of sluice valves.
- 4 Pyrgos Dam. Cleaning of drainage manholes. Repairing of outlets. Cleaning of concrete channels and repairing of the joints. Repairing of the gate.
- 5 Kalokhorio Dam. Repairs to main axle and maintaining of penstock.
- 6 Lymbia Dam. Cleaning of canals.
- 7 Kambos. Repairing and replacing of air vessels. Carrying out various tests to locate the problem of stage II pumping. Removal and replacing of coupling. Replacing of propellers and difusers of the boosters.
- 8 Chakistra. Removal and replacement of a "dry run" system. Removal of stage II booster. Temporary installation of a "Grundfos" pump.

TABLE X-11 - GOVERNMENT WATERWORKS - RECHARGE WORKS - MAINTENANCE COSTS

Ser No	Project	Maintenance cost £
1	Sotira .....	
2	Paralimni Panayia .....	



3	Paralimni .....	
4	Ayia Napa .....	
5	Phrenaros .....	
6	Dherinia .....	
7	Avgorou .....	
8	Xylophaghou .....	
9	Akhna .....	
10	Xylymbou .....	
11	Paralimni Lake .....	
12	Vrysoulles .....	
13	Ormidhia .....	
14	Liopetri .....	
	Total .....	£2201

GOVERNMENT WATERWORKS - RECHARGE WORKS - MAINTENANCE DETAILS

South-Eastern Messaoria: Maintaining of outlet systems. Cleaning of Paralimni main canal and intake. Repairing of embankments.

DETAILS ON OPERATION AND MAINTENANCE OF GOVERNMENT IRRIGATION PROJECTS

ARGAKA PROJECT

The Argaka Irrigation Project consists of a dam reservoir of maximum capacity at spillway crest 0.990 MCM and a distribution system made of closed conduits commanding an area of 2,340 donums. Irrigation in the Project area started late in January and lasted until late in December 1985. An area of 1,638 donums was irrigated by utilizing about 1.311 MCM of water.

The area irrigated was planted with citrus, bananas, vines, deciduous, vegetables, cereals and avocados. Out of the 1.311 MCM of water utilized 885,736 m<sup>3</sup> were sold to the farmers at the nominal rates and an amount of 425,053 m<sup>3</sup> was taken from the overflow, free of charge. The gross income from the sale of water was £26,572. The expenditure of management was £6,038 the power £3,907 and that of maintenance amounted to £4,035. Net income to the Project was £12,592.

Project Hydrology

The project hydrologic data, as recorded during the year, are tabulated on Table X-12. The dam reservoir was filled to spillway crest on January 24th and overflow continued until May 10th 1985. The overspilled quantity could not be measured. The minimum level of water in storage ever reached was in October with total quantity in storage around 37,500 m<sup>3</sup>.

TABLE X-12 - ARGAKA DAM - HYDROLOGY FOR 1985

Item No	Description	Quantity m <sup>3</sup>	% Storage capacity
1	Intitial amount in storage .....	372 680	37.6
2	Inflow-Seepage-Overflow .....	1 186 587	119.8

3	Total release .....	1 248 084	126.1
4	Leakages .....	4 139	0.4
5	Evaporation .....	83 601	8.4
6	Overflow .....	not measured	-
7	Final amount in storage .....	279 600	28.2
8	Minimum quantity in storage (Oct.).....	37 500	3.8
9	Storage capacity .....	990 000	100.0

Water Utilization and Crops Irrigated

The project is built for irrigation purposes and as such, a quantity of 1,310,789 m<sup>3</sup> of water was utilized for the irrigation of 1,638 donums of land planted with various crops as indicated in Table X-14.

Table X-13 shows the utilization of the project water and Table X-14 shows the crops irrigated.

TABLE X-13 - ARGAKA DAM - WATER UTILIZATION

Item No	Description	Quantity m <sup>3</sup>	% Storage capacity
1	Water used for irrigation from dam .....	1 156 895	116.9
2	Water used for irrigation from boreholes	153 894	15.5
3	Water used for recharge .....	NIL	NIL
4	Total water utilized .....	1 310 789	132.4

TABLE X-14 - ARGAKA DAM - CROPS IRRIGATED

Ser No	Crop	Area Donums
1	Citrus .....	720
2	Bananas .....	380
3	Vines .....	30
4	Deciduous .....	130
5	Vegetables .....	130
6	Avocados.....	16
7	Cereals .....	150
8	Other .....	82
Total .....		1 638

Water Sale, Income, Operation and Maintenance Costs

The total quantity utilized for irrigation, water released from the dam reservoir, water pumped from the boreholes and water taken from the overflow, amounted to 1,310,789 m<sup>3</sup>. Out of this a quantity of 885,736 m<sup>3</sup> was sold to the farmers at the nominal rates and the rest 425,053 m<sup>3</sup> was given free of charge because it was taken from the overflow. From the sale of water a total of £26,572 was collected. For the operation of the project an amount of £6,038 was paid to the watermen and bill collectors, where for the maintenance of the project another £4,035 was spent and for the power £3,907. The net income for the benefit of the project was £12,592. All the data concerning water sale, operation and maintenance costs are shown in table IX-15.



### Maintenance Details

The maintenance works carried out during the year 1985 were the following:

- Cleaning of embankment from wild vegetation .
- Painting of manhole metal covers and gate valves.
- Cleaning of a nearby stream.
- Repairing of float valve of the breakpressure tank.
- Cleaning the tank.
- Replacement of sluice valves.
- Repairing and replacement of watermeters.
- Repairings of pipeline.

TABLE X-15 - ARGAKA DAM - INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m <sup>3</sup>	Amount £
1	Water sold at nominal rates .....	885 736	26 572
2	Water sold at reduced rates .....	NIL	NIL
3	Water given free of charge* .....	425 053	NIL
4	Total quantity utilized and gross income .....	1 310 789	26 572
5	Operation cost .....	-	6 038
6	Power cost .....	-	3 907
7	Maintenance cost .....	-	4 035
8	Net income ..	-	12 592

\* This quantity was taken from the overflow

### Project performance for the last two years

Table X-16 shows the performance of the project for the last two years. As shown there was a small increase in the total volume of water used for irrigation and a small decrease in the area irrigated. The net income to the project was increased 69.7%.

TABLE X-16 - ARGAKA DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1984	1985	% Change on 1984
1	Capacity .....	1000 m <sup>3</sup>	990	990	NIL
2	Water available in storage .....	"	1 555	1 480	- 4.8
3	Water utilized for irrigation...	"	1 288	1 311	+ 1.8
4	Water sold .....	"	902	886	- 1.8
5	Water given free .....	"	386	425	+10.1
6	Water used for recharge .....	"	NIL	NIL	NIL
7	Gross income .....		22 536	26 572	+17.9
8	Operation cost and Power cost ..		11 927	9 945	-20.8
9	Maintenance cost .....		3 191	4 035	+26.4
10	Total expenses .....		15 118	13 980	+ 7.5
11	Net income .....		7 418	12 592	+69.7
12	Area irrigated .....	donums	1 649	1 638	- 0.7

## AYIA MARINA PROJECT

The Ayia Marina Irrigation Project consists of a dam reservoir of capacity at spillway crest of 0.300 MCM and a distribution system commanding an area of 1,500 donums. The distribution system consists of a main conduit at the terminal of which tertiary pipes branch-off to distribute water to each individual plot. Irrigation in the project area started early in January 1985 and continued throughout the year until late in December. An area of 302 donums was irrigated by utilizing about 0.289 MCM. The area irrigated was planted mainly with citrus, bananas, and vegetables. The water utilized was sold to farmers at the approved rates. The total gross income from the sale of water amounted to £8,320. The expenditure for the operation was £5,146 and that for maintenance £1,197. Net income to the project was £1,977.

### Project Hydrology

The project hydrologic data as recorded during the year, are tabulated on Table X-17.

The dam was filled up to the spillway crest on March the 21st and overflow continued until April the 19th 1986. Minimum quantity of water ever stored during the year under review, was 44,740 m<sup>3</sup> and this occurred in November 1985.

TABLE X-17 - AYIA MARINA DAM - HYDROLOGY FOR 1985

Item No	Description	Quantity m <sup>3</sup>	% Storage capacity
1	Initial amount in storage .....	46 350	15.4
2	Inflow - Seepage .....	383 449	127.8
3	Total release .....	309 055	103.0
4	Leakages .....	31 537	10.5
5	Evaporation .....	27 230	9.1
6	Overflow .....	NIL	NIL
7	Final amount in storage .....	61 010	20.3
8	Minimum quantity in storage (Nov.) ...	44 740	14.9
9	Storage capacity .....	300 000	100.0

TABLE X-18 - AYIA MARINA DAM - WATER UTILIZATION

Item No	Description	Quantity m <sup>3</sup>	% Storage capacity
1	Water used for irrigation .....	289 356	96.4
2	Water used for recharge .....	NIL	NIL
3	Total water utilized .....	289 356	96.4

### Water Utilization and Crops Irrigated

During the year under review, a total quantity of 289,356 m<sup>3</sup> of water was utilized for the irrigation of approximately 302 donums planted with various crops. Details about the water utilization and the crops irrigated and their extent are shown in Tables X-19 and X-20.



### Water Sale, Income, Operation and Maintenance Costs

From the sale of 289,356 m<sup>3</sup> of water, the gross income to the project, amounted to £8,320. Management and operation expenses being the wages of the water man and that of the dam attendant, amounted to £4,920 Maintenance cost of the dam and the distribution system was £1,423 The net income to the project was £1,977. Details regarding sale of water, income and costs are given in Table X-20.

### Maintenance Details

The maintenance works carried out during 1985 were the following:

- Cleaning of the embankment from wild vegetation and removing of driftwood from the reservoir.
- Cleaning of monument points and drainage ditch channels.
- Repairing and maintenance of the windows and the floor of the guardhouse.
- Repairing of the plumbing installation.
- Repairing and replacement of sluice valves.
- Maintenance of float valve and water meters.
- Painting of manhole covers.

TABLE X-19 - AYIA MARINA DAM - CROPS IRRIGATED

Ser No	Crop	Area donums
1	Citrus .....	126
2	Bananas .....	35
3	Vegetables .....	120
4	Vines .....	3
5	Avocados.....	6
6	Other .....	12
	Total .....	302

TABLE X-20 - AYIA MARINA DAM - INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m <sup>3</sup>	Amount £
1	Water sold at nominal rates .....	289 356	8 320
2	Water sold at reduced rates .....	NIL	NIL
3	Water given free of charge .....	NIL	NIL
4	Total quantity utilized and gross income .....	289 356	8 320
5	Operation cost .....	-	5 146
6	Maintenance cost .....	-	1 197
7	Net income .....	-	1 977

### Project Operation Data for the last two years

Table X-21 shows data on the operation of the project for the last two years. The water utilization was decreased by 6.5% where the net income by 16.1%. The total expenditure was increased by 15.2%. The area under irrigation was increased by 21.8%.

TABLE X-21 - AYIA MARINA DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1984	1985	% Change on 1984
1	Capacity .....	1000 m <sup>3</sup>	300	300	NIL
2	Water available in storage ....	"	354	371	+ 4.8
3	Water utilized for irrigation .	"	309	289	- 6.5
4	Water sold .....	"	309	289	- 6.5
5	Water given free .....	"	NIL	NIL	NIL
6	Water used for recharge .....	"	NIL	NIL	NIL
7	Gross income .....	£	7 720	8 320	+ 7.8
8	Operation cost .....	£	4 068	4 920	+20.9
9	Maintenance cost .....	£	1 296	1 423	+9.8
10	Total expenses .....	£	5 364	6 343	+15.2
11	Net income .....	£	2 356	1 977	-16.7
12	Area irrigated .....	donums	248	302	+21.8

KALOPANAYIOTIS PROJECT

The Kalopanayiotis irrigation project consists of a dam reservoir of capacity 363,000 m<sup>3</sup> and a distribution system of closed conduits commanding an area of approximately 435 donums. During 1985 the area commanded was increased to 485. Irrigation in the project area, started in May 1985 and continued throughout the year until the end of October 1985. During this period, a total quantity of 241,383 m<sup>3</sup> of water was used for the irrigation of an area of approx. 450 donums planted mainly with deciduous, citrus and olive trees. The water was sold to the farmers at a fixed rate of 3.5 cent/m<sup>3</sup>. The gross income was £8,448. The operation expenses were £2,552 while the maintenance cost spent on routine works and emergency repairs, was £1,300. The project accounts presented a profit of £4,596.

Project Hydrology

The project hydrologic data, as recorded during the year under review, are tabulated in Table X-22. The dam scouring gate was opened on the 11th of January and closed on the 20th of March. Overflow over the spillway crest occurred during the period 1st April to 10th June, 1985. The smallest quantity ever remained in the reservoir during the irrigation season, was 4,800 m<sup>3</sup> and occurred in September, 1985.

TABLE X-22 - KALOPANAYIOTIS DAM - HYDROLOGY FOR 1985

Item No	Description	Quantity m <sup>3</sup>	% Storage capacity
1	Initial amount in storage .....	282 000	77.7
2	Inflow - Seepage .....	506 065	139.4
3	Total release .....	241 383	73.1
4	Leakages .....	150 000*	41.3
5	Evaporation .....	31 102	8.6
6	Overflow .....	139 967	36.9
7	Final amount in storage .....	132 300	36.4
8	Minimum quantity in storage (Sept).....	4 800	1.3
9	Storage capacity .....	363 000	100.0

\* Roughly estimated



TABLE X-23 - KALOPANAYIOTIS DAM - WATER UTILIZATION

Item No	Description	Quantity m <sup>3</sup>	%Storage Capacity
1	Water used for irrigation .....	241 383	66.5
2	Water allotted to Fishery Department and reutilized for irrigation.....	200 000	55.1
3	Total water utilized.....	241 383	66.5

Water Utilization

During the year under review, a total quantity of 241 383 m<sup>3</sup> of water was utilized for the irrigation of 450 donums planted mainly with citrus, olives and deciduous, (See Table X-23 for water utilization).

Water Sale, Income, Operation and Maintenance Costs and Details

For the sale of the water the gross income during the year under review, was £8 448. Operation expenses, including attendant and waterman wages and travelling costs, amounted to £2 552. Maintenance expenses were £ 1 300. The maintenance works carried out on the project were the following: Repairs to breakages of the Break Pressure Tank No.1. Replacement of the 6" main pipeline in the gallery with a 12" pipeline. The net income to the project was £4 596. Details on these are shown on Tables X-25 and X-26.

TABLE X-24 - KALOPANAYIOTIS DAM - CROPS IRRIGATED

Ser No	Crop	Area Donums
1	Citrus	150
2	Olive trees	4
3	Deciduous	296
Total		450

TABLE X-25 - KALOPANAYIOTIS DAM - INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m <sup>3</sup>	Amount £
1	Water sold at nominal rates....	241 383	8 448
2	Water sold at reduced rates....	Nil	Nil
3	Water given free.....	Nil	-
4	Total quantity utilized and gross income.....	241 383	8 448
5	Operation cost.....	-	2 552
6	Maintenance cost.....	-	1 300
7	Net income.....	-	4 596

TABLE X - 26 - KALOPANAYIOTIS DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1984	1985	% Change on 1984
1	Capacity.....	1000m <sup>3</sup>	363	363	Nil
2	Water available in storage.....	"	550	467	-15.0
3	Water utilized for irrigation...	"	261	241	- 7.7
4	Water sold.....	"	261	241	- 7.7
5	Water given free .....	"	Nil	Nil	Nil
6	Water used for recharge.....	"	Nil	Nil	Nil
7	Gross income .....	£	7 825	8 448	+ 8.0
8	Operation cost.....	£	2 743	2 552	- 7.0
9	Maintenance cost .....	£	898	1 300	+44.8
10	Total expenses.....	£	3 641	3 852	+ 5.8
11	Net income .....	£	1 405	4 596	+227.1
12	Area irrigated .....	donums	450	450	Nil

Project Operation Data for the last two years

Table X-26 shows the operation data for the last two years. The amount of water utilized for irrigation, was decreased by 7.7% and the area irrigated was remained.

The operational costs were down by 7.0% whereas the maintenance costs were up by 44.8%. The net income showed a tremendous increase because the water rates were increased to 3.5 cent/m<sup>3</sup>. The water utilization in the project area seems satisfactory although further increase of the quantity utilized is expected.

KITI DAM

The Kiti dam irrigation project consists of a dam reservoir of storage capacity 1,610,000 m<sup>3</sup> and a distribution system, made of open canals commanding an area of approximately 6,200 donums in the Kiti, Perivolia and Tersephanou villages. For the year under review the dam was dry. An amount of £371 was spent for the cleaning of the canals.

LEFKARA DAM

The Lefkara dam project is a dual purpose project, mainly for the supply of Domestic Water to Famagusta town and partly for the irrigation for agricultural land downstream of the dam. The dam consists of (a) a dam reservoir whose capacity is 13.85 MCM, (b) a distribution system (piped) for the supply of irrigation water to an area of approximately 615 donums, (c) a feeder pipeline, (d) a domestic water treatment plant near Khirokitia and (f) a pipeline to Famagusta town.

As a result of the Turkish invasion and the occupation of the Famagusta town, the reserved water for Famagusta has been utilized to supply water to the Larnaca and Famagusta towns, other villages and refugee camps en route to Famagusta, whose population has been greatly increased or created accordingly from the refugees who were expelled from their villages and town by the occupation army.



This part of the report will deal only with the dam reservoir and water utilization for irrigation and water supply in general, where details, regarding domestic water supply will be given in the section dealing with domestic water supply.

From the sale of irrigation water, the income amounts to £3,185. Maintenance works were carried out at a total cost of £1,311.

### Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in Table X-27.

The water in the dam reservoir did not reach spillway crest but it remained much lower, with maximum quantity in storage around 2,020,000 m<sup>3</sup> or 14.6% of the total capacity, in April. The average inflow - Seepage to the dam reservoir during the year was estimated at 2,656,185 m<sup>3</sup>. The minimum water level reached, occurred in December with minimum quantity in storage estimated at 658,000 m<sup>3</sup>.

TABLE X-27 - LEFKARA DAM - HYDROLOGY FOR 1985

Item No	Description	Quantity m <sup>3</sup>	% Storage capacity
1	Initial amount in storage .....	401 000	2.9
2	Inflow - Seepage .....	2 656 185	19.2
3	Total release .....	2 098 479	15.1
4	Leakages .....	17 409	0.12
5	Evaporation .....	237 307	1.7
6	Overflow .....	NIL	NIL
7	Final amount in storage .....	697 000	5.0
8	Minimum quantity in storage (Dec.)	658 000	4.8
9	Storage capacity .....	13 850 000	100.00

### Water Utilization

As stated above the project was constructed mainly for the supply of domestic water and to a less extent to provide irrigation water for an area of 615 donums downstream the dam structure. The water utilization for the two main categories of use is shown on Table X-28.

### Crops Irrigated

The distribution system of the Lefkara irrigation project is still under construction. However, there has been a relatively small agricultural activity in the area and during the year under review, a total of 170 donums of land has been irrigated by using 91,011 m<sup>3</sup> of water. The area was planted with citrus, vegetables and olive trees as shown on Table X-29.

TABLE X-28 - LEFKARA DAM - WATER UTILIZATION

Item No	Description	Quantity m <sup>3</sup>	% Storage capacity
1	Water used for domestic water supply .....	1 835 333	13.2

2	Water used for irrigation .....	91 011	0.6
3	Total water utilized .....	1 926 344	13.8

TABLE X-29 - LEFKARA DAM - IRRIGATED CROPS

Ser No	Crop	Area Donums
1	Citrus .....	130
2	Vergetables .....	30
3	Olive trees .....	10
	Total .....	170

Water Sale, Income, Maintenance Costs and Details

The water was sold either for irrigation or domestic use at the fixed rates. Details on water sale for domestic purposes are given in the section on Domestic Water Supply. The irrigation water was sold at 3.5 cent/m<sup>3</sup> and the income from the sale of irrigation water amounted to £3,180. The maintenance works were carried out at a cost of £1,311.

The following works were carried out during 1985:

- Painting of metal structures in both galleries
- Cleaning the embankment of the dam from wild vegetation.
- Repairings of breakages to main and secondary pipelines.
- Replacement of sluice valve and a water meter.
- Maintenance of distribution system.
- Painting of metal structures in the gallery.
- Repairing of water meters.
- Removal of avalanched rocks from dam crest.
- Internal repairs to the guardhouse.

Project Operation Data for the Last Two Years

From the table it is shown that the area irrigated was increased by 30.8% and that resulted to an increase of the water used for irrigation by 37.9%. The water used for domestic water supply was increased by 8.5%.

TABLE X-30 - LEFKARA DAM - PROJECT OPERATION DATA FOR THE LAST TWO YEARS

Ser No	Description	Unit	1984	1985	% Change on 1984
1	Capacity .....	1000 m <sup>3</sup>	13 850	13 850	NIL
2	Water available .....	"	2 088	2 802	+34.2
3	Water utilized for irrigation .....	"	66	91	+37.9
4	Water utilized for domestic WS .....	"	1 691	1 835	+ 8.5
5	Total water utilized .....	"	1 757	1 926	+ 9.6
6	Inflow - Seepage .....	"	1 893	2 656	+40.3
7	Area irrigated .....	donums	130	170	+30.8



## POMOS PROJECT

The Pomos irrigation project consists of a dam reservoir of maximum capacity at spillway crest of 860,000 m<sup>3</sup> of water and a distribution system made of a main canal and closed type distribution system commanding an area of 2,850 donums.

Irrigation in the project area started early in March 1985 and continued throughout the year until early in November 1985.

An area of 939 donums of land planted with citrus, bananas and vegetables was irrigated by utilizing 875,200 m<sup>3</sup> of water. From the total water utilized, 677,400 m<sup>3</sup> were taken directly from the dam reservoir, 91,450 m<sup>3</sup> were taken from the overflow and the rest 106,350 m<sup>3</sup> were pumped from the boreholes.

The total gross income from the sale of water amounted to £23,970. The expenditure for the maintenance was £2,560, whereas, the power cost was £3,058 and the operation and management costs were £10,184. Net income to the project for the year under review was £8,168.

### Project Hydrology

The project hydrologic data as recorded during the year are tabulated on table X-31.

The reservoir was filled to spillway crest and overflow occurred during the period February the 4th to April the 23rd 1985. Minimum water level in the reservoir occurred in November with water in storage around 72,720 m<sup>3</sup>.

TABLE X-31 - POMOS DAM - HYDROLOGY FOR 1985

Item No	Description	Quantity m <sup>3</sup>	% Storage capacity
1	Initial amount in storage .....	153 530	17.8
2	Inflow-Seepage-Overflow .....	1 076 846	125.2
3	Total release .....	886 875	103.1
4	Leakages .....	110 868	12.9
5	Evaporation .....	67 476	7.8
6	Overflow .....	not measured	-
7	Final amount in storage .....	178 500	20.8
8	Minimum quantity in storage (Nov.) ...	72 720	8.5
9	Storage capacity .....	860 000	100.00

### Water Utilization and Crops Irrigated

The 875,200 m<sup>3</sup> of water were utilized for the irrigation of 939 donums within the project area. Details about the water utilized and the crops irrigated are shown on Tables X-32 and X-33.

TABLE X-32 - POMOS DAM - WATER UTILIZATION

Item No	Description	Quantity m <sup>3</sup>
1	Water used for irrigation from dam ..	768 850
2	Water used for irrigation from boreholes .....	106 350
3	Water used for recharge .....	NIL
4	Total water utilized .....	875 200

TABLE X-33 - POMOS DAM - CROPS IRRIGATED

Item No	Crop	Area donums
1	Citrus .....	544
2	Bananas .....	232
3	Deciduous .....	8
4	Vegetables .....	67
5	Cereals .....	35
6	Avocados .....	14
7	Olive trees .....	24
8	Other .....	15
		939

Water Sale, Income, Operation and Maintenance Costs

The total quantity utilized for irrigation, water released from the dam reservoir, water pumped from the boreholes and water taken from the overflow amounted to 875,200 m<sup>3</sup>. Out of this 783,750 m<sup>3</sup> were sold at the nominal rates and the rest 91,450 m<sup>3</sup> were sold at reduced rates because that quantity was taken from the overflow.

From the sale of water (see details on Table X-34) the total gross income amounted to £23,970 whereas the operation and management costs were £13,242. Maintenance works on the dam and the distribution system were £2,560. The net income to the project for the year under review amounted to £8,168.

Maintenance Details

The maintenance works carried out during the year 1985 were the following:

- Cleaning of emankment from wild vegetation.
- Removing of driftwood from the reservoir.
- Painting of metal structures
- Repairing of windows and floor of the guard house
- Replacement of sluice valves.
- Cleaning of canals and repairing of joints.
- Repairing of galvanized iron pipelines.



TABLE X-34 - POMOS DAM - INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m <sup>3</sup>	Amount £
1	Water sold at nominal rates .....	783 750	23 513
2	Water sold at reduced rates .....	91 450*	457
3	Water given free of charge .....	NIL	NIL
4	Total quantity utilized and gross income .....	875 200	23 970
5	Operation cost .....	-	10 184
6	Power cost .....	-	3 058
7	Maintenance cost .....	-	2 560
8	Net Income .....	-	8 168

\* This quantity was taken from the overflow.

Project Performance Data for the Last Two Years

Table X-35 shows data regarding hydrology, water utilization, water sales, gross income, operation, maintenance costs, net income and areas irrigated for the last two years.

The last column of the table shows the change in percentages of the quantities of 1985 over the previous year.

The quantity of water utilized for irrigation and the irrigated were slightly decreased while the gross income was significantly increased due to the increase of the water rates.

The operation and maintenance expenses were decreased while the net income was increased enough.

TABLE X-35 - POMOS DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1984	1985	% Change on 1984
1	Capacity .....	1000 m <sup>3</sup>	860	860	NIL
2	Water available in storage ..	"	1 040	1 052	+ 1.2
3	Water utilized for irrigation	"	888	875	- 1.5
4	Water sold .....	"	888	875	- 1.5
5	Water given free .....	"	NIL	NIL	NIL
6	Water used for recharge .....	"	NIL	NIL	NIL
7	Gross income .....	£	20 428	23 970	+17.3
8	Operation and power cost ....	£	13 344	13 242	- 0.8
9	Maintenance cost .....	£	3 214	2 560	-20.0
10	Total expenses .....	£	16 558	15 802	- 4.6
11	Net income .....	£	3 870	8 168	+111.0
12	Area irrigated .....	donums	942	939	- 0.3

YERMASOYIA-POLEMIDHIA PROJECT

The Yermasoyia-Polemidhia Irrigation Project consists of the Yermasoyia dam, the reservoir of which has a capacity of 13.5 MCM and the Polemidhia dam with reservoir capacity in the order of 3.43 MCM. The distribution system of the project consists of closed conduits now commanding an area of about 15,440 donums.

The water in the dam reservoir did not reach spillway crest but it remained much lower with maximum quantity in storage for Yermasoyia dam 11,867,000 m<sup>3</sup> and for Polemidhia dam 1,942,000 m<sup>3</sup>.

For facing the drought of the year under review the boreholes of the "Kouris Delta Emergency Scheme" were set in operation in the period May–November 1985. During 1985 from May to November, a quantity of 2,143,517 m<sup>3</sup> of water was pumped. The pumped water was diverted, into the distribution system of the Yermasoyia–Polemidhia project. A quantity of 1,793,907 m<sup>3</sup> was used for irrigation of an area of the Yermasoyia–Polemidhia project, and the rest 349,610 m<sup>3</sup> were used for recharge of the Yermasoyia aquifer.

A total quantity of 11,949,452 m<sup>3</sup> was released from dams and pumped from the boreholes of the "Kouris Delta Emergency Scheme" (8,799,153 m<sup>3</sup> from Yermasoyia, 1,006,782 m<sup>3</sup> from Polemidhia and 2,143,517 m<sup>3</sup> from boreholes). Out of 11,949,452 m<sup>3</sup>, 5,159,694 m<sup>3</sup>, were used for irrigation. 3,757,870 m<sup>3</sup> for recharge and 3,031,888 m<sup>3</sup> for Domestic Water Supply.

Irrigation in the project area started early in January and continued throughout the year until/late in December 1985. The quantity of 5,159,694 m<sup>3</sup> was used for irrigation of 15,440 donums (partial or full) in the Zakaki, Phasouri, Akrounda, Phinikaria areas and Yermasoyia and Polemidhia Irrigation Divisions. Of the quantity used for irrigation a quantity of 877,391 m<sup>3</sup> were given free of charge as water rights to the Yermasoyia and Polemidhia Irrigation Divisions (656,963 m<sup>3</sup> for Yermasoyia ID and 220,428 m<sup>3</sup> for Kato Polemidhia ID). The rest 4,282,303 m<sup>3</sup> were sold at the nominal rates of 3.0 and 3.5 cent/m<sup>3</sup>.

The quantity released and pumped for recharge (3,757,870 m<sup>3</sup>) was used for recharge of the Yermasoyia and Garyllis aquifers downstream the dams structures. These aquifers are pumped for the supply of water for domestic use for the Limassol town, the Moutayiaka regional water supply scheme and for irrigation in the Zakaki area.

The total gross income from the sale of water amounted to £144,784. The operating costs amounted to £68,463 and the power expenses to £65,575. The maintenance works carried out by the WDD were of the order of £19,872. Net income to the project was £49,125 loss. The above costs include also the operation, power and maintenance expenses of the "Kouris Delta Emergency Scheme".

### Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in the following tables. The data for each dam reservoir are given separately.

#### POLEMIDHIA DAM

The Inflow–Seepage to the Polemidhia dam during the year under review totalled 2,234,249 m<sup>3</sup> representing 26.3% of the reservoir capacity. The reservoir was not filled to spillway crest but it remained much lower with maximum quantity in storage around 1,942,000 m<sup>3</sup> on the 9th April 1985. Leakages occurred through the dam and part of these were intercepted downstream for irrigation purposes. Releases from the dam reservoir were 1,006,782 m<sup>3</sup>.



TABLE X-36 - POLEMIDHIA DAM-HYDROLOGY FOR 1985

Item No	Description	Qty m <sup>3</sup>	% Storage capacity
1	Initial amount in storage .....	435 000	12.7
2	Inflow-Seepage .....	2 234 249*	26.3
3	Total release .....	1 006 782*	
4	Leakages .....	456 286	13.3
5	Evaporation .....	204 181	6.0
6	Overflow .....	NIL	NIL
7	Final amount in storage .....	612 000	17.8
8	Minimum quantity in storage (Dec.)...	556 000	16.2
9	Storage capacity .....	3 430 000	100.0

\* Roughly estimated

YERMASOYIA DAM

The Inflow-Seepage to the dam during the year under review was estimated at 11.931 MCM mostly occurring in the months of January to May and in December. The dam reservoir was not filled up the spillway crest but it remained much lower with maximum quantity in storage around 11.867 MCM on the 26th April 1985.

TABLE X-37 - YERMASOYIA DAM-HYDROLOGY FOR 1985

Item No	Description	Qty m <sup>3</sup>	% Storage capacity
1	Initial amount in storage .....	3 060 000	22.7
2	Inflow-Seepage .....	11 930 919	88.4
3	Total release .....	8 799 153	65.2
4	Leakages .....	20 000*	0.1
5	Evaporation .....	1 113 782	8.2
6	Overflow .....	NIL	NIL
7	Final amount in storage .....	5 044 000	37.4
8	Minimum quantity in storage (Dec.)..	4 472 000	33.1
9	Storage capacity .....	13 500 000	100.0

\* Roughly estimated

Water Utilization from both Dams

Details regarding water utilization from both dams separately and in combine are shown on Tables X-38, X-39 and X-41. In summary during the year under review a total quantity of 8,917,564 m<sup>3</sup> of water was utilized for irrigation and recharge purposes. Out of this quantity 5,159,694 m<sup>3</sup> were utilized for the irrigation (fully or in part) of 15,440 donums as indicated in Table X-40. This quantity includes the releases for irrigation from both dams and the water pumped from the boreholes of the Kouris Delta Emergency Scheme. The rest 3,757,870 m<sup>3</sup> was utilized to recharge the Garyllis and Yermasoyia aquifers.

TABLE X-38 - POLEMIDHIA DAM - WATER UTILIZATION

Item No	Description	Qty m <sup>3</sup>	% Storage capacity
1	Water used for irrigation .....	1 006 782*	29.4
2	Water used for recharge .....	NIL	NIL
3	Total water utilized .....	1 006 782	29.4

\* Roughly estimated because the water meter was out of order during the year under review.

TABLE X-39 - YERMASOYIA DAM-WATER UTILIZATION

Item No	Description	Qty m <sup>3</sup>	% Storage capacity
1	Water used for irrigation .....	2 359 005	17.5
2	Water used for recharge .....	3 408 260	25.2
3	Water used for D W S .....	3 031 888	22.5
4	Total water utilized .....	8 799 153	65.2

TABLE X-40 - YERMASOYIA-POLEMIDHIA PROJECT - IRRIGATED CROPS

Ser No	Crop	Area donums
1	Citrus .....	7 256
2	Vines .....	3 856
3	Deciduous .....	130
4	Vegetables .....	4 178
5	Olive trees .....	20
	Total .....	15 440

TABLE X-41 - YERMAOSYIA POLEMIDHIA PROJECT - WATER UTILIZATION

Ser No	Description	Qty m <sup>3</sup>
1	Water used for irrigation (Y & P & Kouris Delta boreholes) .....	5 159 694
2	Water used for recharge (Yermasoyia Dam & Kouris Delta boreholes) .....	3 757 870
3	Water used for DWS .....	3 031 888
4	Total water utilized .....	11 949 452

From the sale of water the total gross income was £144,784. The operation cost totalled £68,463 and the power cost totalled £65,575 where the maintenance cost spent on routine works was £20,651. Details regarding income and expenditure are shown on Table X-42.



## Water Sale, Income, Operation and Maintenance Costs and Details

Details about the quantity sold at the nominal rates, water given free of charge as water rights, are given in table X-42. For the operation of the project an amount of £68,463 was spent. For the maintenance of both dams, the distribution system and the boreholes £20,651 was spent for the following works:

### Distribution system

Repairings of pipelines. Repairings of water meters, sluice valves, flow regulators and float valves. Maintaining of water meters. Cleaning of manholes. Painting of metal structures.

### Kouris Delta boreholes

Inspection of pumping units. Repairing of the exhaust of the engine of one pump. Replacement of the water cooling tank of the engine of one pump.

### Yermasoyia dam

Repairs to guard house cleaning of embankment from wild vegetation. Cleaning of break pressure tank from drift wood.

### Polemidhia dam

Repairs to guard house. Cleaning of embankment from wild vegetation. Inspection of penstock and drive winch.

## Project Operation Data for the last two Years

Table X-43 gives details regarding the operation for the last two years. The last column shows the fluctuations of the various data of the Project Operation. For the year under review the boreholes of the "Kouris Delta Emergency Scheme" were put in operation so the expenses were tremendously increased. The quantity of water sold was increased and the loss to the project was decreased significantly.

TABLE X-42 - YERMASOYIA-POLEMIDHIA PROJECT - INCOME AND EXPENDITURE DATA

Ser No	Description	Qty m <sup>3</sup>	Amount £
1	Water sold at nominal rates .....	4 282 303	144 784
2	Water sold at reduced rates .....	NIL	NIL
3	Water given free of charge as water rights to:		
	- Yermasoyia Irrig. Division .....	656 963	NIL
	- Polemidhia Irrig. Division .....	220 428	NIL
4	Total quantity/income .....	5 159 694	144 784
5	Operation cost .....	-	68 463
6	Power cost .....	-	65 575
7	Maintenance cost (Yermasoyia & Polemidhia & Kouris Delta Boreholes) .....	-	20 651
8	Total cost .....	-	154 689
9	Net income .....	-	-9 905

TABLE X-43 - YERMASOYIA-POLEMIDHIA PROJECT - DATA ON PROJECT FOR THE LAST TWO YEARS

Ser No	Description	Unit	1984	1985	% Change on 1984
1	Capacity .....	1000 m <sup>3</sup>	16 930	16 930	NIL
2	Water available (Y & P & KDES)...	"	13 507	18 009	+33.3
3	Water utilized for irrigation ...	"	3 969	5 159	+30.0
4	Water sold .....	"	3 554	4 282	+20.5
5	Water given free .....	"	415	877	+111.3
6	Water used for recharge .....	"	3 199	3 758	+17.5
7	Water used for DWS .....	"	2 737	3 032	+10.8
8	Total quantity used .....	"	9 905	11 949	+20.6
9	Gross income .....	£	103 870	144 784	+39.4
10	Operation cost .....	£	69 985	68 463	-2.2
11	Power cost .....	£	60 471	65 575	+8.4
12	Maintenance cost .....	£	20 529	20 651	+0.59
13	Total expenditure .....	£	150 985	154 689	+2.8
14	Net income .....	£	-47 115	-9 905	-
15	Area irrigated .....	donums	15 440	15 440	NIL

PAPHOS IRRIGATION PROJECT

The Paphos Irrigation Project is the largest and most important project of its kind ever undertaken in Cyprus. Construction of the civil works commenced in 1976 and they were completed by the end of 1983. The project consists of the Asprokremmos dam of maximum capacity at spillway crest of 51.00MCM, Mavrokolymbos dam of max. cap. 2,180MCM and a wellfield (24 nos boreholes) all sources of total annual safe yield of 32.00 MCM with a reliability of supply well above 92%. The project area is a coastal strip some 38 km long by 3 to 4 km wide with the town of Paphos at its centre. The total area commanded by the project is 35,000 donums. The distribution system is made of canals and pipes and it is the first project on the island to operate on the "on demand" mode. The water quantity used was taken from the Asprokremmos dam, the boreholes, the diversion from the Dhiarizos and Ezouza rivers and the Mavrokolybos dam.

Irrigation in the project area started in January 1985 and was completed late in December 1985. During this period a quantity of 16.223 MCM of water was utilized for the irrigation of 25,615 donums of land, planted with various crops. Another 24,475 m<sup>3</sup> was given for industrial purposes. In brief the water was utilized as shown on Table X-47. The crops irrigated were citrus, vegetables etc. as shown on Table X-48.

The operation and maintenance of the project is the responsibility of the WDD. From the sale of water at the nominal rates the income for 1985 is around £641,293. The operation expenses amounted to £48,470 whereas the maintenance expenses amounted to £194,439 and the power cost to £293,356. The total annual cost amounted to £536,265. The net income to the project was £105,026.

The hydroelectric power plant was tested in July 1984 and during 1985 from June to August a total of 635,300 KWH of energy was generated. The energy was imported into the system of Electricity Authority of Cyprus. The income from the sale of the energy amounted to £13,192. For the production of the energy an amount of 4,159,500m<sup>3</sup> of water was used.

Project Hydrology & Water Resources

The water in the Asprokremmos dam did not reach spillway crest but it remained lower with maximum quantity in storage around 28.968 MCM on the 26th April 1985. The quantity of water of the order of 18.512 MCM was taken from the Asprokremmos dam, the boreholes, the river diversion and the Mavrokolymbos dam as shown on Table X-44



TABLE X-44 - PAPHOS PROJECT - WATER RESOURCES

Item No	Sources	Quantity m <sup>3</sup>
1	Asprokremmos Dam .....	11 693 013
2	Boreholes in Dhiarizos & Ezouza rivers .....	3 446 108
3	Surface flow diversion from Diarizos & Exouza rivers ...	2 782 389
4	Mavrokolymbos Dam .....	591 000
	Total .....	18 512 510

Hydrology of Dams

The hydrologic data for Asprokremmos dam and Mavrokolymbos dam as recorded during the year under review are tabulated on Tables X-45 and X-46 respectively.

TABLE X-45 - ASPROKREMMOS DAM -HYDROLOGY FOR 1985

Item No	Description	Qty m <sup>3</sup>	% Storage capacity
1	Initial amount in storage .....	15 323 000	30.0
2	Inflow - Seepage .....	14 135 723	27.7
3	Total release .....	11 693 013	22.9
4	Leakages .....	50 191	9.8
5	Evaporation .....	2 253 339	4.4
6	Overflow .....	NIL	NIL
7	Final amount in storage .....	16 235 600	31.8
8	Minimum quantity in storage (Dec.)..	15 826 100	31.0
9	Storage capacity .....	51 000 000	100.0
10	Water available .....	27 185 193	53.3

TABLE X-46 - MAVROKOLYMBOS DAM - HYDROLOGY FOR 1985

Item No	Description	Qty m <sup>3</sup>	% Storage capactiy
1	Initial amount in storage .....	252 500	11.6
2	Inflow-Seepage .....	761 009	34.9
3	Total release .....	591 000	27.1
4	Leakages .....	NIL	NIL
5	Evaporation .....	102 010	4.7
6	Overflow .....	NIL	NIL
7	Final amount in storage .....	310 000	14.2
8	Minimum quantity in storage (Oct.) .....	258 000	11.8
9	Storage capacity .....	2 180 000	100.0
10	Water available .....	911 499	41.8

Water Utilization and Crops Irrigated

From the water developed, about 2.265 MCM were lost in the canal system, 24,475 m<sup>3</sup> were used by industries and the remaining 16.223 MCM were used for the irrigation of 25,615 donums planted with various crops as shown on Table X-48 (See Table X-47 for water utilization).

TABLE X-47 - PAPHOS IRRIGATION PROJECT - WATER UTILIZATION

Item No	Description	Qty m <sup>3</sup>
1	Water used for irrigation .....	16 222 551
2	Water used by industries .....	24 475
3	Water used for recharge .....	NIL
4	Total water utilized .....	16 247 026
5	Total water lost .....	2 265 484
6	Total water delivered from head-works .....	18 512 510

TABLE X-48 - PAPHOS IRRIGATION PROJECT - CROPS IRRIGATED

Ser No	Crop	Area donums
1	Citrus .....	4 808
2	Bananas .....	3 153
3	Vines .....	2 956
4	Onions .....	466
5	Vegetables .....	840
6	Potatoes .....	2 499
7	Melons .....	522
8	Avocados.....	386
9	Alfa-alfa .....	571
10	Ground-nuts .....	6 327
11	Legumes .....	2 223
12	Deciduous .....	413
13	Other .....	451
	Total .....	25 615

Water Sale, Income, Operation and Maintenance Costs

The project developed a quantity 18.512 MCM out of which 16.247 MCM were used for irrigation, and 0.024 MCM were used for industrial purposes, while the rest 2.265 MCM were lost. The irrigation water was sold at the nominal rates of 4 cent/m<sup>3</sup> except the water used for irrigation of the area commanded by Mavrokolymbos dam was sold at 3.5 cent/m<sup>3</sup>. The industrial water was sold at 9 and 13 cent/m<sup>3</sup>. From the sale of water the total income amounted to £641,293, whereas the operation, maintenance and power costs were £534,277. Details are shown on Table X-49.



The maintenance works carried out on the project during 1985 were the following:

Distribution system

- Cleaning of main canal, canaletti and Mavrokolymbos canal.
- Cleaning of pumping stations, regulating and storage tanks.
- Repairing of breakages to pipelines.
- Painting of metal structures and plumbing installations.
- Maintenance of hydrants, water meters flow limit devices, pressure regulators and other hydraulic equipment.

Asprokremmos dam

- Painting of metal structures and woodwork.
- Cleaning of all installation in the intake tower.
- Painting of the flanges on grout holes in the gallery.
- Removing of lime sediment from drainage holes in the gallery.
- Maintaining of the guardhouse.

Mavrokolymbos dam

- Repairing of access road.
- Cleaning of drainage ditch channels
- Cleaning of embankment from wild vegetation.
- Painting of bridge and metal structures.
- Maintaining of penstock and drive winch.

TABLE X-49 - PAPHOS IRRIGATION PROJECT - INCOME AND EXPENDITURE DATA

Item No	Description	Qty m <sup>3</sup>	Amount £
1	Water delivered from Headworks .....	18 512 510	-
2	Water sold for irrigation .....	16 222 551	638 205
3	Water sold for industrial use .....	24 475	3 086
4	Total water sold and gross income ....	16 247 026	641 291
5	Operation cost .....	-	48 470
6	Maintenance cost .....	-	194 439
7	Pumping cost .....	-	293 356
8	Total annual cost .....	-	536 265
9	Net income .....	-	105 026

From the above table it is seen that the income from the sale of water did not compensate for the annual cost of operation and maintenance of the project.

### Project Operation data for the last two years

Table X-50 gives details regarding the operation and maintenance for the last two years. The last column shows the percentage variation of these data with respect to 1984 figures.

TABLE X-50 - PAPHOS PROJECT - DATA ON OPERATION FOR THE LAST TWO YEARS

Item No	Description	Unit	1984	1985	% Change on 1984
1	Yield .....	1000 m <sup>3</sup>	32 000	32 000	NIL
2	Water available* .....	"	32 408	-	+63.5
3	Water utilized .....	"	14 473	16 247	+12.2
4	Water sold for irrigation .....	"	14 442	16 223	+12.3
5	Water sold for industrial use ..	"	31	24	-22.6
6	Total water sold .....	"	14 473	16 247	+12.2
7	Gross income .....	£	499 290	641 291	+28.4
8	Operation and Maintenance Cost .	£	223 204	242 909	+ 8.8
9	Power cost .....	£	283 628	293 265	+ 3.4
10	Total cost .....	£	506 832	536 265	+ 5.8
11	Net income .....	£	-5 221	105 026	-
12	Area Irrigated .....	donums	25 119	25 615	+ 2.0

\* This the water available in the dams, the quantity taken from the boreholes and the river diversion.

From the above table it is seen that the project water utilization has increased tremendously. The income was increased significantly and that resulted in a tremendous increase of the profit.

### ATHALASSA PROJECT

The Athalassa Project consists of a storage dam built, to prevent flooding of the Athalassa Government Farm and for supplying water for the needs of the Government farm in the area. The dam at spillway crest has a capacity of 0.79 MCM and the distribution system commands an area of 310 donums belonging to the Agriculture Research Institute and the Department of Agriculture Farm. The distribution system is made of pipelines. The project is operated by the Department of Agriculture Farm in the area. During the year under review the dam totalled a quantity of 21,000 m<sup>3</sup> of water. Out of this 19,000 m<sup>3</sup> were used for the irrigation of 35 donums of land planted mainly with cereals and seasonal crops.

### KHAPOTAMI PROJECT

The Khapotami irrigation project consists of a diversion weir and a diversion pipeline capable of diverting a flow of 500 cubic meters/hour when the Khapotami river is flowing in the months January-June. The project is supplying water in bulk during the winter, spring and early summer months, to the Pissouri and Alektora Irrigation Divisions. The area commanded by both irrigation divisions is around 4,235 donums, 3,000 donums in the Pissouri Irrigation Division and 1,235 donums in the Alektora Irrigation Division. In both cases the area to be irrigated is planted totally with vines.



Based on the existing water resources for each of the two irrigation divisions and having in mind the area served by each irrigation division, water is allocated as follows:

- If the works divert only 225 m<sup>3</sup>/hr the water will be given in total to the Pissouri Irrigation Division.
- If the works divert more than 225 m<sup>3</sup>/hr but less than 325 m<sup>3</sup>/hr the 225 m<sup>3</sup>/hr will be diverted to the Pissouri Irrigation Division and the remaining to the Alektora Irrigation Division.
- If the works divert a flow of more than 325 m<sup>3</sup>/hr then the water will be allocated as follows:-
  - . 225 m<sup>3</sup>/hr to Pissouri Irrigation Division
  - . 200 m<sup>3</sup>/hr to Alektora Irrigation Division
  - . The remaining flow will be divided between the two irrigation divisions at a ratio of 3:1 (3 parts to the Pissouri irrigation division and 1 part to the Alektora irrigation division).

During the year under review the diversion of water started early in January 1985 and was completed in June 1985 when the river flow diminished. In this period a total of 929,000 m<sup>3</sup> of water was utilized for the supplementary irrigation of 4,235 donums of land planted with vines.

For the maintenance of the project an amount of £775 was spent for the following works:

Cleaning of weir. Repairing of main watermeter. Repairing of pipe breakages. Maintaining of airvalves and main water meters. Cleaning the storage tank in Alektora.

#### KHRYSOXKHOU VALLEY PROJECT

The Khrysokhou valley project consist of five boreholes equipped with electro-submersible pumps, four balancing reservoirs and a distribution system made of pipes commanding an area of 1,770 donums. The project is situated in the Paphos District Polis region in the Khrysokhou river valley.

Irrigation in the project area started in January and continued throughout the year until December 1985. During this period a total quantity of 460,091 m<sup>3</sup> of water was utilized by the farmers.

The water was sold at 4.0 cent/m<sup>3</sup>. The income amounted to £18,404. The operation expenses were £4,339, the maintenance expenses were £8,811 and the pumping expenses were £14,889. The total expenditure was amount to £28,039. This shows that the running costs of the project are not recovered by the income from the sale of water and an annual deficit of £9,635 was observed.

Out of the 1,770 donums commanded by the distribution system only an area of 846 donums was irrigated as shown on Table X-51.

The maintenance works carried out on the project were the following:  
Repairing of pipelines. Repairing and replacing of farm outlets. Repairing of water meters. Painting of pumphouses. Purchasing and installation of two electrosubmersible pumps. Repairing of the pump. Repairing of ball valves. Cleaning of reservoirs from accumulated sand.

TABLE X-51 - KHRYSOXKHOU VALLEY PROJECT - CROPS AND AREA IRRIGATED

Ser No	Crop	Area Donums
1	Citrus .....	250
2	Olives .....	40
3	Alfa-Alfa .....	90
4	Avocados.....	4
5	Tobacco .....	422
6	Other .....	40
	Total .....	846

XYLIATOS PROJECT

The Xyliatos irrigation project consists of a dam reservoir of maximum capacity at spillway crest 1,220,000 m<sup>3</sup> of water and a closed type distribution system commanding an area of 2,300 donums. Irrigation in the project area started early in March 1985 and continued throughout the year until late in November 1985. During this period a total quantity of 587,155 m<sup>3</sup> of water was used for the irrigation of an area of 1,430 donums planted with olive trees, citrus, vegetables and potatoes. The water was sold to the Farmers at a fixed charge of 3 cent/m<sup>3</sup> and gross income was £17,615. The operation expenses were £5,250 while the maintenance expenses were £3,985. The net income to the project for the year under review was £8,380.

Project Hydrology

The project hydrologic data as recorded during the year under review, are tabulated in table X-52. Overflow over the spillway crest occurred during the period 14th January to 13th May 1985. The minimum quantity of water ever stored in the reservoir during the irrigation period, was 524,000 m<sup>3</sup> and occurred in December, 1985.

TABLE X-52 - XYLIATOS DAM - HYDROLOGY FOR 1985

Item No	Description	Qty m <sup>3</sup>	% Storage capacity
1	Initial amount in storage .....	1 154 000	94.6
2	Inflow - Seepage .....	2 322 774	190.4
3	Total release for irrigation ....	709 260	58.1
4	Leakages .....	106 366	8.7
5	Evaporation .....	98 130	8.0
6	Overflow .....	1 950 737	159.9
7	Final amount in storage .....	597 000	48.9
8	Minimum quantity in storage (Dec.) .....	524 000	43.0
9	Storage capacity .....	1 220 000	100.0



TABLE X-53 - XYLIATOS DAM - WATER UTILIZATION

Item No	Description	Qty m <sup>3</sup>	% Storage capacity
1	Water used for irrigation .....	587 155	48.1
2	Water used for recharge .....	NIL	NIL
3	Total water utilized .....	587 155	48.1

TABLE X-54 - XYLIATOS DAM - CROPS IRRIGATED

Item No	Crop	Area Donums
1	Citrus .....	250
2	Seasonal .....	550
3	Potatoes .....	400
4	Olives .....	100
5	Deciduous .....	100
6	Alfa-Alfa .....	10
7	Avocados ) .....	20
8	Pistachio ) .....	
	Total .....	1430

Water Utilization and Crops Irrigated

During the year under review a quantity of 587,155 m<sup>3</sup> of water was utilized for the irrigation of 1,430 donums of land planted mainly with olive trees, citrus, vegetables, potatoes and avocados.

TABLE X-55 - XYLIATOS DAM - INCOME AND EXPENDITURE DATA

Item No	Description	Qty m <sup>3</sup>	Amount £
1	Water sold at nominal rates ...	587 155	17 615
2	Water sold at reduced rates ...	NIL	-
3	Water given free .....	NIL	NIL
4	Total quantity utilized and gross income .....	587 155	17 615
5	Operation cost .....	-	5 250
6	Maintenance cost .....	-	3 985
7	Net income .....	-	8 380

Water Sale, Income, Operation and Maintenance and Details

From the sale of water, the gross income during the year review, was £17,586. Operation expenses, including attendant wages and travelling costs, amounted to £5,250 and maintenance expenses were £3,985 and the net income to the project was £8,380. The following maintenance works were carried out during the year under review:

- Repairs to breakages of float valves of the Break Pressure Tanks.
- Repairing and Installation of gate valves.
- Repairing of the filters.
- Repairing of breakages of the pipe system.
- Building of a reinforced concrete wall around hydrant No. 38.

TABLE X-56 - XYLIATOS DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1984	1985	% Change on 1984
1	Capacity .....	1000 m <sup>3</sup>	1 220	1 220	NIL
2	Water available in storage .....	"	1 560	1 322	-15.2
3	Water utilized for irrigation .....	"	311	587	+88.7
4	Water sold .....	"	311	587	+88.7
5	Water given free .....	"	NIL	NIL	NIL
6	Water used for recharge ..	"	NIL	NIL	NIL
7	Gross income .....	£	9 380	17 615	+87.8
8	Operation cost .....	£	4 977	5 250	+5.5
9	Maintenance cost .....	£	2 795	3 985	+42.6
10	Total expenses .....	£	7 772	9 235	+18.8
11	Net income .....	£	1 608	8 380	+421.1
12	Area irrigated .....	donums	700	1 430	+104.3

Project Operation Data for the last two years

Table X-56 shows the operation data for the last two years. It can be seen that the area irrigated was increased significantly and that resulted to the increase in the water utilization. The total expenses were up by 18.8% and the net income was tremendously increased.

VASILIKOS-PENDASKINOS PROJECT

The purpose of the Vasilikos-Pendaskinos project is the development of surface and groundwater resources from the Vasilikos, Pendaskinos and Maroni rivers both for the agricultural development of the area and the augmentation of the domestic water supply of Nicosia, Larnaca and Famagusta districts.

The project consists of the following:

- Kalavassos dam whose capacity is 17.1 MCM.
- Dhyptamos dam whose capacity is 13.7 MCM.
- Maroni Diversion to divert a proportion of the Maroni river flow to a point upstream of Dhyptamos dam.
- Maroni irrigation scheme which comprises an irrigation network covering about 1740 donums in the delta area of Maroni river
- Vasilikos irrigation scheme. This comprises a main conveyor from Kalavassos dam, break pressure tank and pipeline networks covering an area of about 6260 donums.
- Pendaskinos irrigation area: An area of 2780 donums in the Pendaskinos valley and delta area, is served by the Dhyptamos dam and existing boreholes.



- Kalavassos-Khirokitia pipeline with Tokhni pumping station, which is the main conveyor for water from Kalavassos dam to the Khirokitia treatment plant and of irrigation water to the Vasilikos irrigation area.

Construction of civil works commenced in 1983 and they will be completed in 1987. The main works of both dams were completed by the end of 1984 and the first inflow in Kalavassos dam was recorded on the 2nd November 1984, while the first inflow in Dhypotamos dam was recorded on the 11th January, 1985.

This part of the report will deal only with details about water utilization for irrigation where details regarding domestic water supply will be given in the section dealing with water supply.

Irrigation in Maroni, Pendaskinos and Vasilikos areas, started on the 17th June 1985 and completed in December 1985. During this period a total quantity of 929,265 m<sup>3</sup> was utilized for irrigation. Of the quantity used for irrigation a quantity of 233,636 m<sup>3</sup> was utilized in Maroni area, 435,558 m<sup>3</sup> in Ayios Theodoros area and 260,771 m<sup>3</sup> in Kalavassos area. The water charge was fixed at 4.5 cent/m<sup>3</sup>.

The water used upto the end of November was given free of charge. For December 1985 a quantity of 62,157 m<sup>3</sup> was sold to the farmers. The income from the sale of water amounted to £2,797. The operation expenses were covered by the constructional costs for the year under review.

XI LARNACA-FAMAGUSTA  
REGIONAL OFFICE

by  
T N Pamatsos  
Executive Engineer I  
Regional Engineer

General

By the end of the year the staff of the Regional Office was composed of the following Officers :

1 Executive Engineer - Head  
1 Senior Technician  
5 Technicians I  
1 Assistant Chief Foreman  
11 Regular Employees  
1 Secretary Typist

For the execution of the construction works 6 foremen and 46 workers were engaged.

The activities of this office cover the Districts of Larnaca and Famagusta. Its functions are divided into four main categories as follows :

- Water Resources and Hydrology : Surface and groundwater measurements and studies.
- Investigations and Design : Design of water supplies and irrigation schemes.
- Construction of water supply and irrigation schemes.
- Operations and Maintenance of existing irrigation and water supply schemes.

HYDROLOGY AND WATER RESOURCES

Stream Gauging

During the year 3 permanent gauging observation stations (one monthly



at Liopetri Dam and two weekly at Paralimni Lake) equipped with automatic water level recorders were in operation and weekly or monthly visits were paid for observation and maintenance.

### Ground Water Hydrology

The ground water conditions of the two Districts Famagusta and Larnaca were observed by means of 495 wells/boreholes.

The water level (i.e. the distance from established bench marks on the top of the observation wells/boreholes to the ground water level) of 365 of them were taken twice this year i.e. in March before the irrigation period and in November after the irrigation period.

The water level of 63 of these observation boreholes was taken every month and another 10 of them was taken every two months.

The water level of 57 boreholes used for village water supplies were also taken once during the whole year.

### Chemical Analyses

A total number of 230 samples were taken from Government and Communal or Private boreholes/wells or springs and were sent to the Government Laboratories for Chemical Analysis.

Also 425 samples taken from wells and boreholes were analysed in the Regional Office for chloride content.

### Boreholes Test Pumping

During the year the test pumping of 10 boreholes/wells for private use were carried out.

### Plotting of Boreholes

During the year the plotting of wells/boreholes in Famagusta/Larnaca Hydrological Area continued and the total number of wells/boreholes plotted were 1418.

### Questioning

The annual questionnaire was carried out in the area where the plotting was completed. A total number of 4298 cases were carried out.

### Village Water Supplies

During the year the water supply of each village in the two Districts was checked (i.e. the flow of springs and boreholes used by each village were measured and samples were sent to the Government Laboratory for chemical analysis).

### Quarries

A total number of 44 applications for quarries which were sent to the District Office by the Department of Mines were examined on the spot, and returned to the above Department with the comments of this Office.

## Southern Conveyor Project

During the year the two Officers dealing partly in different studies concerning the Southern Conveyor continued.

The ground water level of 98 wells/boreholes was taken in South-Eastern Mesaoria and another 45 in the area of Kiti.

In addition the water levels were measured by 4 automatic recorders situated at Kiti, Xylophaghou, Liopetri and Phrenaros and were visited once a month.

## Well Sinking Permits

A total number of 1413 applications for sinking, covering permits and the change of conditions of permits of well/boreholes were examined in the two districts and were presented to the General Advisory Committee for wells/boreholes of the Ministry of Agriculture and Natural Resources. Some 1220 applications are of cases lying in the conservation areas and another 193 in the non-conservation areas.

Apart from the above applications 657 cases dealing with wells/boreholes were also examined direct from the District Office of the W D D Larnaca/Famagusta and were submitted to the District Officers of the two Districts.

The above applications concerned cases for the renewal of leased agreements of wells/boreholes drilled on Government or Forest Land or cases of cleaning or deepening of existing wells/boreholes or Cypriot Turkish wells/boreholes, now working for refugees. From the above 441 cases were approved, 11 were not and 205 were for the check of the condition of permits or returned to the District Officers for further examination.

## Water Supply (Special Measures) Law 32/64

The control of the aquifers of Ormidhia and Xylophagou under the Special Measures (Water Supply) Law 32/64 was continued and the District Officer in concurrence with the Water Development Department and the Agricultural Department investigated a total number of 903 boreholes.

In Ormidhia and Xylophagou area, 127 applications for new boreholes, or covering permits were examined. Some 55 of them were approved and another 72 not approved.

## INVESTIGATIONS AND DESIGN

### Investigations

During 1985 the following investigations were carried out :

#### LARNACA DISTRICT

Mari.: Investigation for the water supply of the Stock Farming Area of the village and for the improvement of the village water supply.



For the solution of irrigation division problems and protection of underground water supply.

Odhou : For improvement of two Government boreholes for irrigation division problems. Study of the village sewage problems.

Melini : Solution of water supply and irrigation division problems and protection of underground water supply.

Ayii Vavatsinias : Investigation for the creation of a new irrigation division and for the solution of the village water supply and irrigation division problems. Study of the village sewage problems and investigation of a case of building an irrigation water tank near the river.

Ora : Solution of irrigation division problems and for fencing private land near the river.

Vavla : Improvement of the village water supply network.

Vavatsinia : Investigation of the springs of the village water supply and protection for underground water supply.

Pano Lefkara : Investigation for the village water supply and study of the village sewage problems. Protection of underground water supply.

Skarinou : Solution of a pipeline through a new division of plots and for the solution of water supply problems. Study of the village sewage problems.

Khirokitia : Improvement of a Government borehole for the livestock and for the water supply of the village and for extension of part of the village water supply network.

Tokhni : Study for the village sewage problems.

Zyyi : Study for the village sewage problems and for the solution of water supply problems. Protection for underground water supply.

Maroni : Relocation of part of the conveyance pipeline of the village water supply which passes through private plots.

Psematismenos : For water supply permits of new division of plots and for improvement of Government borehole 72/78 for irrigation purposes of "Drakondies" Irrigation Division.

Ayios Theodoros : Improvement of the village water supply (replacing of the old conveyor with the new one) and for the solution of water supply problems. Investigation of a case of building a house near the river.

Kophinou : Study for the village sewage problems and for the solution of water supply problems.

Anglisidhes : Study for the village sewage problems and for the water supply of the village division plots.

Anaphotia : For improvement of a Government borehole for the live-stock of the village and for the solution of water supply problems of the live stock of the village.

Kiti : Improvement of the village water supply scheme and for water supply permits of new division of plots. Study for the village sewage problems and for relocation of RCC irrigation channel for Kiti Dam Government works.

Tersephanou : Investigation for the connection of the village water supply with Khirokitia Famagusta Pipeline and study for the village sewage problems. Water supply to new division of plots.

Dhromolaxia : For improvement of the village water supply network and water supply to new refugee self housing plots, Phases G and H. Replacement of part of the village water supply network and for water supply of the village slaughter house. For study for the village sewage problems and water supply of plots for professional purposes.

Pervolia : Water supply to new refugee self housing plots Phase D and for water supply permits of new division of plots.

Meneou : Completion plan of the village water supply network.

Klavdhia : For the connection of the village water supply with Khirokitia-Famagusta pipeline, and for the solution of water supply problems.

KaloKhorio : Improvement of the village water supply network and for the study of the village sewage problems.

Ayia Anna : Study for the village sewage problems and for the solution of water supply problems. Protection for underground water supply.

Psevdhas : For the solution of water supply problems and for precaution of the spring of the village water supply. Protection of underground water supply.

Mosphiloti : Investigation for new refugee self housing division of plots and for the solution of water supply problems.

Kornos : Water supply for the village division of plots and for the solution of water supply problems. Protection of underground water supply.

Athienou : Improvement of the village water supply (Replacing of the old conveyor with a new one and replacing of the village water supply network) and for improvement of a Government borehole for the water supply of the live stock of the village. Study for the village sewage problems and for water supply permits for new division of plots.

Aradhippou : Study for antiflood works at Aradhippou river on the north of the village and for the solution of water supply problems. Study for the village sewage problems and for water supply permits



for new division of plots. Protection for underground water supply.

Livadhia : Study for the village sewage problems and for the solution of water supply problems.

Voroklini : Study for the village sewage problems and for improvement of the old spring of the village water supply. Water supply of new division of plots. Relocation of a pipeline which passes through division of plots.

Xylymbou : Improvement of the village water supply network and study for the village sewage problems. Extension of the stock farming area network and for the solution of the village water supply problems. For the solution of problems to the recharge dam "Laxia tou Hjiillia" and water supply permit of new division of plots.

Ormidhia : Improvement of the village water supply network and study for the village sewage problems. Water supply of new division of plots and for the protection of underground water supply.

Dhekelia E A C Refugee Camp : Water supply to new refugee self housing plots Phase C.

Kalavastos : Investigation for protection of underground water supply.

Xylophaghos : Connection of the village water supply with Khirokitia Famagusta pipeline phase B and for water supply to new refugee self housing plots phase F. Relocation of part of the village water supply network and study for the village sewage problems.

Larnaca (Halla Sultan Tekke) : Solution of irrigation problems of the garden at the Archaeological Monument.

#### FAMAGUSTA DISTRICT

Akhna Forest : Water supply to new refugee self housing plots Phases C-D and water supply of plots for professional purposes of the refugees. For the solution of water supply problems.

Akhyritou (Vrysoulles) : Water supply of plots for professional purposes of the refugees and for the solution of water supply and irrigation problems. Protection for underground water supply.

Avgorou : Improvement of the village water supply network and relocation of part of the refugee self housing estate water supply network. Water supply of the stock farming area of the village and for the solution of water supply problems. Study for the village sewage problems.

Liopetri : Improvement of the village water supply network and study for the village sewage problems. Protection for underground water supply,

Phrenaros : Improvement of part of the village water supply network and study of the village sewage problems. Protection of underground water supply.

Sotira : Improvement of the village water supply (repair or iron tower tank) and protection of underground water supply. For the solution of stock farming problems.

Dherinia : Improvement of the village water supply network and study for the village sewage problems.

Paralimni : Study for the village sewage problems and solution of water supply problems.

Ayia Napa : Relocation of a pipeline to the road Ayia Napa-Cape Greco and for intervention in the river bed near Ayia Napa spring (Gliki Nero). Extension of the tourist area water supply network and for the solution of water supply problems. Protection of underground water supply.

TABLE XI-1  
DESIGNS SUBMITTED TO THE DIRECTOR FOR APPROVAL

Ser. No.	Village and Scheme	Est. Cost £
VILLAGE WATER SUPPLY		
<u>Larnaca District</u>		
1	Vavla : Improvement of the village water supply network .....	14 000
2	Kiti : Improvement of the existing house to house scheme water supply .....	125 000
3	Ayios Theodoros : Improvement of the village water supply (placing of a new conveyor pipeline) .....	7 000
4	Ormidhia : Improvement of the existing house to house scheme water supply .....	95 000
5	Kalokhorio : Improvement of the existing house to house scheme water supply .....	28 000
6	Mari : Replacing of pumping main pipeline of the village water supply .....	17 500
7	Xylophaghos : Refugee self housing house to house scheme water supply phase F .....	500
8	Xylophaghos : Connection of the village water supply with Khirokitia-Famagusta pipeline Phase B (re-estimate) .....	130 000
9	Dhromolaxia : Improvement of the existing house to house scheme water supply .....	67 000
10	Dhromolaxia : Refugee self housing house to house scheme water supply .....	1 900



TABLE XI-1

Ser. No.	Village and Scheme	Est. cost £
VILLAGE WATER SUPPLY (cont.)		
11	Dhromolaxia : Refugee self housing house to house scheme water supply Phase H .....	3 300
12	Kornos : Water supply of village division of plots Phase B .....	3 000
13	Pervolia : Refugee self housing house to house scheme water supply phase D .....	2 200
14	Dhekelia E A C : Refugee self housing house to house scheme water supply Phase C .....	2 600
15	Anglisidhes : Water supply of village division of plots .....	4 600
16	Klavdhia: Connection of the village water supply with Khirokitia-Famagusta pipeline ..	8 500
<u>Famagusta District</u>		
1	Dherinia : Improvement of the existing house to house scheme water supply .....	185 000
2	Avgorou : Relocation of the existing house to house scheme water supply .....	160 000
3	Avgorou : Relocation of part of the village water supply network .....	3 000
4	Akhna Forest : Refugee self housing estate house to house scheme phase C .....	5 800
5	Akhna Forest : Refugee self housing estate house to house scheme phase D .....	2 100
6	Akhna Forest : Refugee self housing estate water supply of plots for professional purposes house to house scheme .....	6 200
7	Phrenaros : Improvement of part of the village water supply network scheme .....	4 000
8	Akhyritou (Vrysoulles): Refugee self housing estate water supply of plots for professional purposes - house to house scheme .....	7 500
9	Ayia Napa :a) Extension of the village water supply scheme to the road from the elementary school to the Grecian Bay Hotel .....	8 000

TABLE XI-1

Ser. No.	Village and Scheme	Est. Cost
VILLAGE WATER SUPPLY (cont.)		
11	Ayia Napa :b) Extension of the village water supply scheme to the road of the village cemetery .....	30 000
	c) Relocation of part of the village water supply scheme to the road Ay. Napa - Cape Greco .....	12 500
STOCK FARMING AREAS WATER SUPPLY		
<u>Larnaca District</u>		
1	Mari : Water supply for the village stock farming area .....	2 700
2	Xylotymbou Stock Farming Area : Extension of the distribution network water supply scheme .....	2 000
<u>Famagusta District</u>		
1	Avgorou : Water supply for the village stock farming area .....	7 000
ANIT FLOOD WORKS		
1	Aradhippou : Improvement of the river bed of Aradhippou river .....	43 000
VARIOUS MINOR SCHEMES		
<u>Larnaca District</u>		
1	Dromolaxia : Relocation of part of the village water supply network .....	200
2	Kornos : Improvement of the village water supply network .....	100
3	Maroni : Relocation of a pipeline of the village water supply .....	420
4	Ayios Theodoros : Improvement of the village water supply (Installation of a new ball valve to the central water tank) .....	150
5	Voroklini : Water supply for new division of plots	18 000
6	Larnaca (Palla Sultan Tekke) : Improvement of the well for irrigating the gardens of the Archaeological Monument .....	1 000



TABLE XI-1

Ser. No.	Village and Scheme	Est. Cost £
VARIOUS MINOR SCHEMES		
<u>Famagusta District (cont.)</u>		
1	Sotira Stock Farming Area :Relocation of pumping main pipeline .....	2 000
2	Sotira :Improvement of the village water supply (repair of iron tower tank) .....	1 000

## OPERATION AND MAINTENANCE

General

The Operation and Maintenance Branch consists of two sections :

- The Domestic Water Supply Section dealing with matters concerning water supply schemes, and,
- The Irrigation Branch dealing with matters concerning irrigation projects.

Domestic Water Supply Branch

The main activities of this Branch during the year were the following:

- Controlling and adjusting the quantity of water given to villages and refugee housing estates connected to the Khirokitia-Famagusta main pipeline.
- The branch is also involved in the administration of the Larnaca and Famagusta Water Boards through the participation of the District Engineer in the Water Board meetings as a representative of the Director. Through its membership of Water Boards the District Engineer acts as their Technical Adviser.
- The branch offers technical advise and assistance to several Government, semi-Government and Communal Improvement Boards on water supply matters.

Irrigation Branch

The main activities of this branch during the year were the following:

- Was involved in the administration and management of Government Waterwork Projects, through participation in the Committees of these Projects (Kiti Dam).
- Carried out the maintenance of these projects performing routine dam and pipeline maintenance, valves and water meter repairs or replacement, painting of metal or wood work components etc.

- Gave technical advise and technical assistance concerning the maintenance of contributory irrigation projects.
- Performed routine checks to 53 Government Recharge Waterworks (12 in Larnaca District and 41 in Famagusta District) and undertook the maintenance procedures where it was necessary.
- The Branch participates in the meetings of the Committees of the Water Commissioners of Vasilikos-Pendaskinos Government Projects and Lefkara Dam. Also it has undertaken a survey in cooperation with the District Agricultural Department, of 17 Irrigation Divisions falling within the above Projects, to find out the water rights of each Division.



## XII LIMASSOL REGIONAL OFFICE

by

N.E. Neocleous  
Executive Engineer II  
Regional Engineer

### General

Limassol Regional Office is responsible for the activities of the Department within the District of Limassol. The office is divided into four main sections as follows:

- Water Resources
- Investigation and Design
- Construction
- Operation and Maintenance

The Regional Office is manned by 49 staff as follows:

- 1 Executive Engineer II
- 1 Senior Technician
- 12 Technicians I
- 1 Chief Foreman
- 2 Assist. Chief Foremen
- 11 Hourly Technicians
- 1 Accounting Officer
- 2 Clerk II
- 18 Foremen

For the execution of the construction works about 300 skilled and unskilled workers were engaged.

### WATER RESOURCES

Hydrological measurements were carried out in the prescribed areas which are under the Special Measures or Conservation Law as listed under DIVISION II WATER RESOURCES.

### Surface Water Hydrology

#### Rivers

The flow of the rivers is gauged by means of automatic water level recorders and the results are calibrated by means of current meter measurements.

Nine gauging stations equipped with automatic water level recorders are established on main rivers of Limassol District.

- The total discharges calculated for each river are given in the Hydrological Year Book of the Department.

- Kouris river, at Khalassa gauging station had a continuous flow throughout the year.

- Current meter measurements were taken at weekly intervals except at times of flood, when additional measurements were taken (total measurements 154) and at the same time 7 water samples were taken for suspended sediment analysis. Another 18 water samples were taken from the rivers, for ionic analysis.

### Springs and Streams

The discharge of 38 springs and streams were measured at monthly intervals for the benefit of village water supplies, Limassol water supply, the design of minor irrigation and water supply schemes and hydrological observations.

A total of 528 springs discharges were taken either volumetrically or by means of a current meter.

Water samples from the above springs and streams were taken once during the year, for chemical analysis.

In addition the discharge of 2 streams and the water level of 18 boreholes were measured, within the framework of Pitsilia Project. A total of 24 stream measurements and 216 water level measurements were taken.

### Groundwater Hydrology

Hydrological investigations and measurements were carried out in the Special Measures Law area of Akrotiri and the water conservation areas of Yermasoyia, Moni-Pyrgos, Paramali-Evdhimou, Pissouri-Evdhimou, Pareklissha and the rest of Limassol District.

#### Special Measures Law - Akrotiri Phasouri Area

Hydrological observation and control is exercised by means of 195 wells/boreholes strategically situated in the area.

Water level measurements are taken twice a year from the above wells/boreholes except from 148 wells/boreholes where water levels are observed monthly, so that the behaviour of the water table in the aquifer, is observed more closely. A contour map showing the water situation in the aquifer, is drawn monthly.

Sea water intrusion in the aquifer is observed and studied by means of 67 wells/boreholes at Zakaki-Asomatos area and 23 wells/boreholes at Akrotiri area, water samples from which area taken 3-4 times a year. In addition the salinity of the water of 25 wells/boreholes in Episkopi-Akrotiri area was observed once a week during the months, July-September.

Water pumped from the aquifer for irrigation, domestic and industrial purpose is noted monthly for each individual licenced well, by means of water meter, (total 393) attached to each pumping unit in order to ensure that the quantity pumped does not exceed the quantity allocated.



It is thus ensured that pumping is kept at the necessary to preserve the existing plantations in good and productive condition and at the same time ensuring that the aquifer is not extensively damaged.

Water for irrigation was also supplied in the above area, from Yermasoyia and Polemidhia Dams, through the distribution system, of the Dams and from Kouris river, through the irrigation intakes, up to the end of May 1985.

#### Water extracted from Akrotiri Aquifer.

Purpose:	M.C.M.
Irrigation . . . . .	13.18
Domestic . . . . .	3.48
Industrial . . . . .	<u>0.74</u>
Total . . . . .	17.40
Water supplied from Dams . . . . .	1.32
Total supplied for irrigation from the aquifer and from the Dams . . . . .	14.50

#### Water Conservation Areas

The Water situation within the Water Conservation Areas is observed by means of a number of wells/boreholes, the water level of which is measured twice a year and the total of water extracted is estimated by the method of the questioning.

The Aquifer of Yermasoyia river is observed more closely, by means of 42 wells/boreholes, the water level of which is measured once every week. During 1984, a quantity of 3.4 M.C.M. was released for recharge, in the aquifer, from Yermasoyia Dam. Also a quantity of 0.59 M.C.M. was pumped and released into the aquifer from Episkopi B/Hs (Kouris Delta)

Salinity is also observed taking water samples for analysis, twice a year, from a number of wells/boreholes.

The total number of observation wells/boreholes, in the Water Conservation Areas, which are measured twice a year, is 211.

#### Well Sinking Permits

Applications for well sinking permits and applications to transfer water to other plots, engine installations or Adjustment of pumping permits were investigated: some 513 cases were investigated and permits were finally granted by the D.O. for 440 of them.

#### Limassol Water Supply

Water supply to Limassol, for domestic purpose from the springs and boreholes is gauged monthly. A total quantity of 8.13 MCM. was supplied, 1.60 MCM from springs and 6.53 MCM from boreholes.

#### Village Water Supply

The water supply of 106 villages was measured during the period

September-November, when springs and boreholes are at their minimum output or maximum drawdown, respectively.

The quality of the water is being examined at regular intervals by the Medical Department.

#### Metereological Observations

Daily records were kept for rainfall (Max. 51.5 mm on 21.12.1985) water evaporation (Max. 11.1 mm on 25.8.85) temperature (Max. 40.8 C on 24.8.1985), wind velocity and sun reflection, at Yermasoyia Dam.

Records were also kept for rainfall (Max. 58.6 mm on 21.12.1985) and water evaporation (Max. average 43.4 mm for 4 days period 22.8.1985 - 25.8.1985) at Polemidhia Dam.

#### Quarry and Gravel Pits Permits

24 applications for quarries and gravel pits licences, were examined and submitted to the Senior Mines Officer.

#### Dams and Reservoirs

In the District of Limassol there are 21 Dams and Reservoirs. Maximum water stored during 1984 and other data are recorded under OPERATION AND MAINTENANCE DIVISION.

#### INVESTIGATION & DESIGN

The solution of the irrigation and water supply problems of all the populated area of Limassol District was the major task of this section.

#### Irrigation

For the development of irrigation systems of Limassol District 27 cases were examined, studied and the relevant designs were prepared for the total cost of £407,547, as follows.

TABLE XII - 1

#### IRRIGATION SCHEMES PREPARED IN 1985

Ser. No.	Village & Description	Est. cost £
1	Ayios Ioannis (Agros). Rehabilitation of "Ayia Marina" Irrigation Division . . . . .	49 000
2	Saittas-Perapedhi. Relocation of pipelines on the new road Saittas Perapedhi . . . . .	2 200
3	Krasokhoria Project. Rehabilitation of 15 existing schemes in Krasokhoria area . . . . .	179 400
4	Trakhoni Extension. Installation of farm outlets in Trakhoni-Ypsonas area . . . . .	10 300
5	Pissouri. Extension of irrigation system of "Pissouri" irrigation Division . . . . .	7 500
6	Karvounas-Kyperounda-Agros. Relocation of pipelines on the new road Karvounas-Kyperounda-Agros . . .	25 700



7	Agros-Zoopiyi. Releation of pipelines on the new road Agros-Zoopiyi . . . . .	7 600
8	Trimiklini. Removing of channel and pipelines of "Fractis" Irrigation Division . . . . .	4 800
9	Agridhia. Rehabilitation of "Mylos-Theotocos" Irrigation Association . . . . .	3 400
10	Kilani. Rehabilitation of Ayia Mavri location of "Kilani" Irrigation Division . . . . .	4 200
11	Vasa (Kellaki). Utilization of B/H 165/83 for supplementary supply of Vasa (Kellaki) domestic water supply and proposed Irrigation Division (irrigation scheme) . . . . .	48 500
12	Dhymes. Re-evaluation to construct storage tank for "Hji Pelendros" Irrigation Division . . . . .	3 900
13	Tris Elies. Utilization of B/H 146/84 for "Dracontas" Irrigation Division . . . . .	25 300
14	Yermasoyia. Relocation of pipelines on the new road	8 200
15	Ayios Ioannis (Agros). Rehabilitation of "Spylios - Kouforovon" Irrigation Division . . . . .	21 800
16- 27	Twelve cases in twelve villages of total cost . . .	5 747
	Total . . . . .	<u>£407 547</u>

In addition to the above 111 cases (applications) were examined and the relevant technical advice was given to the people concerned.

Domestic Water Supply

For the development of water supply systems of Limassol District, 99 cases were examined, studied and the relevant designs were prepared for the total cost of £3,223,394 as follows.

TABLE XII - 2

DOMESTIC WATER SUPPLY SCHEMES PREPARED IN 1985

Ser. No.	Village & Description	Est. cost £
1	Kellaki. Utilization of B/H 5/83 for supplementary supply of Kellaki village and "Panayia tou Glossa" Monastery . . . . . For the Monastery . . . . .	45 500 800
2	Vasa (Kellaki). Utilization of B/H 165/83 for supplementary supply of Vasa (Kellaki) domestic water supply and proposed Irrigation Division (water supply scheme) . . . . .	6 600
3	Vasa (Kellaki). Utilization of B/H 152/83 for supplementary supply of Vasa (Kellaki) domestic water supply . . . . .	32 000
4	Prastio (Kellaki). Utilization of B/H 136/83 for supplementary supply of Prastio (Kellaki) domestic water supply . . . . .	29 200

5	Pyrgos. Utilization of B/H Hydr. No. 568 (plot 403 Sh/Pl. 54/23) for supplementary supply of Pyrgos domestic water supply . . . . .	18 600
6	Vasa (Kilani). Installation of a new pipeline from "Psisikon" spring to the storage tank of the village	10 300
7	Moni. Utilization of B/H 114/84 for supplementary supply and changing the old pipelines of the distribution system. 1st solution . . . . . 2nd solution . . . . .	41 500 27 000
8	Kato Amiandos. Supplementary supply from new "Mavrolaxia" spring . . . . .	4 700
9	Ypsonas. Re-evaluation for the land division (File No. D.190/76)	2 000
10	Pakhna. Construction of a new storage tank for Domestic water supply . . . . .	9 500
11	Ypsonas. Re-evaluation for the land division (File No. D.235/72) . . . . .	3 000
12	Yermasoyia. Water supply for land division (File No. D.5/85) . . . . .	1 750
13	Yermasoyia. Water supply for land division (File No. D.700/80) . . . . .	80 200
14	Kolossi. Water supply for land division (File No. D.250/82 and D.222/82 . . . . .	11 200
15	Amathus. Water supply of plot 68 Sh/Pl. 54/45 . .	2 100
16	Khalassa. Revised scheme of New Khalassa water supply	77 550
17	Ypsonas. Relocation of pipeline from plot 121 Sh/Pl. 53/63 1st solution . . . . . 2nd solution . . . . .	570 2 200
18	Limassol Water Supply. Scheme of relocation of existing pipes outside of Kouris Dam reservoir . .	602 000
19	Moni. Water supply of plot 468/1 Sh/Pl. 54/40 . .	8 600
20	Parekklisha. Re-evaluation for the land division (File No. 335/83) . . . . .	3 000
21	Erimi. Water supply of livestock area . . . . .	18 600
22	Ypsonas. Re-evaluation for the land division (File No. D.178/80) . . . . .	2 100
23	Moniatis. Re-evaluation for the land division (File No. D.90/81)	2 240
24	Kalokhorio. Utilization of B/H 20/81 for supplementary supply of Kalokhorio domestic water supply . . . . .	36 000
25	Lophos. Extension of the distribution system . . .	1 100
26	P. Kividhes - Souni-Zanaja. Estimate for a stand by pump in Souni-Zanaja - Kividhes scheme . . . . .	4 500
27	Philagra Scheme. Philagra spring protection works in the river bed . . . . .	1 400
28	Yermasoyia. Water supply for the land division (File No. B.370/82/G . . . . .	2 900



29	Moniatis. Re-evaluation for the land division (File No. D.448/79) . . . . .	6 000
30	Moniatis. Estimate for a new route of "Kaminoudhi" spring pipeline 1st solution . . . . . 2nd solution . . . . .	33 000 30 700
31	Limassol Water Supply. Re-evaluation of the scheme of relocation of existing pipes outside of Kouris Dam reservoir . . . . .	615 000
32	Kyperounda. Construction of a new storage tank for domestic water supply . . . . .	9 000
33	Episkopi. Water supply of self housing Estate (Face E') . . . . .	4 800
34	K. Polemidhia. Water supply for the land division (File No. D.296/85) . . . . .	2 750
35	K. Polemidhia. Re-evaluation for the land division (File No. D.554/83) . . . . .	4 000
36	Akrounda. Utilization of B/H 21/85 for supplementary supply of Akrounda domestic water supply . . . . .	45 000
37	Perapedhi. Water supply for the land division (File No. D.174/81) . . . . .	6 000
38	Moutayiaka. Water supply of live stoke area . . . . .	5 700
39	Paramali. Water supply of live stoke area . . . . .	3 100
40	Ephtagonia. Utilization of B/H 50/85 for supplementary supply and changing the old distribution system. . . . .	94 000
41	Trakhoni. New extension of the distribution system . . . . .	13 400
42	Anoyira. Improvement of "Apikreni" spring . . . . .	5 000
43	Kolossi. Water supply of land division of Kolossi inhabitants . . . . .	5 300
44	Amathus. Extension of the distribution system to plot 216/2/2/1 Sh/Pl. 54/37 (File No. B.492/84) . . . . .	14 300
45	Moutayiaka. Additional electricity supply to Moutayiaka pumping station . . . . .	11 900
46	Krasokhoria. Arkolakhania-Phylagra regional scheme . . . . .	365 990
47	Amathus. Water Supply for the land division of LUNION NATIONALE company . . . . .	6 600
48	Mandria. Water Supply for the land division (File No. B.151/81) . . . . .	5 070
49	Pissouri. Pissouri Bay Government scheme. Utilization of B/H 156/83 near Mamonia (Total cost) . . . . .	658 000
50	Ayios Athanasios. Water supply scheme for Cyprus Organization land development . . . . .	48 000
51	Perapedhi. Re-evaluation for the land division (File No. D.433/82) . . . . .	6 000
52	Evdhimou. Utilization of B/H Hydrological No. 50 for supplementary supply of Evdhimou domestic water supply . . . . .	21 600
53	Parekklisha. Relocation of pipelines on the new road . . . . .	6 300

54	Monagroulli. Relocation of pipelines on the new road	2 400
55	Amathus. Water supply of plots 90, 91, 92, Sh/Pl. 54/45.....	3 300
56	Ypsonas. Re-evaluation for the land division (File No. D.44/79) .....	1 250
57	Ypsonas. Re-evaluation for the land division (File No. D.281/84) .....	2 650
58	P.Platres. Re-evaluation for the land division (File No. D.116/75) .....	3 660
59	Paramytha. Re-evaluation for the land division (File No. D.248/79) .....	4 800
60	Moniatis. Extension of the distribution system .....	7 150
61	Ay. Athanasios. Re-evaluation for the land division (File No. D.138/81) .....	1 680
62	Kandou. Utilization of B/H 73/84 for supplementary supply of Kantou domestic water supply .....	26 200
63	Yerasa. Utilization of B/H 106/82 for supplementary supply of Yerasa domestic water supply .....	22 250
64	Ypsonas. Re-evaluation for the land division (File No. D.20/79) .....	4 100
65	Khalassa. Revised scheme of New Khalassa water supply from "Kefalovrysos & Kria Pygadhia" collecting box ..	7 000
66	Khalassa. Revised scheme of New Khalassa livestock area .....	7 550
67-		
99	Thirty three cases in 33 villages of total cost .....	14 184
	Total .....	£3 223 394

In addition to the above 148 cases (applications) were examined, studied and the relevant technical advice was given to those concerned.

#### CONSTRUCTION

##### Irrigation and Domestic Water Supply Schemes

Several schemes were constructed by the Limassol Regional Office for major and minor irrigation schemes, village water supply, water supply for refugee housing estates and other schemes. These are listed UNDER CONSTRUCTION DIVISION, chapter VII. The total cost of construction works in 1985 was £1,495,625.=

Analytically the following schemes approved for construction in 1985:

- Seventeen (17) rural domestic water supply schemes. The expenditure incurred in 1985 was £282,357.=
- Twelve minor irrigation schemes. The expenditure incurred in 1985 was £148,901.=
- Seven (7) major irrigations schemes. The expenditure incurred in 1985 was £706,337.=
- Nine (9) water supply schemes for refugee housing. The expenditure incurred in 1985 was £36,190.=



- Twenty (20) schemes within the framework of Pitsilia Integrated Rural Development Project. An amount of £13,483.= was spent for the completion of these schemes, the construction of which commenced the previous years.
- Twenty-eight (28) schemes for other departments and authorities. The expenditure incurred in 1985 was £118,290.=
- Ninety-one (91) water supply schemes for private developers. The expenditure incurred in 1985 was £190,067.=

#### Vasilikos-Pendaskinos Project-Irrigation Networks

Emphasis must be given to the fact that the Limassol District Office undertook the construction of Vasilikos-Pendaskinos Irrigation Network.

The estimated cost is about £4.0 millions Pounds. The expenditure incurred in 1985 was £580,560.=

Especially in Pendaskinos Irrigation Area, the work commenced in October 1984 and the task was to complete the network before Summer 1985 in order to give water to the farmers to irrigate their existing citrus plantations. This was **achieved** due to the hard work of the personnel of W.D.D. Limassol District Office.

### Materials and Machinery

By the end of the year 1985 the following materials and machinery for water supply and irrigation schemes have been used.

TABLE XII - 3

#### MACHINERY USED BU LIMASSOL REGIONAL OFFICE

Machinery Employed	Unit	Quantity	Value £
Tipper lorries . . . . .	agreed		1 275 07
Tipper lorries . . . . .	W/hours	3 413	12 079 61
Buses . . . . .	W/days	148	2 338 40
Electrowelding machines	W/hours	3 124	3 057 00
Caterpillars . . . . .	W/hours	191	2 638 00
Caterpillars . . . . .	agreed	-	1 150 00
Cutting machines . . . . .	W/hours	4 020	-
Saloon cars . . . . .	W/days	274	2 027 60
Land rovers . . . . .	W/days	2 996	35 147 35
Diggers . . . . .	W/hours	20 796	82 362 30
Compressors . . . . .	W/hours	3 331	8 156 00
Concrete mixers . . . . .	W/days	115	506 00
Braker . . . . .	agreed	607	1 923 25
Crane . . . . .	W/days	1 909	3 906 00
Hydraulic Excavator . . . . .	agreed	-	20 889 98
Motor Roller . . . . .	W/days	33	1 148 40
Grader . . . . .	W/hours	221	1 743 69
Total .. .. .			<u>180 348 65</u>

TABLE XII - 4

#### MATERIALS USED BY LIMASSOL REGIONAL OFFICE

Materials used	Unit	Quantity	Value £
Galvanized steel pipes . . . . .	m	37 571	95 520 39
Steel pipes (coated or uncoated) . . . . .	m	1 911	33 596 84
Ductile iron pipes . . . . .	m	933	3 873 84
Pipes - class 15 . . . . .	m	26 874	158 174 60
Asbestos cement pressure pipes - class 25 . . . . .	m	5 847	122 557 38
pipes - class 20 . . . . .	m	26 393	171 338 45
P.V.C. polythene pipes . . . . .	m	17 304	10 890 84
Cement . . . . .	tones	464	11 345 20
Sand . . . . .	m <sup>3</sup>	932	3 739 71



TABLE XII - 4 MATERIALS USED BY LIMASSOL REGIONAL OFFICE (Cont.)

Materials used	Unit	Quantity	Value £
Aggregates . . . . .	m <sup>3</sup>	1 242	4 365 47
Mild steel . . . . .	tones	79	9 765 00
Sand for pipe bedding	m <sup>3</sup>	20 687	25 806 46
Ready mixed concrete . .	m <sup>3</sup>	217	4 774 00
Fittings . . . . .	No.	43 506	112 558 86
Sluice valves . . . . .	No.	1 470	38 851 82
Water meters . . . . .	No.	395	8 132 00
Shingle . . . . .	m <sup>3</sup>	9 552	28 656 72
Total .. .. .			<u>£833 736 90</u>

**OPERATION AND MAINTENANCE**

The Limassol Regional Office was responsible for the operation and maintenance of all projects in the District of Limassol.

Yermasoyia-Polemidhia Project

Pissouri-Alekhtera Irrigation Schemes

For repairing and maintenance of water meters and valves and general maintenance and painting of metal structures, etc. a sum of £19,639 was spent on Yermasoyia-Polemidhia Dams and Distribution network and £775 on Pissouri-Alekhtera Irrigation Schemes. The amount of £1,012 was spent for the maintenance of the pumping units in Kouris Delta Emergency scheme.

Amathus Water Supply

The scheme operates with automatic control equipment. The operation and maintenance are carried out by the Regional Office of the Department in co-operation with Limassol District Officer.

For supervision, repairs and maintenance of water meters and valves and general maintenance and painting of metal structures etc. Expenditure: £3,511.

Village Water supply schemes

For repairs and maintenance of several water supply systems the sum of £8,465 was spent.

**MEETINGS**

During the year under review, the regional Engineer attended several meetings as the representative of the Director of the Department.

by

A.Lambrou

Executive Engineer I

Regional Engineer

#### General

In 1985 the staff of the Paphos Regional Office was composed of the following:

- 1 Executive Engineer I
- 10 Technicians I
- 3 Technicians II Monthly
- 9 Technicians II Daily
- 1 Chief Foreman
- 5 Foremen Monthly
- 3 Foremen Weekly
- 1 Officer Clerk
- 7 Clerical and accounting staff
- 1 Telephone Operator
- 2 Technicians II Hourly
- 1 Messenger

#### Surface Hydrology

During the year 10 permanent stream gauging stations, equipped with automatic water level recorders were in operation and weekly visits were made for observation, maintenance and calibration purposes by the use of current meter.

A total number of 526 current meter measurements were taken during the year for calibration purposes. Also samples for suspended sediment load and Boron analysis were taken regularly.

#### Springs

During the year 30 springs were under observation and a total number of 614 spring discharges were gauged, 568 by current meter and 46 volumetrically.



### Water Supply

The water supply of 132 villages was gauged during the months of September and October and samples for Ionic & Nitrates analysis were taken.

### Rainfall observing stations

Five rainfall observing stations equipped with automatic rain gauge recorders were in operation during the year, under weekly and monthly visits for observation.

### Ground Water Hydrology

Ground water conditions in South Western Paphos were observed with the help of 127 wells/boreholes.

The distance from established bench marks on top of every observati well/BH to the ground water level was measured twice a year, at the end of the wet season (March) when it is expected to be at highest level and at the end of dry season (November-December), when it is expected to be at the lowest level.

In addition monthly or weekly measurements of the ground water level were taken from 119 wells/BHs during the year for special studies.

During the year a total number of 1981 water level measurements were taken from wells/boreholes under observation as follows:

1633 water levels from S.W Paphos Hydrological Area  
348 water levels from Polis Project Area

### Analysis

A total number of 304 samples for analysis were taken from wells/boreholes, springs and streams, 42 of which were submitted to the Government analyst for Boron & Ionic analysis, 16 to the Department laboratory for suspended sediment, 123 to Khirokitia analyst for Nitrates & Ionic and 123 for Chloride content.

### Well sinking permits

A total number of 174 applications for sinking and covering permits for wells/boreholes were examined and submitted to the District Officer Paphos.

These applications were finally examined and approved by the Advisory Committee of the Ministry of Agriculture and Natural Resources.

The applications were examined as follows:

APPROVED			NOT APPROVED		
S.M.L Area	W.C.A	Non W.C.A	S.M.L Area	W.C.A	Non W.C.A
40	57	19	18	34	6

### Encroachments in Rivers and Streams

Fourty ~~three~~ cases for land encroachments in rivers and streams were examined and the Director of Land and Surveys Department was advised accordingly.

### Quarries and gravel pit permits

Fifty one applications for quarries and gravel pits permits were examined.

The Hydrological section undertook to supervise implementation of the special conditions laid by the Department to the Contractors exploiting the gravel and sand of the river beds.

### Plotting

During 1985, 41 wells/boreholes were plotted on L.R.O plans at Peyia and into the river beds of Dhiarizos- Ezousa special measures low areas covering a total area of 20 Km<sup>3</sup>.

### Pumping Tests

During the year 11 pumping tests, 5 of which for Tourist Development and six for agriculture development were carried out and relevant reports were submitted to the Director of the Department.



## CONSTRUCTION

The construction programme of Paphos District Office for 1985 included 26 Water Supply and Irrigation Schemes of a total cost of £ 603,799 pounds. Also another £ 54,003 pounds were spent for several other works, mainly coming from Public Works Department and the District Officer Paphos.

## INVESTIGATION AND DESIGN

The main task of this section is to solve all water supply and irrigation problems in Paphos District.

The planning and design of irrigation schemes were in Progress during 1985 and a total number of 4 new Projects were prepared. These schemes were submitted to the Director for approval and submission to the interdepartmental Committee for Evaluation. The table below shows separately the extent of land and the cost of each Irrigation Scheme.

TABLE XI-1

### IRRIGATION SCHEMES PREPARED IN 1985

Ser.No.	Village and Description	Est Cost £
1.	Improvements to K.Pyrgos, Irrigation division from B/H 3/85	45,000
2.	Ayios Georgios (Mamonia) improvement and installation electrosubmersible pump in B/H107/60	22,000
3.	Pano Arodes irrigation from existing spring	2,750
4.	Pendalia Irrigation (new plan)Irrigated 140 donums	<u>57,900</u>
		Total amount£137,650

### Village Water Supply Schemes

The design of new Water Supply Schemes for Paphos District continued during 1985 and a total number of 5 schemes were prepared and submitted to the Director for approval.

TABLE XI-2

DOMESTIC WATER SUPPLY SCHEMES PREPARED IN 1985

Ser. No.	Village and Description	Est. cost £
1.	Yiolou Supplementary water supply	40,500
2.	Akoursos Water Supply (House to House)	28,000
3.	Yeroskipos W. Supply. Improvement and replacement of distribution pipeline system	252,000
4.	Mesoyi W. Supply. Improvement and replacement of distribution system.	
5.	Tala Supplementary W. Supply	16,744
6.	Replacement of existing main conveyors in relation to training of road works for Polemi-Kannaviou	223,000
7.	Replacement of existing main conveyor in relation to training of road works for Pomos-K. Pyrgos	56,400
8.	Replacement of existing main conveyor in relation to training of road works for Emba-Tala.	16,800
	Total amount	£ 633,444

Also designed and prepared drawings for livestock area and for river training works, as follows:

1. Livestock area Khrysochou for	£ 13,200
2. Livestock area Kouklia for	14,150
Total amount	£ 27,350

Also 140 applications were investigated by this section during the year.

OPERATION AND MAINTENANCE

During 1985 the Paphos District Office dealt with the operation and maintenance of the several water works in Paphos i.e. Paphos Dams, Khrysochou valley irrigation scheme and the Various Government Water Supply Scheme.

Regarding the Government Water Supply Schemes a detail report covering both the expenditure and the revenue generated has been submitted to the Director.



Also 275 applications regarding E.A.C and CYTA way leaves were examined during 1985

Committee Meetings

During the year under review the District Engineer attended several meetings as the representative of the Director or as member of several local committees.