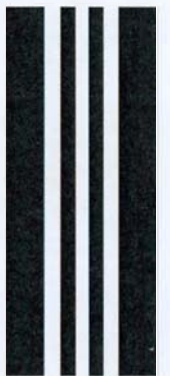


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Republic of Cyprus

Ministry of Agriculture and
Natural Resources

WATER DEVELOPMENT DEPARTMENT **ANNUAL REPORT 1983**

C St. Lytras M. Sc. DIC B. Sc. — Director

WATER DEVELOPMENT DEPARTMENT
ANNUAL REPORT 1983

Village Water Supply Schemes

The design of new water supply schemes for Paphos District continued during 1982 and a total number of 6 schemes were prepared and submitted to the Director for approval.

TABLE XII-2
DOMESTIC WATER SUPPLY SCHEMES PREPARED IN 1983

1) Lemba W. Supply House to House Scheme	£ 18,700
2) Ay. Dimitrianos Improvements	£ 1,560
3) Ay. Marina Khrysockou New Main Conveyor	£ 16,500
4) Ay. Ioannis Improvements	£ 3,970
5) Nikoklia W.S. B/H Combined with irrigation	£ 42,400
6) Pano Pyrgos, K. Pyrgos W.S. Combined scheme for both villages of a total cost of	£ 145,000

Also several schemes of a total cost of £ 3,700 for improvement of springs were prepared and were submitted to the District Office Paphos.

Operation, maintenance and investigation section

During 1983 the Paphos Regional Office dealt with the operation and maintenance of the Several Water Works in Paphos i.e. Paphos Dams, Khrysockhou Valley irrigation scheme and the various Government water supply schemes.

Regarding the Government Water Supply schemes a detail report covering both the expenditure and the revenue generated has been submitted to the Director.

Additionally several cases regarding water supply and irrigation problems were investigated.

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.

Plotting

During 1983, 82 new wells/BHs were plotted on LRO¹ into the river beds of Dhiazizos - Xeros - Akhelia special measures law area covering a total area of 45.9 km². ^{plans}

Pumping Tests

During the year 6 pumping tests, 5 of which for Tourist Development and one for new water supply scheme were carried out and relevant reports were submitted to the Director of the Department.

Construction

The Construction programme of the Paphos Regional office for 1982 included 21 water supply and Irrigation Schemes of a total cost of £ 300,457.000. Also another £ 85,295.000 pounds were spent for several other works, mainly coming from Public Works Department and the District Officer Paphos.

Design Section

The main task of this section is to solve all water supply and irrigation problems in Paphos District.

Irrigation Schemes

The Planning and design of irrigation schemes were in progress during 1983 and a total number of 10 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 extend of land and the cost of each irrigation scheme.

TABLE XII-I
IRRIGATION SCHEMES PREPARED IN 1983

Serial No	Village and Description	Land Irrigated	Estimated Cost £
1	K. Pyrgos Irrigation B/Hs 50/81, 51/81	200	£ 80,500
2	Khoulou, Kartavines B/Hs 181/63, 74/81	110	£ 37,780
3	Kilinia Groutis spring	74	£ 5,090
4	K. Pyrgos Irrigation improvements		£ 5,400
5	Salamiou B/H 97/79	210	£ 56,775
6	Yiolou Ay. Georgios B/H 96/80	65	£ 35,350
7	Yiolou Ay. Nipios B/Hs 90/80, 66/80	220	£ 77,280
8	Kr.Terra Kephlovrysos B/H	375	£ 23,200
9	P. Akourdalia Grailles - Villourka	110	£ 28,000
10	Kholetria B/H 27/69	170	£ 62,600
326		Total	£ 411,975

In addition monthly or weekly measurements of the ground water level were taken from 118 wells/BHs during the year for special studies.

During the year a total number of 2106 water level measurements were taken from wells/BHs under observation as follows:

from

1758 water levels from S.W. Paphos Hydrological Area
348 " " " Polis Project Area.

Analysis

A total number of 497 samples for analysis were taken from Wells/BHs, springs and streams, 70 of which were submitted to the Government analyst for Boron & Ionic, 152 to Khirokitia analyst for Nitrates & Ionic, 34 to the Departmental laboratory for suspended sediment and 241 were analysed in the Paphos district office for chloride content.

Questioning

The annual questioning was carried out in South Western Paphos Hydrological area on 2640 owners of wells during summer for determining the ground water extracted, area irrigated and kind of crops planted.

Well sinking permits

A total number of 144 applications for sinking and covering permits of Wells/BHs 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		
SML Area	W.C.A.	Non W.C.A.	SML Area	W.C.A.	Non W.C.A.
18	58	7	17	40	4

Encroachments in Rivers and streams

Thirty cases for land encroachments in rivers and streams were examined and the Director of Lands and Surveys Department was advised accordingly.

Quarries and Gravel pits permits

Twenty seven 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.

Pumping schemes on Turkish boreholes

Six applications regarding improvements of Turkish boreholes were received by this office and relevant investigations were carried out. When necessary pumping schemes were prepared and reports were submitted to the General Committee for approval.

XII PAPHOS REGIONAL OFFICE

By

A. Lambrou
Executive Engineer I
Regional Engineer

General

In 1983 the staff of the Paphos Regional Office was composed of the following:

- 1 Executive Engineer I - Head
- 8 Technician I
- 3 Technicians II Monthly
- 4 Technicians II Daily
- 1 Assistant chief Foreman
- 5 Foremen Monthly
- 3 Foremen Weekly
- 1 Secretary
- 5 Technicians II hourly

Surface Hydrology

During the year 13 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 736 current meter and 18 volumetric 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 35 springs were under observation and a total number of 614 spring discharges were gauged, 46 by current meter and 568 volumetrically.

Water Supply

The water supply of 132 villages was gauged during the months of September and October and samples for Iodic & 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 126 wells/BHs.

The distance from established benchmarks on top of every observation 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 the dry season (November-December) when it is expected to be at the lowest level.

TABLE XI - 4

MATERIALS USED BY LIMASSOL REGIONAL OFFICE

Materials used	Unit	Quantity	Value £
Galvanized steel pipes	m	117 556	451 055
Asphalt coated steel pipes . .	m	18 721	104 822
Asbestos cement pressure pipes - class 15	m	24 630	212 999
Asbestos cement pressure pipes - class 20	m	6 821	29 269
PVC pipes	m	4 975	781
Cement	tonnes	466	10 274
Sand	m ³	2 100	6 819
Aggregates	m ³	1 400	6 331
Mild Steel	tonnes	50	6 952
Ready mixed concrete	m ³	297	6 508
Fittings	No	28 730	72 282
Sluice Valves	No.	2 996	19 890
Water meters	No	380	6 481
Total			<u>£934 763</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 ProjectPissouri-Alectora Irrigation Schemes

For repairing and maintenance of water meters and valves and general maintenance and painting of metal structures, etc. a sum of £11 441 was spent on Yermasoyia-Polemidhia Distribution network, £1 115 on Polemidhia Dam, £2 655 on Yermasoyia Dam and £335 on Pissouri-Alectora Irrigation Schemes.

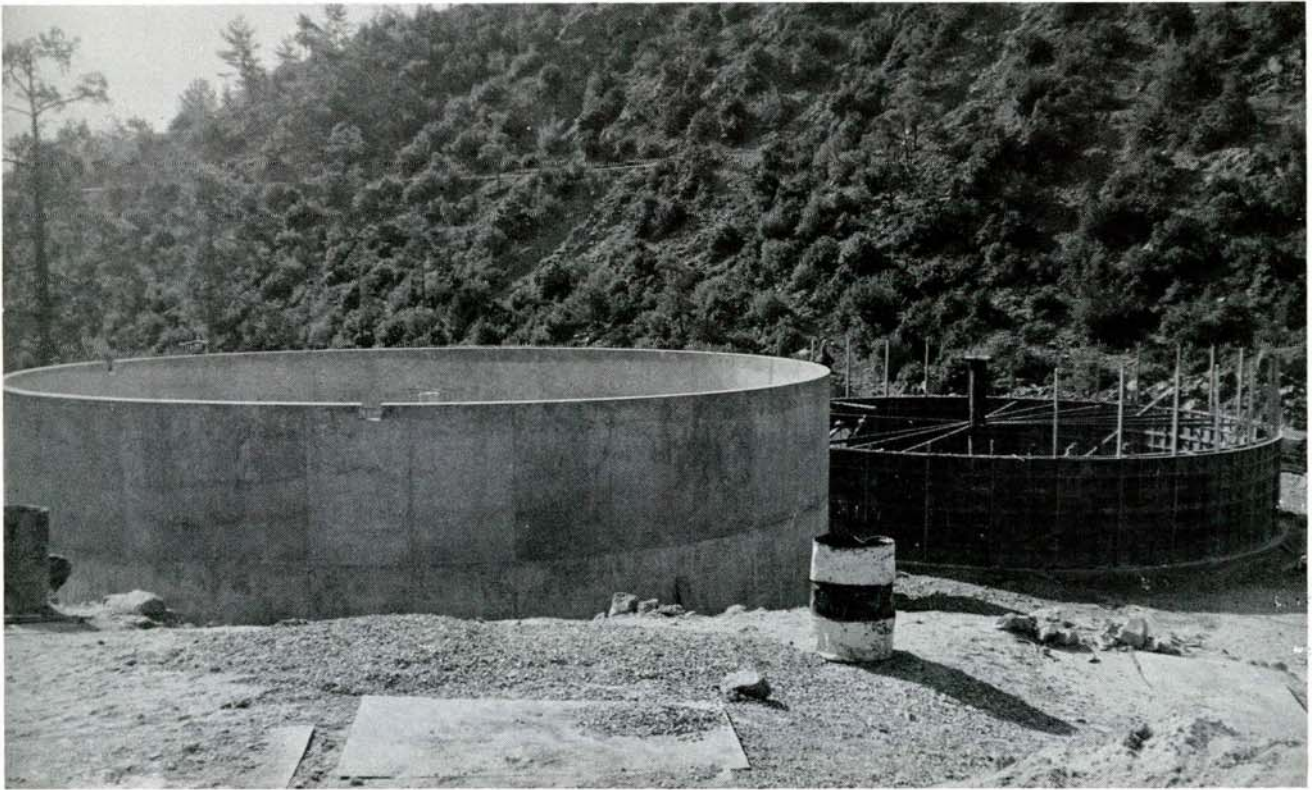
Amathus Water Supply

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: £1 984.

Village water supply schemes

For repairs and maintenance of several water supply systems the sum of £5 607 was spent.



Kato Amiantos irrigation tanks, WDD Photo D79-5, 19.9.83

In addition to the above 74 cases (applications) were examined and the relevant technical advice was given to those concerned.

CONSTRUCTION

Routine Irrigation and Domestic Water Supply Schemes

Several schemes were constructed by the Limassol Regional Office for minor irrigation schemes, village water supplies and water supply schemes for refugee housing estates. These are listed under CONSTRUCTION DIVISION.

Major Irrigation Schemes

Kouris Delta Emergency Scheme

The Kouris Delta Emergency Scheme was the main measure among others measures taken against the drought of 1983. This scheme involved the utilization of nine boreholes (seven in the Kouris Delta Area and two in Trachoni Area) and the connection of the boreholes to the distribution network of Yermasoyia-Polemidhia Project. A length of 8 500 m pipeline dia \varnothing 200 to \varnothing 600 was laid and a balancing tank of 500 m³ was constructed. The whole scheme was completed in two months period.

The total cost of construction works was £537 045. The operation cost for the extraction of 1.224 MCM of water was £42 985.

Materials and Machinery

By the end of the year 1983 the following materials and machinery for irrigation and water supply projects have been used.

TABLE XI - 3

MACHINERY USED BY LIMASSOL REGIONAL OFFICE

Machinery Employed	Unit	Quantity	Value £
Tiper lorries	-	agreed	5 457
Tiper lorries	w/hours	561	1 520
Buses	w/days	153	1 454
Electrowelding machines	w/hours	3 642	2 840
Caterpillars	w/hours	443	3 009
Caterpillars	agreed	-	554
Cutting machines	w/hours	280	280
Saloon cars	w/days	497	2 370
Land rovers	w/days	2 840	22 507
Diggers	w/hours	9 376	36 140
Compressors	w/hours	2 896	4 307
Concrete mixers	w/days	368	841
Total			<u>£76 972</u>

54	<u>Moniatis</u> . Supplementary supply for land division of M & S Estates Ltd. (File No. D686/78)	3 000
55	<u>Kolossi</u> . Supplementary supply for land division of PAMIDA CYPRUS MID. EAST STEEL ENTERPRISES LTD (File No. D293/79)	14 250
56	<u>Asgata</u> . Design to construct new storage tank in high position	8 900
57	<u>Polemidhia</u> . Supplementary supply of Refugee (policemen) officers estate	5 000
58	<u>Ayios Athanasios</u> . Supplementary supply for land division (File No. 536/81)	1 600
59	<u>Kolossi</u> . Supplementary supply of houses at plot 330/1 Sh/Pl 58/6 (File No. B72/83)	4 700
60	<u>Yermasoyia</u> . Supplementary supply at plot 1 Sh/Pl 54/52 (File No. D486/74)	3 900
61	<u>Kilani</u> . Design to construct new storage tank in high position	7 800
62	<u>Kantou</u> . Supplementary supply of the proposed cementery at plot 179 Sh/Pl 55/53	2 470
63	<u>Amathus</u> . Supplementary supply at the cement factory from Amathus water supply	12 200
64	<u>Kato Polemidhia</u> . Re-evaluation for land division (File No. D 29/81)	1 340
65	<u>Alassa</u> . Stock farm water supply	18 600
66	<u>Amathus</u> . Supplementary supply at plot 90/3/1 Sh/Pl 54/47	2 500
67	<u>Yermasoyia</u> . Supplementary supply at plot 204/1 Sh/Pl 54/52	1 470
68	<u>Amathus</u> . Supplementary supply at plot 239/271/1/1 Sh/Pl 54/45	1 160
69	<u>Amathus</u> . Supplementary supply at plot 47 Sh/Pl 54/45	2 000
70	<u>Amathus</u> . Supplementary supply at plot 103/1/1 Sh/Pl 54/45 (File No. D373/79)	2 000
71	<u>Palodhia</u> . Removing and installation of the pipelines of water supply distribution system near the new road	5 800
72	<u>Yermasoyia</u> . Removing of pipelines of Yermasoyia distribution system near the sea shore road	1 960
73	<u>Pano Kividhes</u> . Supplementary supply for land division	4 300
74	<u>Pera Pedhi</u> . Utilization of B/H 109/77 for the improvement of water supply	11 000
75- 101	Twenty seven minor cases in 27 villages of total cost	11 505
	Total	<u>£1 290 305</u>

31	<u>Kouka</u> . Re-evaluation for land division at plots 725/1, 723, 726 Sh/Pl 47/28 (File No. D160/82) . . .	4 100
32	<u>Polemidhia</u> . Supplementary supply of Refugee Government officers estate	3 500
33	<u>Yermasoyia</u> . Supplementary supply at plot 201/272 Sh/Pl 54/52	2 900
34	<u>Amathus</u> . Supplementary supply at plot 246/1/1/4 Sh/Pl 54/45 & 53	1 400
35	<u>Kolossi</u> . Re-evaluation for land division at plots 309/1, 278/4/1 Sh/Pl 58/6 (File No. D708/77)	3 000
36	<u>Pano Polemidhia</u> . Substitution of water supply distribution system	12 000
37	<u>Episkopi</u> . Substitution of water supply distribution system	103 000
38	<u>Episkopi</u> . Supplementary supply at plot 273 Sh/Pl 53/61 (File No. B519/81)	2 120
39	<u>Amathus</u> . Supplementary supply at plot 102 Sh/Pl 54/45 (File No. B553/81)	3 700
40	<u>Ayios Athanasios</u> . Re-evaluation for supplementary of plot 284 Sh/Pl 54/42 (File No. 67/74)	2 450
41	<u>Kolossi</u> . Supplementary supply for land division at plots 120, 122/1, 123, 23 Sh/Pl 58/6 (File No. D218/80)	5 650
42	<u>Avdhimou</u> . Refugee self housing scheme	6 400
43	<u>Amathus</u> . Supplementary supply at plots 191, 192, 193/3, 193/4, 195/2, 193/2, 190/2/1/2, 190/2/1/1, Sh/Pl 54/47	1 800
44	<u>Ypsonas</u> . Re-evaluation for land division at plots 281, 282 Sh/Pl 53/63 (File No. D20/79)	5 900
45	<u>Yermasoyia</u> . Utilization of B/H 107/61 for the improvement of the village water supply	16 000
46	<u>Episkopi</u> . Stock farm water supply and supplementary of land division for the permanent inhabitants	20 800
47	<u>Kato Polemidhia</u> . Refugee self housing scheme phase "C"	9 100
48	<u>Souni Zanatjia</u> . Supplementary supply of 17 houses (File No. B327/80)	4 700
49	<u>Amathus</u> . Supplementary supply at plot 37 Sh/Pl 54/45	4 900
50	<u>Moniatis</u> . Re-evaluation for land division at plot 56/1 Sh/Pl 47/21 (File No. D330/79)	3 500
51	<u>Amathus</u> . Supplementary supply at plot 229/1 Sh/Pl 54/45	2 140
52	<u>Lofou</u> . Re-evaluation for supplementary the proposed church of Ayia Marina	7 300
53	<u>Amathus</u> . Supplementary supply at plots 144/1, 146, 149, 147, 147/1 Sh/Pl 54/39	14 000

9	<u>Pissouri</u> . Improvement of water supply scheme by Mesa Poros stream (Constructing of weir and filter) .	3 500
10	<u>Paramali</u> . Supplementary supply to plot 167/1 Sh/Pl 52/64	1 420
11	<u>Limassol</u> . Design to utilize the B/Hs EB51/77 EB50/77 and EB97/70 for the improvement to Limassol water supply	534 000
12	<u>Yermasoyia-Omonia</u> . Removing of pipelines on the new road Yermasoyia-Omonia quarter	21 430
13	<u>Amathus</u> . Supplementary supply to plot 61/3 Sh/Pl 54/45	3 280
14	<u>Kato Polemihia</u> . Supplementary supply to Verengaria locality from K. Polemihia distribution system	7 000
15	<u>Kato Polemihia</u> . Substitution of distribution system at Evangelistria Street	8 000
16	<u>Louvaras</u> . Removing of pipeline Louvara-Ayiou Mama from Trimiklini camp	1 600
17	<u>Amathus</u> . Supplementary supply to plots 104, 103/1/1/1/2, 103/1/1/2 Sh/Pl 54/45	2 400
18	<u>Amathus</u> . Supplementary supply to Aphrodite Holiday Apartments at plot 109 Sh/Pl 54/45	2 000
19	<u>Yermasoyia</u> . Re-evaluation of land division (File D381/80)	9 400
20	<u>Yermasoyia</u> . Evaluation to install chlorine systems near the storage tanks of Yermasoyia village	2 400
21	<u>Kato Platraes</u> . Utilization of B/H 81/81 for the improvement of village water supply	60 000
22	<u>Lofou</u> . Supplementary supply of Profitis Elias and Ayia Maria church	11 800
23	<u>Yermasoyia</u> . Supplementary supply for land division of STEPPA ENTERPRISES Ltd. (File (File D648/79)	2 360
24	<u>Ayios Athanasios</u> . Re-evaluation for land division at plots 457, 457/1 Sh/Pl 54/42 (File D 138/73)	1 100
25	<u>Ypsonas</u> . Design to substitute pipelines of small diameter in the village	4 100
26	<u>Mouttayiaka</u> . Refugee self-housing scheme phase "C" .	4 000
27	<u>Yermasoyia</u> . Removing of pipelines of the distribution system of Yermasoyia at Limassol By Pass	14 800
28	<u>Amathus</u> . Supplementary supply for land division at plots 154/3, 54/5, 162/1, 162/2, 163/1, 163/4 Sh/Pl 54/45 & 53 (File Nos B297/82/ST & B297/82	21 900
29	<u>Mouttayiaka Scheme</u> . Improvement of water supply by substitute the main pipes of the scheme	98 000
30	<u>Amathus</u> . Supplementary supply at plot 82/1/1/1 Sh/Pl 54/45 & 53	1 480

11	<u>Sykopetra</u> . Improvement of distribution system of <u>Agriidhia</u> Konomidhes Irrigation Division	4 500
12	<u>Agros</u> . Improvement of distribution system of <u>Platania</u> Irrigation Association	1 850
13	<u>Alectora</u> . Improvement of Distribution system of <u>Alectora</u> Irrigation Division	8 900
14	<u>Moniatis</u> . Construction of new weir and substitution of main channel of <u>Saittas-Moniatis</u> Irrigation Division	16 300
15	<u>Akrotiri</u> . Design to take water from <u>Akrotiri</u> (<u>Elias</u>) channel by pumping for <u>Yermasoyia</u> aquifer	60 000
16	<u>Erimi, Kolossi</u> . Improvement of main channel <u>Erimi</u> of <u>Asomatos, Trachoni, Zakaki, Tserkez Tsiflik</u> Irrigation Division	41 000
17- 22	Six minor cases in six villages of total cost	2 505
	Total	<u>£636 755</u>

In addition to the above 90 cases (applications) were examined and the relevant technical advice was given to those concerned.

Water Supply Branch

For the development of water supply systems of Limassol District, 101 cases were examined and the relevant designs were prepared for the total cost of £1 290 305 as follows.

TABLE XI- 2

DOMESTIC WATER SUPPLY SCHEMES PREPARED IN 1983

Ser. No.	Village & Description	Est. cost £
1	<u>Episkopi</u> . Stock farm water supply and supplementary of new area of the village	58 000
2	<u>Pano Platres</u> . Supplementary supply to plot 33/2 Sh/Pl 47/12	3 070
3	<u>Pera Pedhi</u> . Improvement of water supply scheme by constructing new storage tank in high position	10 300
4	<u>Akrotiri</u> . Modification of the design of water supply distribution System	21 800
5	<u>Paramali</u> . Supervision of supplementary for land division at plots 180/3/2, 180/5, 180/4, 180/3/1, 180/3/3, 180/1, 179, 185/3, 185/2/2, 180/6 Sh/Pl 52/64	3 500
6	<u>Trachoni</u> . Re-evaluation for land division (file No. D229/72)	3 850
7	<u>Ayios Amvrosios</u> . Extension of the distribution system	5 000
8	<u>Amathus</u> . Supplementary supply to SANSI building No. 2	1 000

Records were also kept for rainfall (Max 61.0 mm on 24.12.1983) and water evapotranspiration (Max average 9.1 mm for 3 days period, 29.8.1983-31.8.1983) at Polemidhia Dam.

Quarry and Gravel Pits Permits

Six 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 19 Dams and Reservoirs. Maximum water stored during 1983 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 areas of Limassol District was the major task of this section.

Irrigation Branch

For the development of irrigation systems of Limassol District, 22 cases were examined, and the relevant designs were prepared for the total cost of £636,755 as follows:

TABLE XI- 4

IRRIGATION SCHEMES PREPARED IN 1983

Ser. No.	Village & Description	Est. cost £
1	<u>Arakapas</u> . Improvement of distribution system of Perasma tis Koutsis Irrigation Division	56 000
2	<u>Louvaras</u> . Improvement of Kato Pervolia-Maskalos proposed Irrigation Division	2 700
3	<u>Pera Pedhi</u> . Utilization of B/H 109/77 for the improvement of Pera Pedhi Irrigation Division . . .	47 700
4	<u>K. Polemidhia</u> . Removing of A.C. pipeline on the Limassol By Pass 1st solution	5 000
	2nd solution	9 000
5	<u>Pelendri</u> . Improvement of Dhimma tou Khoriou proposed Irrigation Association	1 400
6	<u>Prini</u> . Improvement of distribution system of Mylos Irrigation Division	5 200
7	<u>Erimi-Kolossi, Akrotiri, Trachoni</u> . Improvement of earth channels of Asomatos, Zakaki, Trachoni, Tserkez-Tsiflik Irrigation Division	310 000
8	<u>Kolossi</u> . Improvement of distribution system of Erimi-Kolossi Irrigation Division	47 000
9	<u>Avios Theodoros (of Agros)</u> . Improvement of distribution system of Pintoukia Irrigation Division	8 300
10	<u>Kantou</u> . Installation of electrosubmersible pump on B/H No. 4 of Limni Irrigation Division	9 400

analysis. In addition 162 samples were taken from kouris river for a special study.

Springs and Streams

The discharge of 50 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 for hydrological observations.

A total of 514 spring 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 6 springs and streams and the water level of 18 wells/boreholes were measured, within the framework of Pitsilia Project. A Total of 18 spring and stream measurements and 183 water level measurements were taken.

Groundwater Hydrology

Hydrogogical 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, Parekklisha and the rest of Limassol District.

Special Measures Law - Akrotiri Aquifer

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 purposes 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 this area from Yermasoyia and Polemidhia Dams, through the distribution system, of the Dam. Also from Kouris river, through the irrigation intakes, up to the end of May 1983.

Water extracted from Akrotiri Aquifer.

Purpose	MCM
Irrigation	11.02
Domestic	3.66
Industrial	0.90
Total	15.58
Water supplied from Dams	1.40
Total supplied for irrigation from the aquifer and from the Dams	12.42

Water Conservation Areas

The water situation within the Water Conservation Areas is also 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 30 wells/boreholes, the water level of which is measured once every week. During 1983, a quantity of 3.0 M.C.M. was released for recharge, in the aquifer, from Yermasoyia Dam.

Salinity is also observed taking water samples for analysis, twice a year, from a number of wells/boreholes.

The number of observation wells/boreholes in the Hydrological Areas, which are under control, is 272.

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 558 cases were investigated and permits were finally granted by the D.O. for 468 of them.

Limassol Water Supply

Water supply to Limassol, for domestic purpose from the springs and boreholes is gauged and monthly samples are taken both at the water source and at the two reservoirs, for chemical and bacteriological analysis. A total quantity of 7.8 MCM was supplied, 1.7 MCM from springs and 6.1 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 draw down, respectively.

Water samples were taken from each of the above sources, for chemical analysis.

Metereological Observations

Daily records were kept for rainfall (Max. 38.1 mm on 11.11.1983) water evaporation (Max. 10.3 mm on 26.7.1983) temperature (Max. 39.4 C on 26.7.1983), wind velocity and sun reflection, at Yermasogia Dam.

XI 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 the various sections as follows:

34 staff who serve in

- Water Resources 8
- Investigation and Design 7
- Construction 12
- Operation and Maintenance 2
- Clerical 4

For the execution of the construction works 20 foremen and 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 WATER RESOURCES DIVISION.

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.

Eight 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 293) and at the same time 14 water samples were taken for suspended sediment analysis. Another 24 water samples were taken from Kouris, Kryos and Zyghos rivers for suspended solids

Ser. No.	Village and Scheme	Est. Cost £
12	<u>Zyyi</u> Improvement of the village water supply network (placing central sluice valves).....	150
13	<u>Pano Lefkara</u> Relocation of conveyance pipeline of the VWS	10 800
14	<u>Kiti</u> Relocation of R C C channels to facilitate division of plots	2 040
1	Maintenance of irrigation channels of Kiti Dam Government Work	6 500
15	<u>Sharinou</u> Relocation of pipeline of the village water supply	350
16	<u>Skarinou-Ayios Theodoros-Alaminos</u> Improvement of the villages water supply (placing of a valve ball)	150
17	<u>Zyyi-Tokhni</u> Improvement of BH EB 22 of Irrigation Division	250

FAMAGUSTA DISTRICT

1	<u>Sotira</u> Improvement of the village water supply (placing central sluice valves)	420
	Relocation of pipelines of the village WS	6 800
2	<u>Liopetri</u> Improvement of the village water supply (placing central sluice valves).....	250
	Relocation of pipelines of the village water supply	5 000

CONSTRUCTION

VILLAGE WATER SUPPLIES

During 1983 the Regional Office undertook the Construction of various schemes listed under CONSTRUCTION DIVISION.

VARIOUS MINOR SCHEMES

LARNACA DISTRICT

Ser. No.	Village and Scheme	Est. Cost £
1	<u>Tersephanou</u> Improvement of the village water supply network (placing central sluice valves and air valves)	400
2	<u>Alethriko</u> Improvement of the village water supply net work (placing central sluice valves).....	350
3	<u>Troulli-Kellia</u> Relocation of pipelines of the villages water supply	2 600
4	<u>Dromolaxia</u> Self Housing Improvement of the village water supply network (placing central sluice valves)	320
5	<u>Meneou</u> Self Housing Improvement of the village water supply net work (placing central sluice valves)	250
6	<u>Pyrga</u> Improvement of the village water supply network (placing central sluice valves)	150
7	<u>Psevdhas</u> Improvement of the village water supply network (placing central sluice valves)	100
8	<u>Anaphotia-Aplanda</u> Relocation of conveyance pipeline of the VWS	2 300
9	<u>Anglisidhes</u> Improvement of the village water supply network (placing central sluice valves)	200
10	<u>Kivisil</u> Improvement of the village water supply net work (placing central sluice valves)	150
11	<u>Psematismenos-Maroni-Zyyi</u> Relocation and repairs of pipelines of the villages water supply	350

Ser. No.	Village and Scheme	Est. cost £
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FAMAGUSTA DISTRICT

1	<u>Avgorou</u> Construction of a new Tower Tank	20 000
2	<u>Paralimni</u> Improvement of existing house to house scheme water supply	440 000
3	<u>Ayia Napa</u> Improvement of water supply from BH hyd.No.26 (Monopetra)	19 000
4	<u>Dherinia</u> Improvement of part of the existing house to house water supply scheme	30 000
5	<u>Dherinia</u> water supply for the industrial zone area	19 000
6	<u>Phrenaros</u> Improvement of Water Supply	6 100
7	<u>Akhna Forest</u> Refugee self housing house to house scheme phase "C"	30 000

B STOCK FARMING AREAS WATER SUPPLY

LARNACA DISTRICT

1	<u>Aradhippou</u> Supplementary water supply of stock farming area	14 000
2	<u>Kophinou</u> Supplementary Water supply of Stock Farming Area	6 000

FAMAGUSTA DISTRICT

1	<u>Farenaros</u> Water Supply for the village Stock Farming Area	17 000
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C IRRIGATION WORKS

LARNACA DISTRICT

1	<u>Kellia</u> Irrigation Division from BH 40 T/79	50 000
2	<u>Avios Theodoros</u> Expansion of irrigation division from BH 64/73	4 848
3	<u>Psematismenos</u> Expansion of irrigation Div.	1 500
4	<u>Skarinou</u> Expansion of irrigation Division	5 800

Ser. No.	Village and Scheme	Est. Cost £
4.	<u>Athienou</u> Improvement of the village water supply	23 000
5	<u>Ayia Anna</u> : Improvement of part of the existing house to house scheme water supply	1 800
6	<u>Kornos</u> Water supply of army camp	7 000
7.	<u>Makarios III Housing Estate</u> House to House scheme water supply	7 500
8.	<u>Dhromoloxia</u> , Water supply to T/C plots for Refugees	3 200
9	<u>Meneou</u> , Water supply of Meneoy Public Beach and hotel area	75 000
10	<u>Tersephanou</u> Construction of a new storage tank for the village water supply	23 000
11	<u>Kiti-Pervolia</u> Improvement of the village water supply	5 700
12	<u>Anaphotia-Aplanda</u> Improvement of the villages water supply	2 400
13	<u>Anaphotia</u> Water supply of village division of plots phase A (No. 15).....	5 200
14	<u>Anglisidhes</u> Supplementary water supply of Anglisidhes and Famagusta pipeline from Government BH 141/83	33 000
15	<u>Kophinou</u> Improvement of existing house to house scheme water supply	35 000
	Water supply of Kophinou slaughter house for Nicosia-Larnaca-Limassol from Khirokitia-Famagusta pipeline	69 000
16	<u>Khirokitia</u> Improvement of existing house to house scheme	40 000
17	<u>Zyvi Housing Estate</u> Water supply of commercial unit	1 800

Phrenaros : Improvement of the village water supply from new boreholes and for water supply of the proposed stock farming area of the village. For the solution of water supply problems.

Dherinia ; For improvement of part of the village water supply network and for water supply of the village Industrial Area.

Liopetri : Relocation of part of the village water supply network and for installation of a sluice valve for the water supply network.

Sotira : For relocation of part of the village water supply network and for the solution of water supply problems. Investigation of water supply for the stock farming area.

Avgorou : For the construction of a new tower tank of the village water supply.

Vrysopelles : For the solution of water supply problems.

Achna Forest : For expansion of the stock farming area of water supply network.

For all the villages of Famagusta District investigations were carried out for new sources of water supply in order to cope with the lack of rain.

DESIGNS SUBMITTED TO THE DIRECTOR FOR APPROVAL

A VILLAGE WATER SUPPLY

Ser. No.	Village and Scheme	Est. Cost £
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LARNACA DISTRICT

1	<u>Xylophaghou</u> : a) Improvement of existing house to house scheme water supply	63 000
	b) Water Supply of village division of plots (No.14) phase A	5 500
	c) Water Supply of village division of plots (No.45) phase B (Re-estimate)	8 000
2	<u>Ormidhia</u> Water supply of village division of plots (Re-estimate)	12 000
3	<u>Voroklini</u> Improvement of existing house to house scheme water supply	34 000

Livadhia : For antiflood works and for the solution of water supply problems. Water supply to new division of plots and installation of sluice valve for the water supply network.

Voroklini : Maintenance of antiflood works and for the solution of water supply problems. Improvement of the village water supply network.

Pyla ; For the solution of water supply problems.

Xylotymbau : Installation of a sluice valve for the village water supply network and for permits for the water supply of new division of plots.

Xylophaghou : Water supply for village division of plots and for improvement of the village water supply from a new Government borehole. Improvement of the village water supply network and for the solution of water supply problems.

Ormidhia : Investigation for improvement of the village water supply from a new Government borehole and for the water supply for the village division of plots. For the solution of water supply problems. Investigation for the construction of a small recharge dam.

Kellia-Troulli : Investigation for relocation of part of the villages water supply network.

For all the village in Larnaca District investigations were carried out for new sources of water supply in order to cope with the lack of rain.

FAMAGUSTA DISTRICT

Paralimni-Ayia Napa : Investigations for the installation of a new pumping main pipeline from Phrenaros reservoir of Famagusta to the community reservoir of the villages.

Ayia Napa : Investigation for improvement of the village water supply and extension of the water supply network. For the solution of water supply problems and for grant of state land for construction of the new stadium of the village.

Paralimni : Improvement of the village water supply network and relocation of part of the village water supply network. For the solution of water supply problems.

Livadhia : For antiflood works and for the solution of water supply problems. Water supply to new division of plots and installation of sluice valve for the water supply network.

Voroklini : Maintenance of antiflood works and for the solution of water supply problems. Improvement of the village water supply network.

Pyla ; For the solution of water supply problems.

Xyloymbou : Installation of a sluice valve for the village water supply network and for permits for the water supply of new division of plots.

Xylophaghou : Water supply for village division of plots and for improvement of the village water supply from a new Government borehole. Improvement of the village water supply network and for the solution of water supply problems.

Ormidhia : Investigation for improvement of the village water supply from a new Government borehole and for the water supply for the village division of plots. For the solution of water supply problems. Investigation for the construction of a small recharge dam.

Kellia-Troulli : Investigation for relocation of part of the villages water supply network.

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Paralimni : Improvement of the village water supply network and relocation of part of the village water supply network. For the solution of water supply problems.

Kiti-Pervolia : Improvement of the villages water supply from private boreholes or from new community boreholes.

Kiti ; Inspection for maintenance of irrigation channels of Kiti Dam Government Work and for the solution of water supply problems. Relocation of R C C channel to facilitate the division of plots.

Pervolia : For the solution of water supply problems of the village and tourist area.

Sophtheades : For grant of state land for a fish pond.

Kalokhorio : Improvement of the village water supply from a new Government Borehole and for the solution of water supply problems.

Ayia Anna : For improvement of the village water supply net work.

Psevdna : For the solution of water supply problems of the refugee self housing.

Pyrga : For the solution of water supply and irrigation problems. Permits for water supply to new division or plots.

Kornos : For improvement of the village water supply network and solution of the water supply problems.

Stavrovouni : For improvement of the Monastery Water Supply

Athienon : Improvement of the Water Supply from a new borehole and for permits for water supply for new division or plots.

Avdhellero : Investigation for the village water supply.

Aradhippou : Improvement of the village Stock Farming Area Water Supply from a new borehole and for Water Supply to farming buildings to "Chinachomeni" area of the village. For the solution of water supply problems.

Makarios III Government Housing Estate : For the extension of the water supply net work for building new Government Housing Estate.

Zenon-Kamares II Government Housing Estate ; Effluent pipeline from biological station to proposed dam at Aradhippou village.

Larnaca Salt Lake : Investigation for conveying water from the sea.

Mari : Case for including new division of plots to the irrigation division.

Pano Lefkara : Investigation for improvement of the village water supply and improvement of the village water supply network. Relocation of the conveyor pipeline of the village water supply.

Vavla ; Construction of a new water tank for Ayios Minas Monastery for water supply and irrigation purposes.

Ayii Vavatsinia : Case of building an illegal irrigation tank and for grant of state land to farmers of the village. For the solution of irrigation problems.

Kophinou ; Investigation for water supply of Nicosia-Limassol-Larnaca Slaughter house. Improvement of the existing house to house scheme water supply. For improvement of water supply to the stock farming area and for the solution of water supply problems.

Menovia : Connection of the village water supply to Khirokitia-Famagusta pipeline and for the solution of water supply problems.

Anglisidhes ; For anti-flood works and for the connection of the village water supply to Khirokitia Famagusta pipeline or to the Government Borehole 141/83. For the solution of water supply problems of the village.

Anaphotia-Aplanda : For the connection of the villages water supply to Khirokitia-Famagusta pipeline and relocation of part of the conveyor pipeline of the village water supply. For the solution of water supply problems.

~~Dhromolaxia-Meneou-Tersephanou~~ : For improvement of the complex water supply from Khirokitia-Famagusta pipeline.

Dhromolaxia ; For the solution of water supply problems of the village and Stock Farming Area and for water supply of new division plots for refugee self housing to T/C plots.

Meneou : For the solution of water supply problems and water supply of Meneou Tourist Area and public beach.

Tersephanou : For the construction of a new storage tank for the village water supply and for the solution of water supply problems.

INVESTIGATIONS AND DESIGN

Investigations

During 1983 the following investigations were carried out:

LARNACA DISTRICT

Alethriko-Mazotos-Kivisil : Improvement of the complex water supply from Khirokitia-Famagusta Pipeline.

Kivisil : Installation of a sluice valve for the village water supply net work.

Alethriko : Solution of the village water supply problems and placing of a sluice valve for the village water supply net work.

Maroni : Solution of Lakki-Xalona irrigation division problems.

Psematismenos: Investigation of expansion of Drakondies irrigation division and for the solution of water supply problems.

Tokhni : For the solution of water supply and irrigation division problems.

Ayios Theodoros ; Investigation for the solution of the irrigation division problems from BH 64/73 and completion of expansion of the irrigation division. Improvement of the irrigation division system from BH 14/74 and for the solution of water supply problems.

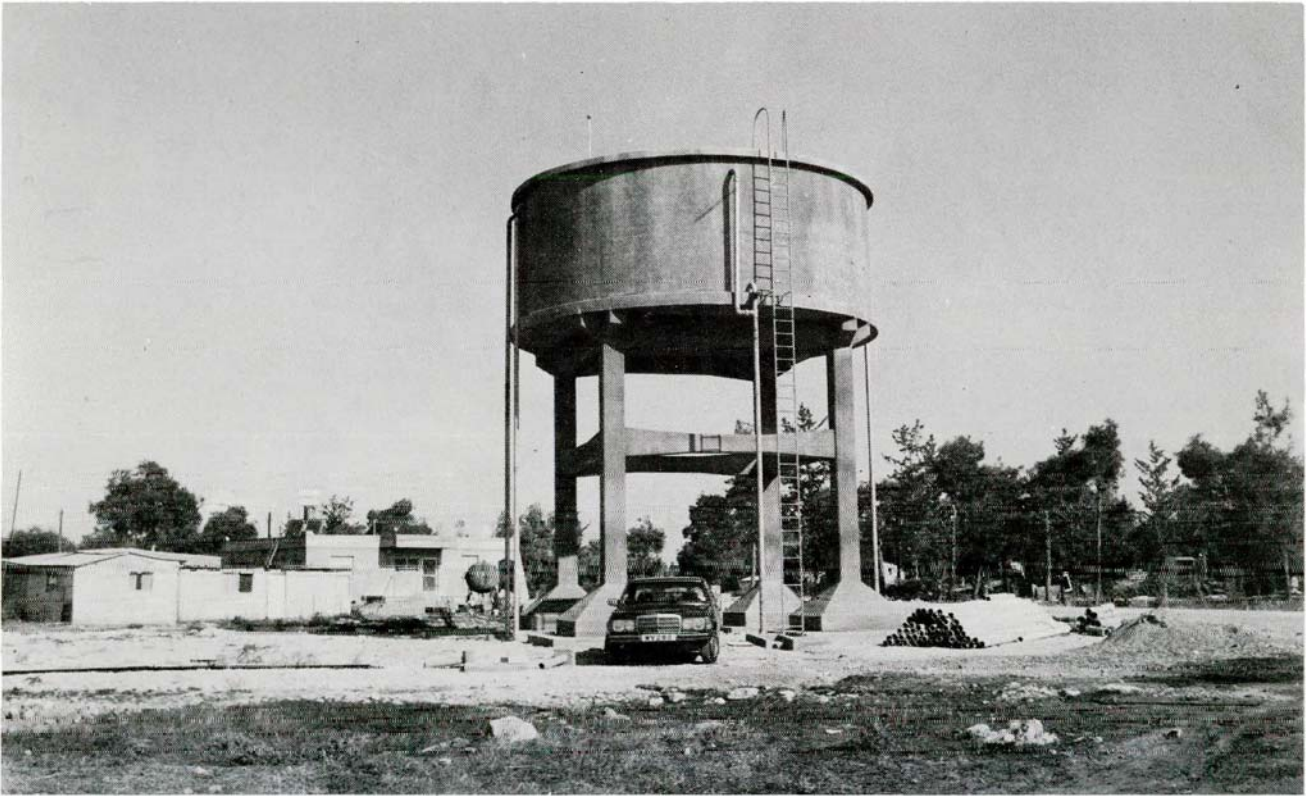
Skarinou : For the solution of water supply problems and relocation of pipelines of the village water supply.

Skarinou-Ayios Theodoros-Alamins : Investigation of the Water supply of the villages from the community borehole.

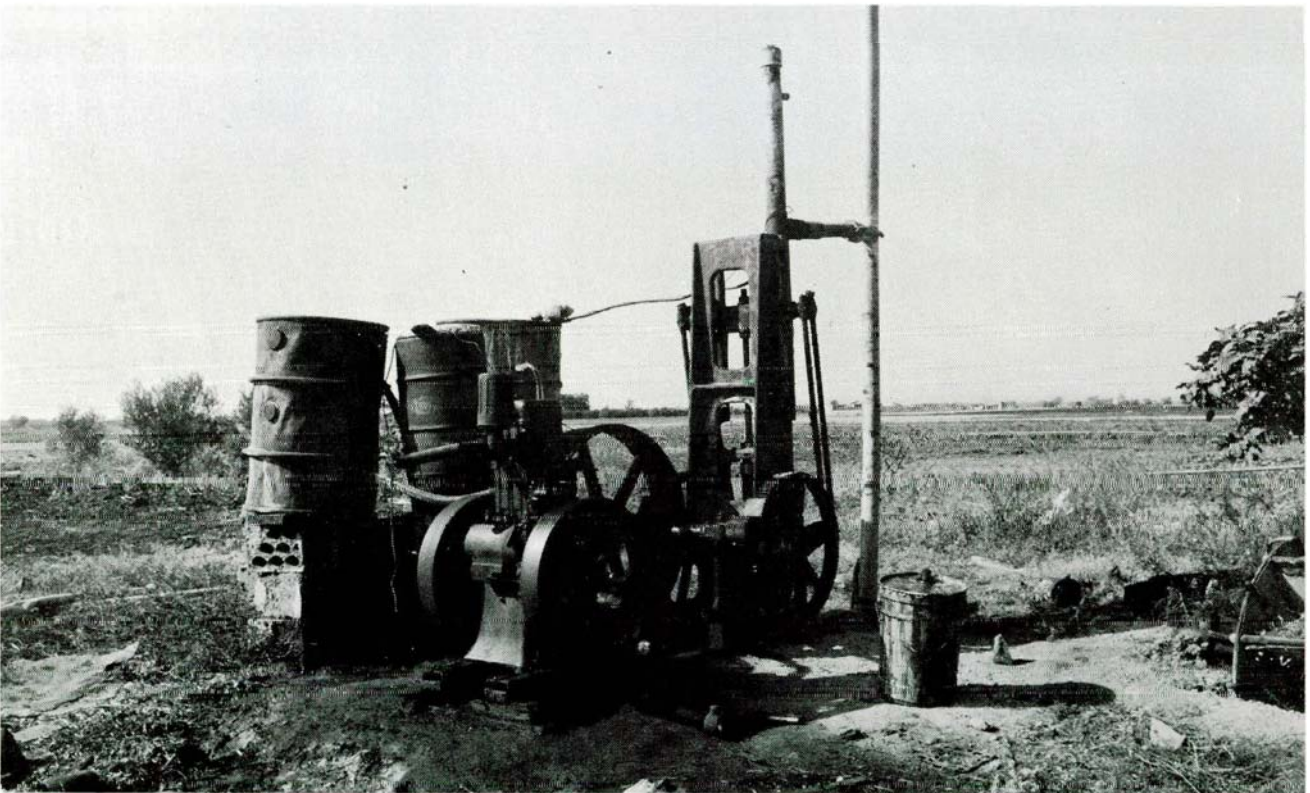
Khirokitia : Improvement of the village water supply net work and for the solution of water supply problems.

Kalavastos : Investigation for the cancellation of the old irrigation channels and for the extension of the village water supply network for water supply and new building plots.

Zyvi: For the solution of water supply problems and for water supply to new refugee self housing plots and water supply of commercial unit.



Akhna forest self-housing estate storage tank. WDD photo D89-1, 8.11.83



Kokkinokhoria Irrigation Area
Diesel engine and stirrup type pump. WDD photo D89-8, 8.11.83

Agriculture and Natural Resources. Some 842 applications are of cases lying in the conservation areas and another 320 in the non-conservation areas.

Apart from the above applications 610 cases dealing with wells/boreholes also were examined direct from the District Office of WDD 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.

From the above 341 cases were approved, 16 were not and 253 were returned to the District Officers for further examination.

Water Supply (Special Measures) Law 32/64

The major aquifers of Ormidhia and Xylophaghos which were declared as water conservation areas in the past, have been covered by the water supply (Special Measures) Law since 1982 whose purpose is to further, more efficiently protect and control the water resources.

For the above cases :

- The District Officer, with the concurrence of the Water Development Department and the Agriculture Department investigated a total number of 659 boreholes (legal or/and illegal).
- In Ormidhia Area, permits for 270 boreholes have been granted modifying the extraction of water and the areas to be irrigated.

Emergency Water Supply Scheme

Under the Emergency Water Supply scheme 109 boreholes in Larnaca District and 30 Boreholes in Famagusta District, all private, have been surveyed with the purpose of using them for Water Supply in case of emergency.

Under the emergency measures taken, the quantity of water given to several villages from the Lefkara-Famagusta pipeline was daily - from 25.4.83 to 31.10.83 - controlled and regulated accordingly by a member of our staff.

Also a number of 210 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 16 boreholes/wells for domestic water supply or 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 772.

Questioning

The annual questionnaire was carried out in the area where the plotting was completed. A total number of 2241 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 a sample was sent to the Government Laboratory for chemical analysis).

Quarries

A total number of 11 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

During the year the two Officers dealing partly in different studies concerning the Southern Conveyor continued.

The ground water level of 101 wells/boreholes was taken in South-Eastern Mesacria and another 49 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.

Wells sinking permits

A total number of 1162 applications for sinking, covering permits and the change of the conditions of permits of wells/boreholes were examined in the two Districts, and were presented to the General Advisory Committee for wells/boreholes of the Ministry of

6) Petra Dam (special case)

Maintaining of penstocks

Total expenditure: £33

7) Ayia Vavatsinias Dam

Installation of watermeter, sluice valves, manholes and flow regulators

Total expenditure: £600

8) Arakapas Dam

Installation of ladder and cleaning of Trashrack

Expenditure: Government share: £300

Village share £150

Total £450

9) Arakapas Pond No. 1

Repairing of the bank corner and cleaning of drainage ditch channel.

Total expenditure: £160

10) Eleudria Pond

Construction of diversion canal and protective wall, repairing of bank, water meters etc.

Expenditure: Government share: £267

Village share £533

Total £800

11) Kato Mylos Pond

Cleaning of drainage ditch channel

Total expenditure: £200

12) Kynerounda Pond No. 2

Repairing of the bank corners

Total expenditure: £410

13) Agriidhia Pond

Cleaning of drainage ditch channel

Total expenditure : £110

14) Lagoudera Pond

Repairing of the bank corners and cleaning of drainage ditch channels.

Total expenditure: £350

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X LARNACA - FAMAGUSTA REGIONAL OFFICE

by

T N Hamatsos
Executive Engineer I
Regional Engineer
General

By the end of the year the staff of the Regional Office of Larnaca and Famagusta was composed of the following Officers:

1 Executive Engineer
1 Senior Technician
5 Technicians I
9 Regular Employees
1 Secretary-Typist

HYDROLOGY AND WATER RESOURCES

Stream Gauging

During the year 3 permanent gauging observation (one monthly at Liopetri Dam and two weekly at Paralimni Lake) stations 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 488 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 64 of these observation boreholes was taken every month and another 10 of them was taken every two months.

The water level of 49 boreholes used for village water supplies were also taken once during the whole year.

Chemical Analyses

A total number of 772 samples were taken from Government and Communal or private boreholes/wells or springs and were sent to the Government or Departmental Laboratories for Chemical Analysis.

15) Ephtagonia Pond No. 1

Repairing of bank corners, P.V.C. appearance, cleaning of drainage ditch channel.

Total expenditure: £250

16) Ephtagonia Pond No. 2

Repairing of bank corners and cleaning of drainage ditch channel

Total expenditure: £370

17) Ephtagonia Pond No. 3

Repairing of bank and P.V.C. appearance

Total expenditure: £250

18) Akapnou - Ephtagonia Pond

Repairing of bank corners

Total expenditure: £160

19) Melini Pond

Cleaning of drainage ditch channels

Total expenditure: £160

20) Ayii Vavatsinias Pond No. 1

Cleaning of drainage ditch channels.

Total expenditure: £160

6) Petra Dam (special case)

Maintaining of penstocks

Total expenditure: £33

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II. Contributory Projects

1) Pyrgos Dam

Cleaning and repairing of leakage collector system. Painting of irrigation main from the dam up to the stilling chamber, with Evode. Repairing of joints of canals, Replacing of 70 No. irrigation posts, maintaining of sluice valves and repairing of breakages to canal wings.

Expenditure:- Government share	£625
Village share	<u>£313</u>
Total	£938

2) Palekhori Dam

Purchase of accessories and repairing of main 12"Ø irrigation meter.

Expenditure: Government share	£30
Village share	<u>£15</u>
Total	£45

3) Prodromos Dam

Maintaining of guard house, painting of woodwork and replastering of wall inside the guard house. Painting of guard house inside and outside. Repairing of fencing, Placing of 7 No. 3"Ø fence poles near the touristic area and Maintaining of sluice valves of distribution system.

Expenditure:- Government share	£480
Village share	<u>£240</u>
Total	£720

4) Pera Pedhi (special case)

Disilting operation

Total expenditure: £300

5) Lefka Marathasa (Special case)

Repairing of irrigation main.

Total expenditure: £47

8) Kalopanaxiotis Dam

Painting of bridge and treating of wood work with solignum, painting with Evode all air valves, sluice valves, break pressure valves and painting of manhole covers. Repairing of 4 No. breakages of irrigation mains.

Total expenditure: £839

9) Athalassa Dam

Fencing and constructing of 2 No. gates

Total expenditure: £224

10) Potamia

Disilting of gabbion weir

Total expenditure: £500

11) Ayios Theodoros Irrigation Scheme

Repairings to pipes and replacing of specials

Total expenditure: £450

(This sum was taken from the Kiti dam allotment)

12) Lefkara Dam (20A/15/244)

Repairing of scourings and regrading of access road, repairing of plumbing installation of the guard house and repairing of sluice valves of irrigation web. Replacing of 2 No. irrigation valves and one meter. Repairing of a breakage of the water supply main.

Total expenditure: £549

13) Xyliatos Dam (20A/36/344)

Repairings of pipe breakages, flow regulators, sluice valves, washouts etc.

Total expenditure: £1,601

4) Mavrokolymbos Dam

Cleaning of embankment from wild vegetation maintaining of engine and winch system.

Slabbing of 30 meters of canal, filling of joints with gutta terna. Cleaning of canals and siphons, painting of manhole covers, repairing of sluice valves and replacing 11 No. sluice valves.

Total expenditure £3455

5) Yermasovia and Polemidhia

Yermasovia Dam

Cleaning of embankment from wild vegetation painting of gates, railings, water level indicator and other metal structures. Maintening of engine and winch.

Polemidhia Dam

Constructing of a metal housing of engine. Painting of bridge, water level indicator and other metal structures. Maintaining of engine and winch. Removing of wild vegetation from embankment.

Distribution System

Repairing of irrigation meters, sluice valves and air valves. Painting of manhole covers and all specials.

Repairing of 34 No. breakages to irrigation mains.

Total expenditure: £11,213.

6) Fissouri Alektora Irrigation Scheme

Desilting of weir, cleaning of two reservoirs from silt and repairing of breakages of irrigation main.

Total expenditure:- £335

7) Kiti Dam

Removing of main 12" ϕ irrigation meter and installing of an air valve on irrigation main.

Repairing of 2 No. 12" ϕ irrigation meters at Kokkines outlets and concreting of a manhole.

294 Actual expenditure: £969

MAINTENANCE DETAILS FOR 1983

During the year under review the maintenance works carried out on each individual Project are summarized below. All costs were charged to Head 20A-Subhead 244 "Maintenance of Dams and Distribution Systems".

I. Government Projects

1) Ayia Marina Dam

Cleaning of embankment from wild vegetation, cleaning of gallery, painting of penstock and main sluice valve.

Repairing of sluice valves, replacing of 10 No. sluice valves, painting of manhole covers and grilles, repairing of access road.

Total expenditure: £998

2) Argaka Dam

Cleaning of embankment from wild vegetation cleaning of gallery and spillway, painting of bridge and flow recorder, repairs to woodwork of bridge.

Painting of manhole covers, repairing of sluice valves and replacing of 10 No. sluice valves.

Replacing of 3 No. irrigation meters and repairing of 8 No. breakages of distribution system.

Total expenditure: £1559

3) Pomos Dam

Cleaning of embankment from wild vegetation, cleaning of gallery and spillway.

Repairing of 280 No. canal joints. Painting of manhole covers grilles and main sluice valve. Repairing of sluice valves and replacing of 20 No. sluice valves.

Total expenditure:- £1195

TABLE IX-56

XYLIATOS DAM - WATER UTILIZATION

Item No.	Description	Qty	% Storage capacity
1	Water used for irrigation	49 614	4.1
2	Water used for recharge	Nil	Nil
3	Total water utilized	49 614	4.1

Water Utilization and Crops Irrigated

The distribution system of the Xyliatos irrigation project is still under construction. However there has been a relatively small agricultural activity in the area. During the year under review a quantity of 49,614 m³ of water was utilized for the irrigation of 80 donums of land planted mainly with olive trees, citrus, vegetables and potatoes.

TABLE IX-57

XYLIATOS DAMINCOME AND EXPENDITURE DATA

Item No.	Description	Qty m ³	Amount £
1	Water sold at nominal rates	49 614	1 488
2	Water sold at reduced rates	Nil	-
3	Water given free	Nil	-
4	Total quantity utilized and gross income	49 614	1 488
5	Operation cost	-	2 379
6	Maintenance cost	-	1 601
	Net income	-	- 2 492

Water Sale, Income, Operation and Maintenance costs

From the sale of water, the gross income during the year review, was £1,488. Operation expenses, including attendant and waterman wages and travelling costs, amounted to £2,379. The maintenance expenses were £1,601 and the net income to the project was £2,492 loss.

XYLIATOS PROJECT

The Xyliatos irrigation project consists of a dam reservoir of maximum capacity at spillway crest 1,220 000 m³ of water and a closed type distribution system commanding an area of 2 300 donums. The dam was completed by the end of September 1982 and it was closed on the 7th of October 1982. Irrigation in the project area started mid April 1983 and continued throughout the year until late in November 1983. During this period a total quantity of 49 614 m³ of water was used for the irrigation of an area of 30 donums planted with olive trees, citrus vegetables and potatoes in the Ayia Marina Village. The water was sold to the Farmers at a fixed charge of 30 mills/m³ and the gross income was £1 488. The operation expenses were £2 379 while the maintenance expenses were £1 601. A deficit of £2 492 was observed for the year under review.

Project Hydrology

The project hydrologic data as recorded during the year under review, are tabulated in table IX-55. Overflow over the spillway crest occurred during the period 16th March to 11th June 1983. The minimum quantity of water ever stored in the reservoir during the irrigation period, was 1 057 000 m³ and occurred in October 1983.

TABLE IX-55

XYLIATOS DAM

HYDROLOGY FOR 1983

Item No.	Description	Qty	% Storage capacity
1	Initial amount in storage	33 000	4.0
2	Inflow - Seepage	2 324 000	190.5
3	Total release for Irrigation	49 614	4.1
4	Leakages	168 000	13.8
5	Evaporation	96 000	7.9
6	Overflow	468 000*	38.4
7	Final amount in storage	1 196 000	98.0
8	Minimum quantity in storage	1 057 000	86.6
9	Storage capacity	1 220 000	100.0

* Roughly estimated

running costs of the project are not recovered by the income from the sale of water and an annual deficit of 27,475 was observed.

Out of the 1,770 donums commanded by the distribution system only an area of 555 donums was irrigated as shown on Table IX-54.

TABLE IX-54

KHREYSAKHOU VALLEY PROJECT - CROPS AND AREA IRRIGATED

Ser. No.	Crop	Area Donums
1	Citrus	164
2	Vines	12
3	Deciduous	20
4	Avocados	13
5	Vegetables	103
6	Tobacco	202
7	Others	41
	Total	555

AYIOS THEODOROS SCHEME (LARIACA)

The Ayios Theodoros Scheme consists of one borehole equipped with a mechanically driven pump, a regulating concrete dam and a distribution system made of pipes commanding an area of approximately 460 donums. The scheme is situated in the Laritaca District on the Pendankinos River and was completed in 1980. This scheme was turned over to the irrigators for the operation and maintenance. This was done because of the small size of the scheme and the limited quantities of water pumped.

In the year review the scheme was in operation from July to November during which period a total quantity of 60,894 m³ was pumped and used for irrigation. All the expenses for the operation and maintenance of the scheme were undertaken by the irrigators. The area irrigated was around 460 donums planted mainly with citrus.

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 $225 \text{ m}^3/\text{hr}$ the water will be given in total to the Pissouri Irrigation Division.
- * If the works divert more than $225 \text{ m}^3/\text{hr}$ but less than $325 \text{ m}^3/\text{hr}$ the $225 \text{ m}^3/\text{hr}$ 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 $325 \text{ m}^3/\text{hr}$ then the water will be allocated as follows:-

- a. $225 \text{ m}^3/\text{hr}$ to Pissouri Irrigation Division
- b. $100 \text{ m}^3/\text{hr}$ to Alektora Irrigation Division.
- c. 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 1983 and was completed in June 1983 when the river flow diminished.

During this period a total of $1,111,343 \text{ m}^3$ of water was utilized for the supplementary irrigation of 4,235 donums of land planted with vines.

KHRYSOKHOU VALLEY PROJECT

The Khrysokhou valley project consists of five boreholes equipped with electrosubmersible pumps, from 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 and was completed in June 1981.

Irrigation in the project area started in January and continued throughout the year until November 1983. During this period a total quantity of $422,754 \text{ m}^3$ of water was utilized by the farmers. From January 1st to September 8th the water was sold at 25 mils/m^3 and from Sept. 9th to December 31st at 35 mils/m^3 . The income amounted to £11,527. The operation and maintenance expenses including pumping cost amounted to £18,902. This shows that the

Project Operation Data for the last two years

Table IX-53 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 1982 figures.

TABLE IX-53

PAPHOS PROJECT - DATA ON OPERATION FOR THE LAST TWO YEARS

Item No.	Description	Unit	1982	1983	% change on 1982
1	Yield	1000 m ³	32 000	32 000	Nil
2	Water available	"	11 699	15 105	+21.1
3	Water utilized	"	10 422	13 064	+25.4
4	Water sold for irrigation	"	9 401	12 792	+36.1
5	Water sold for industrial use	"	356	272	-23.6
6	Total water sold	"	9 757	13 064	+33.9
7	Gross income	£	198 707	314 000	+58.0
8	Operation cost	£	18 959	102 400	+440.1
9	Maintenance	£	55 067	68 065	+23.5
10	Power cost	£	179 641	202 310	+12.6
11	Total cost	£	253 667	372 775	+47.0
12	Net income	£	-54 960	-58 775	-6.9
13	Area Irrigated	donums	13 536	18 432	+37.7

From the above Table it is seen that the project water utilization has increased tremendously. However the cost/income ratio is worsening since the annual cost are not recovered.

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 A R I 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 was dry, so no irrigation took place. The maintenance expenses were £224.

KHAPOTAMI PROJECT

The Kha-Potami irrigation project consists of a diversion weir and a diversion pipeline capable of diverting a flow of 500 cubic meters/hour when the Kha-Potami river is flowing in the months January-June. The project is supplying

Ser No.	Crop	Area donums
7	Melons	563
8	Avocadocs	63
9	Alfa-alfa	448
10	Ground-nuts	2 993
11	Legumes	3 141
12	Others	410
	Total	18 432

In addition to the above areas a further 3,190 donums of land commanded by Mavrekolymbos dam have been irrigated with supplies from the project western main conveyer.

Water Sale, Income, Operation and Maintenance Costs

The project developed a quantity 15.105 MCM out of which 12.792 MCM were used for irrigation, and 0.272 MCM were used for industrial purposes, while the rest 2,040 MCM were lost. The irrigation water was sold at the nominal rates of 20 mils/m³ up to 9th of September 1983 and 35mils/m³ after. The industrial water was sold at 30 mils/m³ up to 9th of September and 89mils/m³ after. From the sale of water the total income amounted to £314,000, whereas the operation, maintenances and power costs were £372,775. Details are shown on Table IK-52.

TABLE IK-52

MAVREKOLYMBOS IRRIGATION PROJECT - INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m ³	Amount £
1	Water delivered from Headworks	15 105 000	-
2	Water sold for irrigation	12 792 016	306 138
3	Water sold for industrial use	272 128	7 962
4	Total water sold	13 064 144	314 000
5	Operation cost	-	102 400
6	Maintenance cost	-	68 065
7	Pumping cost	-	202 310
8	Total annual cost	-	372 775
9	Net Income		- 58 775

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.

TABLE IX-49ASPROKREMIOS DAM-HYDROLOGY FOR 1983

Item No.	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	2 133 667	4.2
2	Inflow - Seepage	13 041 063	25.6
3	Total release	8 680 000	17.0
4	Leakages	47 321	0.1
5	Evaporation	1 731 781	3.4
6	Overflow	Nil	Nil
7	Final amount in storage	13 362 000	13.0
8	Minimum quantity in storage (Oct.)	11 496 000	22.5
9	Storage capacity	51 000 000	100.0

Water Utilization and Crops Irrigated

From the water developed, about 2,040,856 m³ were lost in the canal system, 272,128 m³ were used by industries and the remaining 13,064,144 m³ were used for the irrigation of 18,432 donums planted with various crops as shown on Table IX-51 (See Table IX-50 for water utilization).

TABLE IX-50PAFHOS IRRIGATION PROJECT - WATER UTILIZATION

Item No.	Description	Qty m ³
1	Water used for irrigation	12 792 016
2	Water used by industries	272 128
3	Water used for recharge	Nil
4	Total water utilized	13 064 144
5	Total water lost	2 040 856
6	Total water delivered from headworks	15 105 000

TABLE IX-51PAFHOS IRRIGATION PROJECT - CROPS IRRIGATED

Ser. No.	Crop	Area donums
1	Citrus	4 148
2	Bananas	921
3	Vines	1 635
4	Onions	374
5	Vegetables	485
6	Potatoes	3 251

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 51.00 MCM and a wellfield (24 nos boreholes) both 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 dam, the boreholes and the diversion from the Dhiarizos river.

Irrigation in the project area started in January 1983 and was completed late in December 1983. During this period a quantity of 12.792 MCM of water was utilized for the irrigation of 18,432 donums of land, planted with various crops. Also another 0.272 MCM was given for industrial purposes. In brief the water was utilized as shown on Table IX-48. The crops irrigated were citrus, vegetables etc. as shown on Table IX-51.

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 1983 is around £314,000. The operation and maintenance expenses amounted to £170,465 and the power cost to £202,310. Total annual cost amounted to £372,775.

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 20,033,888 m³ in June. The quantity of water of the order of 15,105,000 m³ was taken from the Asprokremmos dam, the boreholes and the river diversion as shown on Table XI-48.

TABLE IX-48

PAPHOS PROJECT-WATER RESOURCES

Item No.	Sources	Quantity m ³
1	Asprokremmos Dam	8 680 000
2	Boreholes in Dhiarizos river	3 660 000
3	Surface flow diversion from Dhiarizos river	2 765 000
	Total	<hr/> 15 105 000

Project Operation Data for the last two Years

Table IX-47 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 decreased and the net return was accordingly decreased.

TABLE IX-46

YERMASOYIA - POLEMIDHIA PROJECT

INCOME & EXPENDITURE DATA

Ser. No.	Description	Qty m ³	Amount £
1	Water sold at nominal rates	3 985 111	101 607
2	Water sold at reduced rates	Nil	Nil
3	Water given free of charge as water rights to:		
	- Yermasoyia Irrig. Division	324 200	Nil
	- Polemidhia Irrig. Division	137 435	Nil
4	Total quantity/income	4 446 746	101 607
5	Operation cost	-	69 041
6	Power cost	-	35 139
7	Maintenance cost (Yermasoyia & Polemidhi.)	-	17 080
8	Total cost	-	121 260
9	Net income	-	- 19 653

TABLE IX-47

YERMAOSYIA-POLEMIDHIA PROJECT - DATA ON PROJECT FOR THE LAST TWO YEARS

Ser. No.	Description	Unit	1982	1983	%Change on 1982
1	Capacity	1000 m ³	16 930	166 930	Nil
2	Water available	"	13 052	12 743	-2.4
3	Water utilized for irrigation	"	7 010	4 447	-36.6
4	Water sold	"	6 578	3 985	-39.4
5	Water given free	"	432	462	+ 6.9
6	Water used for recharge	"	1 983	2 999	+51.2
7	Total quantity used	"	8 993	7 446	-17.2
8	Gross income	£	170 054	101 607	-40.3
9	Operation cost	£	55 200	69 041	+25.1
10	Power cost	£	28 062	35 139	+25.2
11	Maintenance cost	£	11 716	17 080	+45.8
12	Total expenditure	£	94 978	121 260	+27.7
13	Net income	£	75 076	-19 653	-
14	Area Irrigated	donnums	15 440	15 440	Nil

TABLE IX-43

YERMASOYIA DAM
WATER UTILIZATION

Item No.	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	1 768 887	13.1
2	Water used for recharge	2 998 804	22.2
3	Water used for DWS	2 079 930	15.4
4	Total water utilized	6 847 621	50.7

TABLE IX-44

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 IX-45

YERMASOYIA - POLEMIDHIA PROJECT
WATER UTILIZATION

Ser. No.	Description	Qty m ³	% Storage capacity
1	Water used for irrigation (Y & F & Kouris Delta boreholes)	4 446 746	22.3
2	Water used for recharge	2 998 804	17.7
3	Water used for DWS	2 079 930	12.3
4	Water lost in pipe system	565 191	3.3
5	Total water utilized	9 525 480	56.3

From the sale of water the total gross income was £101,607. The operation cost including power cost totalled £104,180 whereas the maintenance costs spent on routine works was £17,080. Details regarding income and expenditure are shown on Table IX-46.

TABLE IX-41

YERMASOYIA DAM-HYDROLOGY FOR 1983

Item No.	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	2 896 000	21.4
2	Inflow-Seepage	3 569 025	63.5
3	Total release	6 972 451	51.6
4	Leakages	10 000	0.1
5	Evaporation	816 594	6.0
6	Overflow	Nil	Nil
7	Final amount in storage	3 564 000	26.4
8	Minimum quantity in storage (Dec.)	3 148 000	23.3
9	Storage capacity	13 500 000	100.00

* Roughly estimated

Water Utilization from both Dams

Details regarding water utilization from both dams separately and in combine are shown on Tables IX-42, IX-43 and IX-45. In summary during the year under review a total quantity of 7,445,550 m³ of water was utilized for irrigation and recharge purposes. Out of this quantity 4,446,746 m³ were utilized for the irrigation (fully or in part) of 15,440 donums as indicated in Table IX-44. This quantity includes the releases for irrigation from both dams

the water pumped from the boreholes of the Kouris Delta Emergency Scheme. The rest 2,998,804 m³ was utilized to recharge the Yermasoyia aquifer.

Water Sale, Income, Operation and Maintenance Costs

Details about the quantity sold at the nominal rates, water given free of charge as water rights and the water given at reduced rates are given in Table IX-46.

TABLE IX-42

POLEMIDHIA DAMWATER UTILIZATION

Item No.	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	1 582 515	46.1
2	Water used for recharge	Nil	Nil
	Total water utilized	1 582 515	46.1

The total gross income from the sale of water amounted to £101,607. The operating costs including power expenses amounted to £24,180. The maintenance works carried out by the WDD were of the order of £17,060. Net income to the project was £19,653 less. The above costs include also the operation, power and maintenance expenses of the "Kourris 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 2,018,002 m³ representing 58.8% of the reservoir capacity. The reservoir did not fill to spillway crest but it remained much lower with maximum quantity in storage around 1,626,000 m³ on the 21th April 1983. Leakages occurred through the dam and part of these were intercepted downstream for irrigation purposes. releases from the dam reservoir were 1,783,656 m³.

TABLE IX-40

POLEMIDHIA DAM-HYDROLOGY FOR 1983

Item No.	Description	Qty m ³	% Storage capacity
	Initial amount in storage	604 000	17.6
2	Inflow-Seepage	2,018 002	58.8
3	Total release	1 783 656	52.0
4	Leakages	350 059	10.2
5	Evaporation	166 291	4.8
6	Overflow	Nil	Nil
7	Final amount in storage	330 000	9.6
8	Minimum quantity in storage (Nov.)	225 000	6.6
9	Storage capacity	3 430 000	100.0

YERMASOYIA DAM

The Inflow-Seepage to the dam during the year under review was estimated at 8.569 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 8.796 MCM on the 13th May 1983.

Item No.	Data	Unit	1982	1983	%Change on 1982
8	Operation cost	£	12 046	11 819	-1.9
9	Maintenance cost	£	1 116	1 195	+7.1
10	Total expenses	£	13 162	13 014	-1.1
11	Net income	£	4 700	4 570	-2.8
12	Area irrigated	donums	990	1 015	+2.5

YERMASOYIA-POLEMIDHIA PROJECT

The Yermasoyia-Polemichia 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 3.43MCM. 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 well lower with maximum quantity in storage for Yermasoyia dam 10,300,000 m³ and for Polemidhia dam 1,626,000 m³.

For facing the drought of the year under review, the "Kouris Delta Emergency Scheme" was constructed at a cost of £360,000. According to that scheme seven boreholes were developed and a pipeline was installed to divert the pumped water into the distribution system of the Yermasoyia-Polemichia project. During 1983 from July to November, a quantity of 1,234,564 m³ of water was pumped and used for irrigation of an area of the Yermasoyia-Polemichia project.

Irrigation in the project area started early in January and continued through part the year until late in December 1983. A total quantity of 8,856,107 m³ released from both dams (7,072,451 m³ from Yermasoyia and 1,783,656 m³ from Polemidhia). Out of 8,856,107 m³, 3,777,373 m³ were given for irrigation, 2,998,804 m³ for recharge and 2,079,930 m³ for Domestic Water Supply. A total quantity of 4,446,746 m³ was used for the irrigation of 15,440 donums (partial or full) in the Sakaki, Phasouri, Akrounda-Phinikaria areas and Yermasoyia-Polemichia Irrigation Divisions. Of the 4,446,746 m³ of water, 461,635 m³ were given free of charge as water rights to the Yermasoyia and Polemidhia Irrigation Divisions (324,200 m³ for Yermasoyia and 137,435 for Kato Polemidhia) and the rest 3,985,111 m³ were sold at the nominal rates, 22 & 25 mils/m³ before September 9th and 27 & 30 mils/m³ after. A quantity of 565 191 m³ was lost in the pipe system.

The quantity released for recharge (2,998,804 m³) was used for recharge of the Yermasoyia aquifer downstream the dam structures. The aquifer is pumped for the supply of water for domestic use for the Limassol town, and the Moutayiak Regional watersupply scheme.

TABLE II-38

MAJOR REVENUE-INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m ³	Amount \$
1	Water sold at nominal rates	831 700	17 434
2	Water sold at reduced rates	30 100 *	150
3	Water given free of charge	Nil	Nil
4	Total quantity utilized and gross income	861 800	17 584
5	Operation cost	-	11 819
6	Maintenance cost	-	1 195
7	Net Income	-	4 570

* This quantity was taken from the overflow.

Project Performance Data for the Last Two Years

Table II-39 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 1983 over the previous year.

The quantity of water utilized for irrigation was decreased by 5.7% and the gross income by 1.6%. The area irrigated was increased by 2.5%.

The operational costs were decreased by 1.9% while the maintenance costs increased by 7.1%. Total expenses were down by 1.1%. Net income to the project was decreased by 2.8%.

TABLE III-39

POMOS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No.	Data	Unit	1982	1983	%Change on 1982
1	Capacity	1000 m ³	860	360	Nil
2	Water available in Storage	"	1 035	1 140	+10.1
3	Water utilized for irrigation	"	914	862	- 5.7
4	Water sold	"	914	862	- 5.7
5	Water given free	"	Nil	Nil	Nil
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	\$	17 862	17 584	- 1.6

Water Utilization and Crops Irrigated

The 861,800 m³ of water were utilized for the irrigation of 1,015 donums within the project area. Details about the water utilized and the crops irrigated are shown on Tables IX-36 and IX-37.

TABLE IX-36

POWOS DAM-WATER UTILIZATION

Item No.	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	861 800	100.2
2	Water used for recharge	Nil	Nil
3	Total water utilized	861 800	100.2

TABLE IX-37

POWOS DAM-CROPS IRRIGATED

Item No.	Crop	Area donums
1	Citrus	650
2	Bananas	250
3	Deciduous	25
4	Vegetables	35
	Cereals	30
	Others	25
	Total	1 015

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 861,800 m³. Out of this 831,700 m³ were sold at the nominal rates and the rest 30,100 m³ were sold at reduced rates because that quantity was taken from the overflow.

From the sale of water (see details on Table IX-38) the total gross income amounted to £17,584 whereas the operation and management costs were £11,819. Maintenance works on the dam and distribution system were £1,195. Net income to the project for the year under review amounted to £4,570.

POMOS PROJECT

The Pomos irrigation project consists of a dam reservoir of maximum capacity at spillway crest of 860,000 m³ of water and a distribution system made of a main canal and a closed type distribution system commanding an area of 2,850 donums.

Irrigation in the project area started early in April 1983 and continued throughout the year until the end of October 1983.

An area of 1,015 donums of land planted with citrus, bananas and vegetables was irrigated by utilizing 861,800 m³ of water. From the total water utilized 831,700 m³ were taken directly from the dam reservoir whereas the remaining 30,100 m³ were taken from the overflow.

The total gross income from the sale of water amounted to £17,584. The expenditure for the maintenance was £1,195 whereas the operation and management costs were £11,819. Net income to the project for the year under review was £4,570.

Project Hydrology

The project hydrologic data as recorded during the year are tabulated in table III-35.

The reservoir was filled to spillway crest in spillway crest in March the 4th and overflow occurred during the period March the 4th to April 30th 1983. Minimum water level in the reservoir occurred in October with water in storage around 61,360 m³.

TABLE III-35

POMOS DAM-HYDROLOGY FOR 1983

Item No.	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	87 500	10.2
2	Inflow-Seepage-Overflow	1 195 826	139.0
3	Total release	863 139	100.4
4	Leakages	102 573	11.9
5	Evaporation	70 551	8.2
6	Overflow	not measured	-
7	Final amount in storage	231 600	26.9
8	Minimum quantity in storage (Oct.)	61 360	7.1
9	Storage capacity	860 000	100.00

TABLE IX-33MAVROKOLYBOS DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Qty m ³	Amount £
1	Water sold at nominal rates	1 950 077	43 114
2	Water sold at increased rates	Nil	Nil
3	Water given free of charge	214 840	Nil
4	Total quantity utilized and gross income	2 164 917	43 114
5	Quantity bought from Paphos Project and cost	1 661 746	40 296
6	Operation cost	-	17 636
7	Maintenance cost	-	3 455
8	Net income	-	18 273

Project performance for the last two years

Table IX-34 shows data on the operation of the project for the last two years. The operation expenses were up by 24.7% and the maintenance expenses by 87.8%. The net income to the project is a loss of **£18 273** while last year the loss was £5 416.

TABLE IX-34MAVROKOLYBOS DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Data	Unit	1982	1983	% Change on 1982
1	Capacity	1000 m ³	2 180	2 180	Nil
2	Water available in storage	"	943	985	+ 4.5
3	Water utilized for irrigation	"	1 744	2 165	- 24.1
4	Water sold from dam	"	528	288	- 45.5
5	Water given free	"	100	215	115.0
6	Water used from Paphos Project	"	1 116	1 662	+ 48.9
7	Water used for recharge	"	Nil	Nil	Nil
8	Gross income	£	43 447	43 114	0.8
9	Operation cost	£	14 143	17 636	-24.7
10	Maintenance cost	£	1 840	3 455	+ 87.8
11	Cost of water bought from Paphos Project	£	32 880	40 296	+ 22.6
12	Total expenses	£	48 863	61 387	+ 25.6
13	Net income	£	- 5 416	-18 273	-
14	Area irrigated	donums	2 440	3 190	+30.7

Water Utilization and Crops Irrigated

During the irrigation season a total of 2,164,917 m³ of water was utilized for the irrigation of 3,190 donums of various crops as shown on Table IX-32.

TABLE IX-31

MAVROKOLY BOS DAM-WATER UTILIZATION

Item No	Description	Qty m ³	% Storage capacity
1	Water used for irrigation from dam	503 171	23.1
2	Water used for irrigation bought from Paphos Project	1 661 746	76.2
3	Water used for recharge	Nil	Nil
4	Total water utilized	2 164 917	99.3
5	Water lost	243 329	11.2

TABLE IX-32

MAVROKOLY BOS DAM-CROPS IRRIGATED

Ser. No	Crop	Area Donums
1	Citrus	180
2	Bananas	1 000
3	Vines	60
	Melons	500
5	Vegetables	900
6	Potatoes	500
7	Cereals	Nil
8	Others	50
	Total	3 190

Water Sale, Income, Operation and Maintenance Costs

From the sale of water the gross income was £43 114. The water sold from the dam reservoir was at nominal rates of 20 mils/m³ up to 9.9.83 and 30mils/m³ after. The operation expenses amounted to £17 636 where the maintenance works costs were £3 455. Net income to the project was a loss of £18 273. Details regarding the income expenditure and operation costs are shown on Table IX-33.

MAYROKOLYMBOS PROJECT

The Mavrokolymbos dam irrigation project consists of a dam reservoir of capacity 2.180 MCM at spillway crest and a distribution system of canal and pipes commanding an area of around 3,555 donums. Irrigation in the project area commenced early in January 1983 and continued throughout the year and was terminated late in November.

During the period a total quantity of 2, 408,246 m³ of water was utilized for the irrigation of 3,190 donums of bananas, vines and vegetables under cover and in the open. Of the 2,408,246 m³ utilized 1,950,077 m³ was sold at nominal rates, 214 840 m³ was given free of charge to the Potima Chiflik farmers as water rights and the rest 243,329 m³ were lost in the pipe system. Of the 2,408,246 m³ a quantity of 746,500 m³ were released from the dam and the rest 1,661,746 m³ were bought from Paphos Project.

The total gross income from the sale of water amounted to £43 114 where the operation cost amounted to £57 932 including purchase of water. The maintenance expenses were £3 455. A deficit of £18 273 was observed for the year under review.

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated on Table IX-30.

TABLE IX-30
MAVROKOLYMBOS DAM
HYDROLOGY FOR 1983

Item No	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	192 500	8.8
2	Inflow - Seepage	861 336	39.5
3	Total release	746 500	34.2
4	Leakages	Nil	Nil
5	Evaporation	68 439	3.1
6	Overflow	Nil	Nil
7	Final amount in storage	220 000	10.1
8	Minimum quantity in storage(Oct)	113 125	5.2
9	Storage capacity	2 180 000	100.00

There has been intercropping in the citrus plantation since the trees are very young.

Water Sale Income

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 30 mils/m³ and the income from the sale of irrigation water amounted to £1 600.

Project Operation Data for the Last Two Years

From the table it is shown that the quantity of water used for irrigation was decreased by 17.0% and the domestic water supply by 66.7%.

TABLE IX-29

LEFKARA DAM - PROJECT

OPERATION DATA FOR THE LAST TWO YEARS

Ser. No.	Description	Unit	1982	1983	%change on 1982
1	Capacity	1000 m ³	13 850	13 850	Nil
2	Water available	"	5 522	1 919	-65.2
3	Water utilized for irrigation	"	64	53	-17.0
4	Water utilized for domestic WS	"	4 437	1 479	-66.7
5	Total water utilized	"	4 501	1 532	-66.0
6	Inflow - Seepage	"	1 008	1 058	+ 5.0
7	Area irrigated	donums	130	130	0.0

TABLE IX-26

LEFKARA DAM - HYDROLOGY FOR 1963

Item No.	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	1 009 000	7.3
2	Inflow - Seepage	1 058 146	7.6
3	Total release	1 532 851	11.1
4	Leakages	21 661	0.2
5	Evaporation	126 329	0.9
6	Overflow	NIL	NIL
7	Final amount in storage	405 000	2.9
8	Minimum quantity in storage (Dec)	225 000	1.6
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 three main categories of use is shown on Table IX-27.

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 130 donums of land has been irrigated by using 53,362 m³ of water. The area was planted with citrus, vegetables and olive trees as shown on Table IX-28.

TABLE IX-27

LEFKARA DAM - WATER UTILIZATION

Items No.	Description	Qty m ³	% Storage capacity
1	Water used for domestic WS	1 479 489	10.7
2	Water used for irrigation	53 362	0.4
3	Total water utilized	1 532 851	11.1

TABLE IX-28

LEFKARA DAM-IRRIGATED CROPS

Ser. No.	Crop	Area Donums
1	Citrus	100
2	Vegetables	20
3	Olive trees	10
	Total	130

KITI DAM

The Kiti Dam irrigation project consists of a dam reservoir of storage capacity 1,610,000 m³ 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. The maintenance expenses were £969.

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 (e) 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 £1600. Maintenance works were carried out at a total cost of £549.

at Hydrology

The project hydrologic data as recorded during the year under review are tabulated in Table IX-26.

The water in the dam reservoir did not reach spillway crest but it remained much lower, with maximum quantity in storage around 1,205,000 m³ or 8.7% of the total capacity. The average inflow - Seepage to the dam reservoir during the year, was estimated at 1,058,146 m³. The minimum water level reached, occurred in January with minimum quantity in storage estimated at 225,000 m³.

TABLE IX-24

KALOPANAYIOTIS DAM

INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m ³	Amount £
1	Water sold at nominal rates	236 306	5 288
2	Water sold at reduced rates	Nil	Nil
3	Water given free	Nil	Nil
4	Total quantity utilized and gross income	236 306	5 288
5	Operation cost	-	3 044
6	Maintenance cost	-	839
7	Net income	-	1 405

TABLE IX-25

KALOPANAYIOTIS DAM - DATA ON PROJECT FOR THE LAST TWO YEARS

Item No.	Data	Unit	1982	1983	%change on 1982
1	Capacity	1000m ³	363	363	Nil
2	Water available in storage	"	363	449	+23.7
3	Water utilized for irrigation	"	222	236	+6.3
4	Water sold	"	222	236	+6.3
5	Water given free	"	Nil	Nil	Nil
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	£	4 434	5 288	+19.3
8	Operation cost	£	3 678	3 044	-17.2
9	Maintenance cost	£	809	839	+ 1.1
10	Total expenses	£	4 487	5 883	-13.5
11	Net income	£	- 53	1 405	2 750.9
12	Area irrigated	donums	435	435	Nil

Project Operation Data for the last two years

Table IX-25 shows the operation data for the last two years. The amount of water utilized for irrigation, has increased by 6.3% where the area irrigated has remained the same. The increase was mainly due to the fact that the plantations grow in age, resulting to an in water demand.

The operational costs were down by 17.2% whereas the maintenance costs were up by 1.1%. The net income showed an increase because the water rates were increased by 10 mils/m³ from the 9th of September 1983. The water utilization in the project area seems satisfactory although further increase of the quantity utilized is expected.

TABLE IX-22

KALOPANAYIOTIS DAM - WATER UTILIZATION

Item No.	Description	Qty m ³	% Storage capacity
1	Water used for irrigation	236 306	65.1
2	Water used for recharge	Nil	Nil
3	Total water utilized	236 306	65.1

Water Utilization

During the year under review, a total quantity of 236 306 m³ of water was utilized for the irrigation for the irrigation of 435 donums of deciduous plantations in the project area. The plantations are mainly apple, pear and peach trees.

(See Table IX-22 for water utilization).

Water Sale, Income, Operation and Maintenance costs

From the sale of the water the gross income during the year under review, was £5,288. Operation expenses, including attendant and waterman wages and travelling costs, amounted to £3,044. Maintenance expenses were £839. Net income to the project was £1,405. Details on these are shown on Tables IX-24 and IX-25.

TABLE IX-23

KALOPANAYIOTIS DAMIRRIGATED

Sl. No.	Crop	Area Donums
1	Citrus	-
2	Bananas	-
3	Vines	-
4	Deciduous	435
5	Vegetables	-
6	Potatoes	-
7	Cereals	-
	Total	<u>435</u>

KALOPANAYIOTIS PROJECT

The Kalopanayiotis irrigation project consists of a dam reservoir of capacity 363,000 m³ and a distribution system of closed conduits commanding an area of approximately 435 donums. Irrigation in the project area, started late in April 1983 and continued throughout the year until the end of October 1983. During this period, a total quantity of 236,306 m³ of water was used for the irrigation of an area of approx. 435 donums planted mainly with deciduous. The water was sold to the farmers at a fixed rate of 20 mils/m³ from May to August and 30 mils/m³ from September to October. The gross income was £5,258. The operation expenses were £3,044 while the maintenance cost spent on routine works and emergency repairs, was £839. The project accounts presented a profit of £1,405.

Project Hydrology

The project hydrologic data, as recorded during the year under review, are tabulated in Table IX-21. The dam scouring gate was not opened during 1983. Overflow over the spillway crest occurred two times. The first occurred during the period 19th Jan. to 17th June, 1983. The second lasted from 19th to 31st of December. The smallest quantity ever remained in the reservoir during the irrigation season, was 93,000 m³ and occurred in October, 1983.

TABLE IX-21

KALOPANAYIOTIS DAM

HYDROLOGY FOR 1983.

Item No.	Description	Qty m ³	% Storage capacity
1	Initial amount in storage	188 000	51.8
	Inflow - Seepage	2 243 424	618.0
	Total release	236 306	65.1
4	Leakages	150 000*	41.3
5	Evaporation	39 411	10.9
6	Overflow	1 792 709	493.9
7	Final amount in storage	363 000	100.0
8	Minimum quantity in storage	93 000	0.3
9	Storage capacity	363 000	100.0

* Roughly estimated

Project Operation Data for the last two years

Table IX-20 shows data on the operation of the project for the last two years. The water utilization shows a decrease by 11.4% where the net income by 71.7%. The total expenditure showed an increase by 19.0%. The area under irrigation was decreased by 21.2%.

TABLE IX-20

AYIA MARINA DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No	Date	Unit	1982	1983	%Change on 1982
1	Capacity	1000 m ³	300	300	Nil
2	Water available in storage	"	331	348	+ 5.1
3	Water utilized for irrigation	"	290	257	-11.4
4	Water sold	"	290	257	1.4
5	Water given free	"	Nil	Nil	Nil
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	£	5 796	5 423	- 6.4
8	Operation cost	£	3 431	3 965	+15.6
9	Maintenance cost	£	741	998	+34.7
10	Total expenses	£	4 172	4 963	+19.0
11	Net income	£	1 624	460	-71.7
12	Area irrigated	donums	325	256	-21.2

Water Sale, Income, Operation and Maintenance Costs

From the sale of 256,848 m³ of water, the gross income to the project, amounted to £5,423. Management and operation expenses being the wages of the water man and that of the dam attendant, amounted to £3,965. Maintenance cost of the dam and the distribution system was £998. Net income to the project was £460. Details regarding sale of water, income and costs are given on Table IX-19.

TABLE IX-18 - AYLA MARINA DAM- CROPS IRRIGATED

Ser No	Crop	Area donums
1	Citrus	85
2	Bananas	72
3	Vines	-
4	Deciduous	12
5	Vegetables	65
6	Potatoes	-
7	Cereals	-
8	Others	22
		<u>256</u>

TABLE IX-19
AYLA MARINA DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m ³	Amount £
1	Water sold at nominal rates	256 849	5 423
2	Water sold at reduced rates	NIL	NIL
3	Water given free of charge	NIL	NIL
4	Total quantity utilized and gross income	256 849	5 423
5	Operation cost	-	3 965
6	Maintenance cost	-	998
7	Net income	-	460

Project Hydrology

The project hydrologic data as recorded during the year, are tabulated on Table IX-16.

The dam was not filled up to the spillway crest. The maximum quantity stored was 260,636 m³ on the 2nd of May 1983. Minimum quantity of water ever stored during the year under review, was 18,500m³ and this occurred in October 1983.

TABLE IX-16

AYLA MARINA DAM-HYDROLOGY FOR 1983

Item No.	Description	Quantity	%Storage capacity
1	Initial amount in storage	27 045	9.0
2	Inflow - Seepage	366 614	122.2
3	Total release	269 769	89.9
4	Leakages	20 183	6.7
5	Evaporation	25 282	8.4
6	Overflow	Nil	Nil
7	Final amount in storage	133 000	44.3
8	Minimum quantity in storage (Oct.)	18 500	6.2
9	Storage capacity	300 000	100.00

TABLE IX-17

AYLA MARINA DAM-WATER UTILIZATION

Item No.	Description	Quantity m ³	% Storage capacity
1	Water used for irrigation	256 849	85.6
2	Water used for recharge	Nil	Nil
3	Total water utilized	256 849	85.6

Water Utilization and Crops Irrigated

During the year under review, a total quantity of 256,849 m³ of water was utilized for the irrigation of approximately 256 donums planted with various crops. Details about the water utilization and the crops irrigated and their extent are shown in Tables IX-17 and IX-18.

TABLE IX-15

ARGANA DAM-DATA ON PROJECT FOR THE LAST TWO YEARS

Item No.	Date	Unit	1981	1983	% Change on 1982
1	Capacity	1000 m ³	990	990	Nil
2	Water available in storage	"	1 022	1 235	+20.8
3	Water utilized for irrigation	"	1 018	1 019	0.1
4	Water sold	"	915	893	- 2.4
5	Water given free	"	103	136	+32.0
6	Water used for recharge	"	Nil	126	-
7	Gross income	£	18 293	18 810	+ 2.8
8	Operation cost	£	8 839	7 696	-12.09
9	Maintenance cost	£	880	1 559	+77.2
10	Total expenses	£	9 719	9 255	- 4.8
11	Net income	£	8 574	9 555	+11.4
12	Area irrigated	donums	1 276	1 450	+13.6

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 late in February 1983 and continued throughout the year until late in November. An area of 256 donums was irrigated by utilizing about 0.257 MCM. The area irrigated was planted with bananas, vines, deciduous and vegetables. The water utilized was sold to farmers at the approved rates. The total gross income from the sale of water amounted to £5,423. The expenditure for the operation was £3,965 and that for maintenance £998. Net income to the project was £460.

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 overflow, amounted to 1,018,837 m³. Out of this 882,747 m³ was sold to the farmers at the nominal rates and the rest 136,090 m³ was given free of charge because it was taken from the overflow. From the sale of water a total of £18,810 was collected. For the operation of the project an amount of £7,696 was paid to the water men and bill collectors where for the maintenance of the project another £1559 was spent.

Net income for the benefit of the project is £9,555. All the data concerning water sale, operation and management costs are shown on Table IX-14.

TABLE IX-14

ARSAKA DAM-INCOME AND EXPENDITURE DATA

Item No	Description	Quantity m ³	Amount £
1	Water sold at nominal rates	882 747	18 810
2	Water sold at reduced rates	Nil	Nil
3	Water given free of charge *	136 090	Nil
4	Total quantity utilized and gross income	1 018 837	18 810
5	Operation cost	-	7 696
6	Maintenance cost	-	1 559
7	Net income	-	9 555

* This quantity was taken from the overflow

Project performance for the last two years

Table IX-15 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 by 0.1% and the area irrigated was increased by 13.6%. The net income to the project was increased by 11.4%.

Water Utilization and Crops Irrigated

The project is built for irrigation purposes and as such, a quantity of 1,018,837 m³ of water was utilized for the irrigation of 1,450 donums of land planted with various crops as indicated in Table IX-13.

Table IX-12 shows the utilization of the project water and Table IX-13 shows the crops irrigated.

TABLE IX-12

ARGAKA DAM-WATER UTILIZATION

Item No.	Description	Quantity m ³	% Storage capacity
1	Water used for irrigation	1 018 837	102.9
2	Water used for recharge	125 818	12.7
3	Total water utilized	1 144 655	115.6

TABLE IX-13

ARGAKA DAM-CROPS IRRIGATED

Ser No.	Crop	Area Donums
1	Citrus	704
2	Bananas	361
3	Vines	30
4	Deciduous	101
5	Vegetables	126
6	Potatoes	-
7	Cereals	60
8	Others	<u>68</u>
	Total	1 450

DETAILS ON OPERATION 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, 1983. An area of 1,450 donums was irrigated by utilizing about 1.019 MCM of water.

The area irrigated was planted with citrus, bananas, vines, deciduous, vegetables, cereals and potatoes. Out of the 1.019 MCM of water utilized 882,747 m³ were sold to the farmers at the nominal rates and an amount of 136,090 m³ was taken from the overflow, free of charge. The gross income from the sale of water was 218,810. The expenditure of management was 27,696 where that of maintenance amounted to 21,559. Net income to the Project was 29,555.

Project Hydrology

The project hydrologic data, as recorded during the year, are tabulated on Table IX-11. The dam reservoir was filled to spillway crest on March 4th and overflow continued until May 14th 1983. The overspilled quantity could not be measured. The minimum level of water in storage ever reached was in December with total quantity in storage around 18,500 m³.

TABLE IX-11

ARGAKA DAM-HYDROLOGY FOR 1983

Item No.	Description	Quantity m ³	% Storage capacity
1	Initial amount in storage	35 400	3.6
2	Inflow-Seepage-Overflow	1 282 972	129.6
3	Total release	1 177 887	118.4
4	Leakages	3 162	0.3
5	Evaporation	80 443	8.1
6	Overflow	not measured	-
7	Final amount in storage	133 000	13.4
8	Minimum quantity in storage(Oct)	18 500	1.9
9	Storage capacity	990 000	100.0

TABLE IX-10 CONTRIBUTORY IRRIGATION WORKS - MAINTENANCE COSTS

Ser No	Project	Maintenance cost		
		Govt. Contrib.	I D Contrib.	Total Cost
		£	£	£
1	Pera Pedhi (special case)	300	-	300
2	Lefka Marathasa (special case)	47	-	47
3	Petra Dams (special case)	33	-	33
4	Fyrgos Dam	625	313	938
5	Falokhori Dam	30	15	45
6	Frodromos Dam	480	240	720
Total		1515	568	2083

TABLE IX-10a

CONTRIBUTORY IRRIGATION WORKS OF THE PITSILIA PROJECT
MAINTENANCE COSTS

Ser No	Project	Govt. Contrib.	I D Contrib.	Total Cost
		£	£	£
1	Ayii Vavatsinias Dam	-	-	600*
2	Arakapas Dam	300	150	450
3	Arakapas Pond I	-	-	160*
4	Pelenfria Pond	533	267	800
5	Kato Mylos Pond	-	-	200*
6	Hyperounda Pond II	-	-	410*
7	Agridhia Pond	-	-	110*
8	Lagoudhera Pond	-	-	350*
9	Ephtagonia Pond I	-	-	250*
10	Ephtagonia Pond II	-	-	370*
11	Ephtagonia Pond III	-	-	250*
12	Akapnou-Ephtagonia Pond	-	-	160*
13	Melini Pond	-	-	160*
14	Ayii Vavatsinias Pond I	-	-	160*

* Total 833 417 1250
* The maintenance expenses of these ponds were covered from savings or the Pitsilia Project advances.

TABLE IX-10c

RECHARGE WATERWORKS - MAINTENANCE COSTS

Ser No	Project	Maintenance Cost
		£
1	Potamia	500

TABLE IX-9. GOVERNMENT IRRIGATION PROJECTS

COST DATA

Ser No	Project	Water sold m ³	al water utilized	Operation & Maintenance cost	Power cost	Total annual cost	Cost of water ¹	
							£	mils/m ³
1	Argaka	882 747	1 013 837	9 255	-	9 255	10.5	9.1
2	Ayia Marina	256 849	256 849	4 963	-	4 963	19.3	19.3
3	Kalopanayiotis	236 306	236 306	3 883	-	3 883	16.4	16.4
4	Kiti	Nil	Nil	Nil	-	Nil	Nil	Nil
5	Mavrokolymbos	288 331 #	503 171#	21 091 ###	-	21 091	73.1	41.9
6	Pomos	861 800	861 800	13 014	-	13 014	15.1	15.1
7	Polemihia)	3 985 611**	7 446 450**	86 121	35 139	121 260	50.4	16.3
8	Yermasoyia)							
9	Paphos	13 064 144	13 064 144	170 465	202 310	372 775	13.0	15.0
10	Khrysokhou valley	422 754	422 754	8 513	10 389	18 902	20.1	20.1
11	Xyliftos	49 614	49 614	3 980	-	3 980	80.2	80.2
Total		20 047 656	23 659 925	321 265	247 638	569 123	28.4	23.8

1 It does not include capital cost

It does not include the quantity of water purchased from the Paphos Irr. Project

Including the quantity of water pumped from the boreholes of the "Kourris Delta Emergency Scheme"

*** It does not include the cost of water purchased from the Paphos Irr. Project.

TABLE IV-6-DATA ON MANAGEMENT AND OPERATION OF GOVERNMENT
IRRIGATION PROJECTS FOR THE LAST TWO YEARS

Item No	Data	Unit	1982	1983	% change on 1982
1	Capacity	1000 m ³	89 874	91 094	+ 1.4
2	Water available	"	36 461	37 441	+ 2.7
3	Water utilized for irrigation	"	21 237	21 814	+ 2.7
4	Water utilized for DWS	"	4 437	3 831	- 13.7
5	Water utilized for recharge	"	2 648	2 999	+ 13.2
6	Total water used	"	28 322	28 644	+ 1.1
7	Evaporation Losses	"	2 646	3 218	+ 21.6
8	Seepage Losses	"	973	873	- 10.3
9	Water sold	"	19 565	20 101	+ 2.7
10	Gross Income	£	430 105	520 441	+ 21.0
11	Power Cost	£	215 577	247 838	+ 5.2
12	Operation Cost.....	£	119 906	264 039	+ 120.2
13	Maintenance cost	£	76 131	100 069	+ 31.4
14	Total expenses.....	£	411 614	611 946	+ 48.7
15	Net income	£	18 491	-91 505	- 594.9
16	Area irrigated.....	hectares	39 645	45 678	+ 15.2
17	Area commanded	"	74 510	76 810	+ 3.1

TABLE IX-7.

RECHARGE WATERWORKS DATA

Ser. No.	Project	Capacity $m^3 \times 10^3$	Water avail. $m^3 \times 10^3$	Water used for recharge $m^3 \times 10^3$	Water lost in evap. $m^3 \times 10^3$
1*	Kauklia	4545	-	-	-
2*	Ayios Loukas	455	-	-	-
3	Sotira	45	Nil	Nil	Nil
4	Panayia Fam.	45	Nil	Nil	Nil
5	Paralimni	115	Nil	Nil	Nil
6	Ayia Napa	55	Nil	Nil	Nil
7*	Famagusta AntiFlood	50	-	-	-
8	Phrenaros	115	Nil	Nil	Nil
9	Dherisia	23	Nil	Nil	Nil
10	Phrenaros	45	Nil	Nil	Nil
11	Avgorou	68	Nil	Nil	Nil
12*	Kondera	32	-	-	-
13	Xylophagou	86	Nil	Nil	Nil
14	Sotira	32	Nil	Nil	Nil
15*	Lysi	77	-	-	-
16*	Ayios Yeorghios (K)	68	-	-	-
17*	Ayios Epiktitos	34	-	-	-
	Lianthou	45	-	-	-
	Akhna	40	-	-	-
20	Ayiotymbeou	50	Nil	Nil	Nil
21*	Syngراسis	1115	-	-	-
22*	Ayios Yeorghios (P)	90	-	-	-
23*	Famagusta Recharge .	165	-	-	-
24*	Ayios Nicolaos Fam.	1365	-	-	-
25	Paralimni Lake	1365	Nil	Nil	Nil
26*	Fresh Water Lake ...	4545	-	-	-
27*	Makrasyka	195	-	-	-
28*	Akhua Mesaria	90	-	-	-
29	Vrysoulles Fam.	140	-	-	-
30*	Morphou Recharge	130	-	-	-
31*	Morphou Protopapas ..	90	-	-	-
32	Ormidhia (Vathys) ...	100	Nil	Nil	Nil
33*	Masari	2273	-	-	-
34	Liopetri	325	Nil	Nil	Nil
	Total	18063	Nil	Nil	Nil

TABLE IX-6a DATA ON CONTRIBUTORY IRRIGATION WORKS OF THE FITSILIA PROJECT

Ser No.	Project	Capacity M ³ x 10 ³	Area commanded dons	Water available for utilization M ³ x 10 ³	Water used for dam irrigation from M ³ x 10 ³	Water used for boreholes irrigation from M ³ x 10 ³	Water used for DWS M ³ x 10 ³	Total quantity used M ³ x 10 ³	Evapor. & other losses M ³ x 10 ³	Seepage losses M ³ x 10 ³	Area irrigated dons
1	Agros	72	300	72	42	#	#	42	2	-	100
2	Akapnou-Eftegonia	132	185	132	76	-	-	76	23	-	101
3	Arakapas Dam	128	200	128	124	-	-	124	10	-	165
4	Arakapas I	192	190	192	97	-	-	97	14	-	129
5	Ayii Vavatsinias (dam)	53	180	53	38	-	-	38	14	-	} .80
6	Ayii Vavatsinias (pond)	55		55	22	-	-	22		-	
7	Ephtagonia I	92	150	42	36	-	-	36	4	-	48
8	Ephtagonia II	127	175	96	72	-	-	72	5	-	96
9	Ephtagonia III	65	90	11	15	-	-	15	1	-	20
10	Kato Mylos	104	180	135	71	32	-	103	5	-	137
11	Khandria	70	140	70	45	-	-	45	5	-	60
12	Kyperounda I	53	80	50	36	-	-	36	8	-	48
13	Kyperounda II	273	119	34	-	-	-	-	3	-	-
14	Lagoudhera	70	149	-	-	-	-	-	-	-	-
15	Melini	59	110	59	32	-	-	32	5	-	43
16	Agrihia	59	92	27	2	-	-	2	1	-	3
17	Pelendria	123	198	179	70	56	-	126	22	-	168
18	Arakapas B/H	-	92	12	-	12	-	12	-	-	16
19	Arakapas B/Hs	-	180	59	-	59	-	59	-	-	79
20	Polystypos B/H	-	70	5	-	-5	-	5	-	-	7
21	Potamitissa B/Hs	-	198	19	-	19	-	19	-	-	25
22	Kalon Khorion B/Hs	-	393	83	-	83	-	83	-	-	111
23	Ayios Theodoros B/Hs	-	94	###	-	-	-	-	-	-	###
Total		1727	3565	1515	778	266	-	1044	122	-	1436

Not measured
 ## Some quantity of the water from the borehole was given for DWS
 ### Water utilization from the river flow

TABLE IX-5 D.T. ON WATER USE, FC

10 YEARS FOR THE GOVERNMENT PROJECTS

No	Description	Unit	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	Capacity	1000m ³	37 890	37 890	37 890	38 061	37 874	37 874	37 874	89 874	91 094
2	Water available	"	367 27 612	28 000	32 003	27 380	28 282	34 408	50 660	35 278	37 441
3	Water utilized for irrigation	"	NA	7 776	8 388	9 704	9 457	10 847	27 109	19 634	20 858
4	Water used for DWS	"	NIL	1 000	1 365	2 058	2 856	2 210	3 356	4 793	3 831
5	Water used for recharge	"	NA	NA	6 016	3 323	1 982	6 579	14 627	2 648	2 999
6	Total water used	"	NA	8 776	15 085	14 295	15 426	23 609	37 617	28 299	28 644
7	Evaporation losses	"	NA	2 854	2 570	2 662	2 683	2 409	2 587	2 618	3 218
8	Seepage losses	"	NA	NA	428	359	3 367	1 024	5 087	5 424	973
9	Water sold	"	26 138	60 600	73 747	93 485	8 447	12 642	11 748	16 644	19 542
10	Gross income	£	2 544	5 522	6 624	7 999	101 367	128 281	169 418	253 397	433 214
11	Power cost	£	-	-	-	-	-	-	117 689	215 577	247 838
12	Operation cost	£	11 048	12 619	18 627	34 500	33 592	55 197	84 436	207 738	119 906
13	Maintenance cost	£	4 603	3 174	4 496	8 059	8 165	7 202	18 563	50 539	76 131
14	Total expenditure	£	15 651	15 793	23 123	42 559	41 757	62 399	103 059	258 277	411 614
15	Net income	£	10 487	44 808	50 264	50 926	59 610	65 882	68 159	-4 838	21 600
16	Area irrigated	Donums	NA	12 458	17 376	15 459	14 905	20 084	27 109	37 340	39 509

* The deficit is caused mainly by the Paphos and Yermasoyia-Polemithia Irrigation Project. See details that follow on each individual project.

TABLE IX-4 DATA ON IRRIGATION PROJECTS AT THE DISCRETION OF GOVERNMENT

Order No.	Project	Construction		Power		Operat.		Maint.		Total
		£	£	£	£	£	£	£	£	
1	Argaka	390	2 340	1 235	1 019	18 810	3 696	1 559	9 255	9 555
2	Ayia Marina	300	1 500	348	257	5 423	3 965	998	4 963	4 460
3	Kalopanayiotis	363	435	449	236	5 288	3 044	839	3 883	1 405
4	Kiti	1 610	6 200	Nil	Nil	Nil	Nil	969	969	969
5	Lefkara	13 850	615	1 919	53	1 600	#	549	549	1 051
6	Mavrokolymbos	2 180	3 355	985	503	3 190	57 932	3 455	61 387	48 273
7	Pomos	860	2 850	1 140	862	1 015	11 819	1 195	13 014	4 570
8	Polemithia	3 430	15 440	12 743	9 526	15 440	69 080	17 041	121 260	19 653
9	Yernasoyia	13 500	791	310	Nil	Nil	Nil	224	224	224
0	Athalassa	51 000	35 000	15 105	13 064	13 064	18 432	314 000	202 310	102 400
1	Paphos	-	4 235	1 111	1 111	Nil	4 235	-	372 775	-58 775
2	Kha-fotami	-	2 1 770	423	423	423	555	11 527	10 389	5 763
3	Khrysokehou valley	-	2 1 770	423	423	423	555	11 527	10 389	5 763
4	Ayios Theodhos	-	2 1 770	423	423	423	555	11 527	10 389	5 763
5	Larnaca	1 220	2 300	50	50	80	1 488	1 601	3 980	-2 492
6	Xyliatos	91 094	76 810	37 441	28 644	20 101	45 678	520 441	217 838	264 039
Total		91 094	76 810	37 441	28 644	20 101	45 678	520 441	217 838	264 039

* These costs are included in the Lefkara dam in the Report on D.W.S.

** All the expenses were undertaken by the irrigators

*** A quantity of 1,662 MCh m³ was purchased from Paphos Project and sold for irrigation not included in the quantity used

**** A quantity of 1 234 564 m³ was pumped from the boreholes of the "Kourris Delta Emergency Scheme", included in the quantity used

1. This includes 577,000 m³ used for the D.S. of Ficosia, Larnaca, and other areas and the recharge of Yernasoyia aquifer

TABLE IX-5-GOVERNMENT IRRIGATION PROJECTS
AND APPROVED WATER CHARGES IN MILS/M³

	1.1.83			31.12.85		
	Overflow	Industrial	Flat Rate	Overflow	Industrial	Flat Rate
1 Argaka	Free	-	20	Free	-	25
2 Ayia Marina	-	-	20	-	-	25
3 Kalopanayiotis	-	-	20	-	-	30
4 Kiti	-	-	-	-	-	-
5 Lefkara	-	-	30	-	-	30
6 Mavrokolymbos	-	-	20	-	-	30
7 Pomos	10	-	20	5	-	25
8 Polemidhia	-	-	(22),25	-	-	(27),30
9 Yermascyia.....	-	-	(22),25	-	-	27,30
10 Athalassa	-	-	-	-	-	-
11 Paphos	-	30	20	-	89	35
12 Kha-Potami.....	-	-	Free	-	-	Free
13 Khrysskhou Valley	-	-	25	-	-	35
14 Ayios Theodoros.....	-	-	Free	-	-	Free
15 Xyliatos	-	-	30	-	-	30

Figures in parenthesis represent wholesale prices of water sold to existing Irrigation Divisions, namely Polemidhia Irrigation Division and Yermascyia Irrigation Division.

TABLE IX-2-CROPS AND AREAS IRRIGATED BY GOVERNMENT IRRIGATION PROJECTS

Scr. No	Crop	Area in donums
1	Citrus	13 747
2	Bananas	2 604
3	Vines	9 828
4	Deciduous	723
5	Vegetables	5 912
6	Potatoes	3 751
7	Cereals	90
8	Olives	30
9	Ground-Nuts	2 993
10	Legumes	3 141
11	Tobacco	202
12	Avocadoes	76
13	Onions	374
14	Melons	1 063
15	Alfa-Alfa	448
16	Others	696
	Total	45 678

Government controlled area no water was collected for the year under review. For information on individual projects in the Government controlled areas see Tables IX-7 and IX-10c.

COST OF OPERATION ON SOME GOVERNMENT PROJECTS

The operational cost of a number of important projects are shown on Table IX-9. This Table shows the running costs (O&M and Power) and the unit annual cost of water.

The overall project water utilization and project water utilization indices are 76.5% and 59.5% respectively. Of the 21.814 MCM used for irrigation 20.101 MCM was sold at the nominal rates, (92.15%) where the rest 1.713 MCM, (7.85%) was given free of charge as water rights or overflows.

A summary of the above data in detail is given in Tables IX-1, IX-4, and IX-5 where more details are given for each project under separate headings.

Table IX-5 gives data on the operation and maintenance of the government irrigation projects for the last 10 years.

Table IX-8 gives data on the operation and maintenance for the last two years.

B. Contributory Irrigation Projects

In general there are 46 contributory irrigation projects with total capacity 8.885 MCM commanding an area of 38 043 donums. Nine projects of total capacity 5.296 MCM or 59.6% 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. Twenty three projects of total capacity 1.727 MCM, commanding an area of 3 565 donums, belong to the Fitisilia Project. During the year under review the total water collected for the contributory schemes (except those in the Turkish occupied area) amounted to 3.752 MCM out of which 2.863 MCM were used for the irrigation of 4 034 donums whereas the rest were lost in the form of evaporation or remained in the dams/ponds for overyear storage. See Tables IX-6a and IX-6b, for details.

C. Recharge Works

On the island there are about 34 recharge works of total capacity 18.063 MCM. Out of these projects 19 of the total capacity 15.694 MCM or 86.9% 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

Maintenance works totalling £107 082 were carried out on thirty six projects. These include routine maintenance on the dam structures and the distribution systems. For the Government waterworks (irrigation and recharge works) a total of £100 569 were spent where the rest £6 513 were spent on the contributory projects.

A Government Waterworks

In the year under review, the total quantity available from government irrigation projects reached the figure of 37.441 MCM.

From this total, a quantity of 28.644 MCM or 76.5% was utilized, 21.814 MCM for irrigation, 3.831 MCM for the domestic water supply and industries and 2.999 MCM for recharge purposes. The rest of the water remained in storage or lost in the form of overflow. In the same period 3.218 MCM was lost in the form of evaporation where another 0.873 MCM were lost as seepage or deep percolation (see Table IX-1).

The irrigation water was used to irrigate fully or partly 45 678 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes, cereals and olives (See Table IX-2).

The gross income from the sale of water amounted to £520 441 being the income from the sale of water at the rates shown on Table IX-3. The operational expenses amounted to £264 039 being the cost for the payment of the watermen, and the bill collectors etc., which amounted to 13.14 mils/m³ of water sold or 9.22 mils/m³ of water utilized. The maintenance expenses on government projects amounted to £100 069 i.e. 4.98 mils/m³ of water sold or 3.49 mils/m³ of water utilized. The power expenses amounted to £247 838 i.e. 12.32 mils/m³ of water sold or 8.65 mils/m³ of water utilized.

The total annual operation, maintenance and power expenses amounted to £611 946 which amounts to 30.44 mils/m³ of water sold or 21.36 mils/m³ of water utilized.

Evaporation losses from the reservoirs amounted to 3.218 MCM or 8.59% of the total storage capacity available. The seepage losses were estimated at 0.873 MCM or 2.33% of the total storage, mostly from the Polemidhia and Yermasoyia dams.

The surface water resources being much more expensive to develop 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 implemented a program to develop as much as possible more surface water resources. A lot of projects were constructed which increased the water storage capacity of dams, to 118.0 MCM, 100.0 MCM for irrigation or domestic water supply and the rest 18.0 MCM for recharge purposes where the commanded area has risen to 114 853 donums.

Details on the projects and the rate of storage development are given in Drg. No. AG/IR/27 "Cyprus Dam Projects and Regional Development" page 21, and "Progress in Dam Construction" page 26....

Summary of Management, Operation and Maintenance Data

The overall average precipitation during the hydrological year under review was 436 mm or 82% of the 51 year average of the Government controlled area, where the total volume of water available in the dams and from project boreholes in the Government controlled area amounted to 41.193 MCM. From this quantity 24.777 MCM was used for irrigation, 3.831 MCM was used for domestic water supplies and industries, 2.999 MCM was used for recharge 0.873 MCM seeped through or below the dams and another 3.524 MCM was lost as evaporation. The rest 5.189 MCM remained in the dams for overyear storage or lost in the distribution system or as overflow. Projects in the Turkish occupied area are not included here since we cannot collect the necessary information.

The total area commanded by the irrigation projects is estimated at 114 853 donums where as an estimated area of 49 712 donums, has been irrigated (planted with citrus, bananas, deciduous, vegetables, potatoes etc.)

... advice both to the District Officer and to the Committees. The costs of the operation of these projects ... in total by the beneficiaries.

3 Government Recharge Waterworks

These are managed directly by the Water Development Department (See Table IX-7)

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 Divisions. The procedure are 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 paid in full by the Government. By the term maintenance we mean routine dam and pipeline maintenance, valves and watermeter repair or replacements, paintings 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 minor maintenance or repair works are carried out by the respective Irrigation Divisions 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, 3,000 MCM/annum 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.

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 farmers 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 IX-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 with the Director of the WDD is the Paphos Irrigation Project, the Khrysokhou valley, the Hyfatos dam and the Lefkara dam.

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 and valid for 1985 are shown on Table IX-3.

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 the committees are beneficiaries elected by the general assembly meetings of the Irrigation Division beneficiaries. The Water Development Department in such cases

IX. DIVISION OF OPERATION AND
MAINTENANCE (IRRIGATION)

By

N Tsiourtis
Senior Water Engineer

Introduction

This Division includes the Branches dealing with:

- # The management, operation and maintenance of Government irrigation works.
- # The maintenance of contributory irrigation projects

During 1983 the Division consisted of the following staff:

- 1 Senior Water Engineer - Head
- 2 Topographer Irrigation Engineer, class I
- 1 Topographer Irrigation Engineer, class II
- 1 Technical superintendent
- 1 Senior Technician
- 1 Technician I
- 1 Chief Foreman
- 2 Technicians II
- 10 Total Staff

Definitions

Government Waterworks: These are the projects constructed under the Government Waterworks Law Cap. 341. These projects are listed in Tables IX-1 and IX-7.

Contributory Waterworks. These are projects constructed under the Irrigation Division Law Cap. 342. A list of these projects is given in Table IX-6.

MANAGEMENT AND OPERATION PROCEDURES

The management and operation of the various categories waterworks are carried out as follows:

1 Government Waterworks

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:

The total quantity of water distributed in 1983 was 485002m³.

The total expenditure for the operation and maintenance of the scheme was £5030 and the revenue generated was £52000.- More details on expenditure and revenue are given on Table VI-15.

TABLE VII-13 MOUTAYIAKA REGIONAL SCHEME

Expenditure and Revenue account for 1983

Expenditure

	£
Electricity cost	40.802
Maintenance and operation	9.503
Total	<u>50.305</u>

Revenue

Amount collected in 1983	27.529
Amount outstanding for 1983	<u>24.471</u>
Total	52.000
Amount outstanding by 31.12.82	35.047
less amount collected in 1983	30.505
in respect of water delivered before 1983	4.542
Total amount outstanding by 31.12.1983	29.013

Yermasoyia Water Supply Scheme

This scheme supplies water to Yermasoyia village and Potamos tis Yermasoyias, with a total population of 4.800 persons. This scheme supplies also a number of hotels and other touristic installations in the coastal area of Potamos tis Yermasoyias.

The sources of the scheme are three boreholes Hydr. Nos. 286, 948 and 858 situated in Yermasoyia river, and Ayios Photis spring. The operation and maintenance of this scheme is the responsibility of Yermasoyia Improvement Board.

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 Director Generals of the Ministries of Agriculture and Natural Resources, Finance, Communication 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 Nos 946 and 993, situated in Yermasoyia River. The total quantity of water distributed during 1983 was 369,811 m³. The total cost for the operation and maintenance of the scheme was £14255 and the revenue generated for the same year was £162,860.-

More details on expenditure and revenue are given on Table VI-14

TABLE VI-12 AMATHUS WATER SUPPLY SCHEME

Expenditure and Revenue account for 1983

<u>Expenditure</u>	£
Electricity Cost	8011
Maintenance expenses	<u>6244</u>
Total	14255
<u>Revenue</u>	
Sale of water	32433
Connection fees	128821
Interest	<u>1606</u>
Total	162860

Mouttaviaka Regional Scheme

This scheme supplies water to 10 Communities of a total population of 12 850 persons. The sources of this scheme are two boreholes Nos 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.

This statement does not include for the amortization cost of the capital expenditure of the scheme. The amortization cost of the installations is estimated at £6895 p.a. The total deficit for the year, without taking into account administration expenses and other overheads, amounts to £12330 p.a.

Timi Water Supply Scheme

This scheme supplies water to Timi village only. The source is borehole No. 2821, and the total quantity of water produced during 1983 was 16711m³.

The total expenditure for the operation and maintenance of the scheme was £911 and the revenue generated was £334.- The water is sold to this community at the price of 20 mils per m³.

Ambelitis Water Supply Scheme

This scheme supplies water to Ambelitis village only. The source is Kephlovrysos spring near Vrecha village. The water is conveyed to the village by a booster pump installed near the spring.

The total quantity of water pumped during 1983 was 39930m³ and the total expenditure for the operation and maintenance of the scheme was £3,153.-

This statement does not include for the amortization of the capital expenditure of the scheme. The amortization cost of the installation is estimated at £30 823 p.a. Without taking into account administration expenses and other overheads, the total deficit for the year 1983 amounts to £ 45929.

Arminou Regional Scheme

This scheme supplies water to eight communities. The source of this scheme is Borehole No. 56/72 in Dhiarizos river near Arminou village. The total quantity of water distributed to the eight villages in 1983 was 33217m³.

The total expenditure for the operation and maintenance of this scheme was £7096 while the revenue generated for the same year was £ 1661. More details on revenue and expenditure are given in table VIII -1/

TABLE VIII -1/ ARMINOU REGIONAL SCHEME

Expenditure and Revenue account for 1983

<u>Expenditure</u>		£
Electricity cost		4404
Maintenance expenses		<u>2692</u>
	Total	£ 7096
<u>Revenue</u>		£
Amount collected for the year 1983		516
Amount outstanding for 1983		<u>1145</u>
	Total	£ 1661
Outstanding accounts by 31.12.1982		3249
Less amount collected in 1983		<u>714</u>
	Total	£ 2535
Total amount outstanding by 31.12.1983		£.3680

The schemes operate with automatic control equipment. Periodic supervision as well as maintenance work are carried out by the Regional Offices of the Department.

During 1983, the following regional water supply 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 two boreholes Nos 57/72 and 56/75 situated in Xeropotamos river. The total quantity of water supplied from these sources during 1983 was 621714m³. The total expenditure for the operation and maintenance of the scheme was £ 49397 and the revenue generated was £ 34194. More details on expenditure and revenue are given on Table VIII-10 below:

TABLE VIII -10 PAPHOS LOWER VILLAGES W.S.

Expenditure and Revenue Account for 1983

<u>Expenditure</u>		£
Electricity cost		43120
Maintenance expenses		<u>6180</u>
	Total	49300
<u>Revenue</u>		
Amount collected for 1983		18562
Outstanding accounts for 1983		<u>15632</u>
	Total	£34194
Outstanding accounts by 31.12.1982		13496
Less amount collected in 1983		5973
Total amount outstanding by 31.12.1983		£23155

Parallel to the restrictions the Municipality launched also a water saving campaign by publicity and the distribution of literature, urging consumers to make frugal use of water.

Water Supply Data

- Total quantity of water produced during 1983	1293881 m ³
- Total quantity of water consumed during 1983 (As registered by consumer meters)	961583 m ³
- Unaccounted for water	25.68%
- Average daily summer consumption (for July-August)	3800 m ³
- Total number of consumers on 31.12.1982	5602 No
and on 31.12.1983	6155 No
- Average number of consumers during 1983	5879 No
- Average gross supply per consumer	603 l/day
- Extension of distribution system (100 mm dia)	1687 m
- Total length of the distribution system as at 31.12.1983	137227 m
- Number of Fire Hydrants installed during 1983	6 No
- Total number of Fire Hydrants installed as at 31.12.1983	65 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.

As a result of the increased rates introduced by this Department for the water delivered to Water Boards from the Government Water Supply Schemes, this Water Board increased its own water rates as from March 1982.

Water Supply Data

- Total quantity of water supplied to service reservoirs during 1983	2613387m ³
- Total quantity of water consumed as registered by area meters during 1983	2471510m ³
- Total consumption as registered by individual consumer's meters in 1983	2098014m ³
- Unaccounted for water	19.72%
- Maximum daily summer consumption (Registered on 8.8.83)	10530m ³
- Total number of consumers as at 31.12.82	15047 No.
- Total number of consumers as at 31.12.83	16453 No.
- Average number of consumers during 1983	15750 No.
- Average gross supply per connection	1/d
- Extension of distribution system during 1983 (100mm, and 150 mm A.C. pipes)	8893m
- Fire Hydrants installed during 1983	33 No.
- Total number of Fire Hydrants installed as at 31.12.83	714 No.

Paphos Water Supply

The water supply of the town is administered by the Municipality. Although the capacity of the Municipality's sources could have met the demand, carrying capacity limitations of the pipeline feeding the town have necessitated the augmentation of the town's supply from the Paphos Lower Villages Government Water Supply Scheme by 99,457m³. Despite this augmentation, the demand during the summer months was greater and restrictions on the water supply had to be imposed. The restrictions provided for a supply every other day.

- Unaccounted for water	27.51 %
- Maximum daily summer consumption. (Registered by area meters on 12.8.1983)	31674 m ³
- Total number of consumers on 31.12.1982	30311 No.
and on 31.12.1983	31885 No.
- Average number of consumers during 1983	31098 No.
- Average gross supply per consumer	6961/day
- Extension of distribution system (100 mm, 150 mm 200 mm and 250mm A.C. pipes)	20462 m
- Total length of distribution system as at 31.12.1983	376447 m
- Total number of Fire Hydrants installed during 1983	48 No.
- Total number of Fire Hydrants installed as at 31.12.1983	1280 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 1983 was 985.210 m³.

Larnaca Water Board

The water supply of this town was supplemented throughout the year from the Central Water Supply System. The total quantity of water delivered to Larnaca Water Board from this system, during 1983 was 2111287 m³. Because of the increased demand on the one hand and the reduced production of the water board sources, due to the dry year, on the other hand, the town faced a water shortage problem and restrictions on the supply had to be imposed in May. These restrictions, which provided for a supply every other day, stayed in force till the end of the year. As a relief measure this Water Board launched a water saving campaign, by publicity and the distribution of nylon bags to be placed by consumers in W.C. cisterns to bulk out water.

- Average number of consumers during 1982
(Excluding consumers in the area under Turkish control) 38536 No.
- Average gross supply per connection 487 l/day
- Extension of distribution system
(100 mm and 150 mm dia. A.C. pipes) 5 300 m
- Total number of Fire Hydrants installed during 1983 26 No.

From analysis of the information available it has been deduced that the consumption in the part of the Nicosia area of supply under turkish control was 23.8% of the total consumption.

Limassol Water Board

The Water Board sources met satisfactorily the water demand and the town enjoyed a regular supply throughout the year 198 . Underpressure supply was observed at the high parts of the town in the summer months which is attributed to the undercapacity of the existing distribution system. 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.

As from March this year the Water Board raised its water rates to reflect its increased costs.

Water Supply Data

- Total quantity of water produced from all sources during 1983 7901932m³
- Total quantity of water consumed during 1983 as registered by area meters 7711306m³
- Total consumption during 1983 as registered by individual consumers meters 5728323m³

FACTS ABOUT THE TOWN WATER BOARDS

Nicosia Water Board

Water shortage was again this year the basic problem of this Water Board, and restrictions on the supply were in force throughout the year 1982.

Nevertheless due to the increased quantities of water delivered to this Water Board from the 1982 Emergency Schemes and Lefkara dam during the Summer and other reasons explained elsewhere in this report, the water supply situation, in comparison with last year, has improved.

The Nicosia Water Board enforced new increased water rates as from 1.3.1982 to reflect its increased costs especially in the purchase of water in bulk from Government.

Water Supply Data

- Total quantity of water delivered to the service reservoirs or directly into the distribution system 9005850m³
- Total quantity of water consumed as registered by area meters 8984898m³
(including Nicosia Water Commission)
- Total consumption during 1983 as registered by individual consumers meters in the Greek sector only 5784270m³
- Unaccounted for water 15.56%
- Maximum daily summer consumption 38400m³
(Based on area meter readings and including Nicosia Water Commission. Registered on 11.7.83 for 18 hours of supply in every 48 hours).
- Total number of consumers on 31/12/1982 37518 No.
(Greek Sector only)
- Total number of consumers on 31/12/83 39554 No.
(In Greek Sector only)

MONTH	Number of samples analysed during 1983							Total
	Larnaca	Nicosia	Limassol	Paphos	Polis	Khirkitie		
January	7	103	--	--	--	10	120	
February	53	--	56	13	--	8	130	
March	66	--	14	15	19	67	181	
April	161	3	30	--	--	50	244	
May	111	10	11	--	--	24	156	
June	69	27	24	23	26	45	214	
July	18	--	32	--	--	18	68	
August	27	--	36	--	--	26	89	
September	43	1	8	--	--	21	73	
October	25	--	14	20	59	26	144	
November	160	9	49	71	--	25	314	
December	45	62	50	--	--	25	182	
Total	785	215	324	142	104\$	345	1915	

* Area from which samples were taken

carbonates, fluoride (F), Nitrite (NO₂), 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 1983, 1915 chemical analyses of drinking water, were carried out, at the laboratory of Khirokitia Water Treatment Plant. Details of the chemical analyses are shown in table no. VIII-9.

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.

- (c) Expenditure under 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 heading "Pumping and maintenance expenses" refers to the following installations:
- * Borehole No. 16/67 in Psematismenos area
 - * Borehole No. 11/69, 4/69 in Khirokitia area
 - * Borehole No. 35/73, 45/73 in Alethriko area

1983 Emergency Scheme Installations

- * Borehole No. 114/80, 127/80, 112/80, 38/82, 16/79 in Klavdhia area.
- * Borehole No. 73/80, 15/83, 75/83 in Alethriko area.
- * Borehole No. 64/73, 125/80, 133/80, 80/83, 55/83, 63/83 in Skarinou area.
- * Borehole No. 45/61 in Khirokitia area.

The total quantity produced by these sources during 1983 was 1,502,748m³.

The unit cost of pumping and maintenance was therefore 9.707 cents/m³.

- (e) Expenditure under 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 65,740m³.

- (f) Expenditure under heading "Maintenance expenses for Civil Engineering Works" refers to maintenance expenses for Yermasoyia-Khirokitia main, Lefkara main Khirokitia-Phrenaros main.

Chemical Laboratory at Khirokitia Water Treatment Plant

The Khirokitia Water Treatment Plant was commissioned in 1974. For the period 1974-78 the operators at the plant 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 Plant 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,



LEGEND

- Gravity mains
- Pumping mains
- Main roads
- Rivers

* Construction started Dec, 1982 - Jan, 1983

CENTRAL WATER SUPPLY SYSTEM

Feeding Nicosia, Larnaca, Famagusta, several villages, refugee housing and tourist installations in N'isia, L'ca, and F'ista areas

	£
Value of water delivered to Nicosia Water Board in 1983	131,677
Value of water delivered to other consumers in 1983	199,907
Total value of water delivered in 1983	£801,440*
Amount actually collected in 1983 in respect of water delivered in 1983	377,768
Amount outstanding on 31.12.83 for water delivered in 1983	£423,672*
Amount outstanding by 31.12.82	656,560
Less amount collected in 1983 in respect of water delivered before 31.12.82	134,317
	£522,243**
Total amount outstanding by 31.12.83	£945,915***

Notes on expenditure and revenue account of the Central Water Supply System for 1983

(a) The Capital Cost of the CWSS installations up to the end of 1983 was £3018026. Roughly the amortization of this capital investment at 9% for 40 years is £280,555 annually. The capital cost of the 1982/83 Emergency Schemes added to the system and commissioned in 1982/83 was £175,777. Amortized at 9% over 5 years only this adds a further annual cost of £45,190 bringing the total annual amortization of capital investment to £325,745. Thus without taking into account office overheads for the management of the scheme, the profit for the year 1983 amounts to £45,627. If outstanding payments are not considered as revenue then there is a deficit of £378,045.

(b) Expenditure under heading "Khirkitia and Lefkara installations" refer to the following installations.

Khirkitia Treatment Works
Lefkara dam

The total quantity of water treated during the year reached 3,387.289m³ and the unit running cost was 1.94 cents/m³.

* Includes an amount of £145,655 representing the value of 985,210m³ of water supplied to Famagusta area occupied by Turks.

** Includes an amount of £462,115 representing the value of 8097209m³ supplied to Famagusta area occupied by Turks during the years 1974-1982.

*** Includes an amount of £607,770 representing the value of water delivered to Famagusta area occupied by Turks during the years 1974-1983.

TABLE VII-8. NICOSIA-LARNACA-FAMAGUSTA
CENTRAL WATER SUPPLY SYSTEM

Expenditure and revenue accounts for 1983

Expenditure

Khirokitia and Lefkara Installations

	£
Electricity	5,483
Wages	36,682
Materials and others	23,578
Total	65,743

Yermasoyia-Vasilikos pumping and maintenance expenses

Electricity	171,725
Wages	22,834
Materials and others	1,629
Total	196,188

Pumping and maintenance expenses

Electricity	100,084
Wages	31,237
Materials and others	14,562
Total	145,883

Khirokitia-Lefkara Regional Water Supply Scheme

Electricity	17,228
Maintenance	265
Total	17,493

Maintenance expenses for Civil Engin. Works

Wages	3,740
Materials and others	1,021
Total	4,761

GRAND TOTAL **430,068**

Revenue

Revenue Generated in 1983

Value of water delivered to Larnaca Water Board in 1983	324,201
Value of water delivered to Famagusta area occupied by Turks in 1983	145,655

Table VIII-7 (continued)

Community Served	Consumption from CWSS in MCM				
	1979	1980	1981	1982	1983
Eastern Region Villages					
Aradippou	0.043	0.097	0.175	0.131	0.104
Xylotymbou	0.147	0.154	0.158	0.158	0.121
Dherynia	0.130	0.147	0.153	0.152	0.137
Avgorou	0.115	0.113	0.134	0.133	0.121
Phrenaros	0.008	0.015	0.051	0.053	0.014
Livadhia	0.071	0.085	0.104	0.134	0.127
Voroklini	0.054	0.059	0.062	0.065	0.064
Sotira	0.088	0.082	0.097	0.091	0.073
Paralimni	0.086	0.127	0.210	0.207	0.247
Ayia Napa	0.032	0.049	0.161	0.217	0.255
Kellia	0.012	0.018	0.015	0.024	0.025
Troulli	0.023	0.033	0.036	0.038	0.036
Aradippou-Livestock	0.007	0.020	0.021	0.017	0.011
Anzio Camp	0.122	0.082	0.084	0.047	0.013
Akhna Forest	0.077	0.103	0.095	0.098	0.097
Displaced persons Service	0.027	--	--	--	--
Pyla	--	--	--	--	0.008
Subtotal Eastern Villages	1.042	1.184	1.556	1.565	1.453
Irrigators & Minor consumers	0.052	0.047	0.055	0.076	0.305
Grand Total	3.600	3.283	4.114	5.347	5.335

Expenditure and Revenue

A statement showing expenditure and revenue of the Central Water Supply System for the year 1983 is shown in table VII-8 below.

Operation of the Vasilikos Pendaskinos - First Phase link to Nicosia is not included here as it is included in the accounts of the Nicosia System.

Notes: Figures in parenthesis 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 a decrease of 8.3% in 1983 over the corresponding 1982 figure. Closer examination of the figures, however, indicates that the old ground water sources of the system were drastically affected by the 1981-83 drought and it was the implementation of the 1982/83 Emergency Schemes that was effective in maintaining the groundwater production at levels similar to previous years.

The quantity drawn from Lefkara Dam was significantly decreased. This as in 1982, was done at the expense of storage in the dam which, due to the small quantities impounded during the year, (0.876 MCM) showed a further reduction from 1.009 MCM on 1.1.1983 to 0.405 MCM on 31.12.1983.

In order to meet the demand on the System the Water Treatment Works at Khirokitia was in continuous operation since the groundwater available even during the winter period of low demand was not adequate to meet that demand.

Bulk Consumption

Table VIII-7 shows the bulk consumption of the various communities served by the CWSS over the years 1979-1983.

TABLE VIII-7 CENTRAL WATER SUPPLY SYSTEM
Bulk Consumption in MCM per annum 1979-1983

Community Served	Consumption from CWSS in MCM				
	1979	1980	1981	1982	1983
Nicosia (via Dhyptomos)	--	--	0.014	0.891	0.042
Larnaca	1.292	0.796	1.182	1.446	2.111
Pamagusta	0.973	1.017	1.058	1.060	0.985
Subtotal - Towns	2.265	1.813	2.254	3.397	3.138
Western Region Villages					
Pano Lefkara	0.036	0.033	0.025	0.044	0.042
Kato Lefkara	0.013	0.009	0.009	0.010	0.008
Kato Dhrys	0.008	0.010	0.009	0.008	0.008
Vavla	0.008	0.008	0.007	0.007	0.008
Alethriko	0.017	0.017	0.018	0.028	0.029
Mazotos	0.025	0.026	0.035	0.042	0.031
Kivisili	0.016	0.020	0.017	0.020	0.021
Tokhni	0.045	0.041	0.031	0.035	0.025
Mencyia	0.001	--	--	--	0.002
Khirokitia	0.013	0.019	0.024	0.033	0.024
Maroni	)	0.027	0.031	0.039	0.031
Zyyi	(0.059	0.019	0.029	0.029	0.026
Psematismenos	)	0.010	0.012	0.013	0.011
Aplanda-Anaphotia	--	--	--	--	0.005
Meneou-Dhromolaxia-Tersephanou	--	--	--	--	0.107
Klavdhia	--	--	--	0.061	0.020
Kalo Khorio	--	--	--	--	0.041
Subtotal Western villages	0.241	0.239	0.249	0.309	0.439

operating their own sources where such sources exist and of distributing the water to their consumers and collecting water rates. Water is also supplied to Turkish occupied Famagusta town.

The Turkish side makes no payments in respect of the cost of the water supplied to Famagusta town.

Demand

Apart from Nicosia and Larnaca towns, restrictions were imposed on the supply of water to communities served by the CWSS during the year. The restrictions on the communities supplied provided for a supply every other day, and were imposed on 25.4.1983 and lifted on 31.10.1983. The only villages exempted from these measures were Paralimni and Aya Napa.

The total demand on the system during 1983 was 5.4 MCM which is at the same level as that of 1982.

Sources and Production

The main sources of the Central Water Supply System and their production over the years 1979 to 1982 are given in table VII-6.

TABLE VII-6 CENTRAL WATER SUPPLY SYSTEM
Yield of Sources in MCM per annum 1979-1983

Source	Year				
	1979	1980	1981	1982	1983
Khrokitia Treatment Works	--	--	--	--	1.957
Drawing from Yermasoyia Dam	--	--	--	--	1.429
Drawing from Lefkara Dam	2.807	2.107	3.035	4.325	
Drawing from Vasilikos Subsurface Dam	--	--	--	--	0.001
Sub-Total	2.807	2.107	3.035	4.325	3.387
Vasilikos Subsurface dam	0.579	0.833	0.762	0.449	0.366
Boreholes					
Psematismenos	0.179(1)	0.124(1)	0.101(1)	0.127(1)	0.116(1)
Khrokitia	0.320(2)	0.278(2)	0.243(2)	0.206(2)	0.168(2)
Alethriko	0.190(1)	0.338(2)	0.399(2)	0.159(2)	0.093(2)
Subtotal Vasilikos & old BH'S	1.268	1.573	1.505	0.940	0.743
Yermasoyia Dam (for Irrig. 1982/1983)	--	--	--	--	0.232
Emergency Schemes					
Tokhni	--	--	--	0.038(1)	--
Skarinou	--	--	--	0.190(2)	0.237(6)
Meroyia	--	--	--	0.078(2)	0.--()
Alethriko	--	--	--	0.064(1)	0.159(1)
Klavdhia	--	--	--	0.349(4)	0.507(5)
Khrokitia	--	--	--	--	0.123(1)
Subtotal Emergency Schemes	--	--	--	0.719	1.126
Totals	4.075	3.680	4.540	5.984	5.458

- Electricity	2076
- Wages	6106
- Maintenance expenses	636
- Miscellaneous expenses	1328
TOTAL	<u>10146</u>

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 expanded and 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 30 communities in the respective districts.

The system draws both on surface water and groundwater resources. Surface water is drawn from the 13.85 MCM capacity Lefkara Dam and, with the completion of the Yermasoyia-Vasilikos Project by the end of 1982, water can also be drawn from the Yermasoyia Dam. Ground water is obtained from the Vasilikos Subsurface Dam constructed in gravels across the Vasilikos river and from five boreholes in the areas of Psematismenos, Khirokitia and Alethriko Villages.

During 1983 and within the framework of the Emergency Schemes implemented to counter the effects of the 1981-83 drought seven new boreholes have been added to the sources of the System. The boreholes are in the area of Skarinou, Khirokitia, Alethriko and Klavdhia villages. Full details of these schemes are given under the Nicosia Water Supply Section of this report.

Surface water is treated at the Khirokitia Water Treatment Works which has a capacity of 21,800m³ per day. Treated and borehole water is conveyed along a 70km pipeline from Khirokitia up to 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.

As from January 1982 the first phase of the Nicosia Water Supply component of the Vasilikos-Pendaskinos Project has been commissioned. This scheme is connected to the Famagusta pipeline at a point near Skarinou station and conveys treated water to Nicosia. More details are given elsewhere in this report.

Institutional Arrangements

The CWSS is operated and managed entirely by Government. Water is sold in bulk to the town Water Boards of Larnaca and Nicosia and to the various village Water Commissions which are presided over by the District Officers and which take responsibility for

Less amount collected in 1983 in respect
of water delivered before 31.12.82 351265

Amount outstanding on 31.12.83 for water
delivered before 31.12.82 289387

Total amount outstanding by 31.12.83 510642

Total amount collected in 1983 1 173483

This statement does not include for the amortization of the
Government installations and equipment of the scheme.

The amortization cost of these installations and equipment is
estimated at £499,383 annually as given in Table VI-7. Without
taking into account office overheads the deficit for the year
1983 amounts to £215,313. If outstanding payments are not
considered as revenue then the deficit rises to £436,068.

TABLE VI-5 NICOSIA WATER SUPPLY
Amortization Costs

Installations	Capital Costs	Discount rate	Period (years)	Annual Amortization Cost £
Pre-1982 installations Vasilikos-Pendaskinos 1st Phase	1,784,300	8%	Varies	107,760
- 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 (Pyrgos-Stavrovouni-Yeri Dhali-Kattoudhia)	75,100	9%	5	19,307
TOTAL				499,383

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 1983 was 110,000m³ which met satisfactorily the demand. The
total expenditure, (which is borne by Government) for the operation
and maintenance of this system for 1983 was £10,146 as follows:

Purchase of Water from Private Sources 95119

Yeri-Dhali-Kattoudhia Emergency Scheme

	£
Maintenance expenses	242
Electricity and fuel	5468
Wages	3006
Miscellaneous expenses	57
Total	<u>8773</u>

Pyrga Stavrovouni Emergency Scheme

Maintenance expenses	2514
Electricity and fuel	12599
Wages	7655
Miscellaneous expenses	818
Total	<u>23586</u>

Vasilikos-Pendaskinos Project - Phase I

Maintenance expenses	803
Electricity	9527
Wages	4648
Miscellaneous expenses	1099
Total	<u>16077</u>

GRAND TOTAL 713861

Revenue

Revenue generated

	£
Value of water delivered to Nicosia Water Board in 1983	998109 *
Value of water delivered directly to other consumers in 1983	44864
Total value of water delivered in 1983	1042973
Amount actually collected in 1983 in respect of water delivered in 1983	822218
Amount outstanding on 31.12.83 for water delivered in 1983	220755
Amount outstanding by 31.12.82	641152

* This figure is calculated at the actual rates at which the Water Board is charged. As from 1.3.82 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.

Tseri Scheme

Maintenance expenses	1546
Electricity & fuel	44956
Wages	16363
Miscellaneous expenses	8178
Total	<u>71043</u>

Peristerona - Akaki Scheme

Maintenance expenses	4313
Electricity & fuel	57507
Wages	10904
Miscellaneous expenses	378
Total	<u>73102</u>

Kokkini Trimitia - Paliometokho Installations

Maintenance Expenses	5181
Electricity & fuel	66812
Wages	29812
Miscellaneous expenses	4559
Total	<u>106364</u>

Dhali - Latsia Installations

Maintenance expenses	591
Electricity	9941
Wages	9875
Miscellaneous expenses	187
Total	<u>20594</u>

Maintenance Expenses of Civil Engineering Works

Motor Transport expenses	5403
Wages	14347
Hiring charges	2750
Purchase of Materials	959
Miscellaneous expenses	438
Total	<u>23897</u>

- Pyrga Stavrovouni Scheme

This scheme utilizes three boreholes, two in the Pyrga area with nos. 19/82 and 99/79 and one in the Stavrovouni area with no. 100/79. Steel mains of 6" and 8" dia of total length 4400m convey the water first into a circular collecting tank and from there through centrifugal booster pumps the water is being pumped into the 10" dia main connecting borehole 26/82 with the Dhyptamgs-Nicosia pipeline. The yield of these boreholes is 100m³/hr.

Prospects for the solution of the water shortage problem

The operation of the first phase of the Nicosia Water Supply component of the Vasilikos-Pendaskinos Project in 1982 and of the Yermasoyia-Vasilikos Project in 1983 proved invaluable short term contributions to the solution of the water shortage problems of the capital. 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 will persist until the Vasilikos-Pendaskinos Project becomes fully operational in 1986. Even this addition, however, is likely to prove adequate only for a short while, after which deficits will again develop. The long term solution of the problem will come about only when the Southern Conveyor Project comes on stream towards the end of the present decade. This Project is planned to meet the water supply deficits not only of Nicosia but also of Famagusta, Larnaca and Limassol towns and numerous villages up to the year 2010.

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 1983 is given in table VIII-6.

TABLE VIII-4

NICOSIA WATER SUPPLY

Expenditure and revenue account for 1983

Expenditure

Morphou Bay Scheme

	£
Maintenance expenses	288
Electricity	253473
Wages	15830
Miscellaneous expenses	5445
Total	<u>275036</u>

Alethriko Scheme

This scheme utilizes two boreholes with nos. 15/83 and 75/83 A C mains of 6" and 4" dia of total length 2,135 m convey the water from the boreholes into the Alethriko Break Pressure Tank. Total yield of the two boreholes is 80m³/hr.

Khirokitia Scheme

This scheme utilizes borehole No. 45/61. This borehole was connected to existing pipelines and water is being pumped directly to Khirokitia Reservoir. The yield of this borehole is 26 m³/hr.

Skarinou Scheme

The scheme includes 4 boreholes with nos. 63/83, 80/83, 55/83 and 64/73. Steel mains of 4" and 6" dia of total length 2,200m connect the boreholes directly to the Khirokitia-Famagusta pipeline. The total yield of the boreholes is 90 m³/hr.

Klavdhia Scheme (Phase II)

This scheme utilizes one borehole with no. 16/79. Water from the borehole is being conveyed to the Alethriko Break Pressure Tank. This borehole is connected to the conveyors of Klavdhia Scheme Phase I. The yield of this borehole is 17m³/hr.

Dhali (Kattoudhia) Scheme

This scheme utilizes three boreholes with nos. 33/82, 34/82 and 149/80. Steel mains of 4", 6" and 8" dia of total length 4,500 m convey the water from the boreholes directly into the Dhypotamos-Nicosia pipeline. The yield of these boreholes is 100 m³/hr.

Yeri Scheme

In this scheme B/H No. 79/80 is utilized. Steel mains of 6" dia and total length 3,500m connect the borehole directly to the Dhypotamos-Nicosia pipeline. The yield of the borehole is 35m³/hr.

Stavrovouni Scheme (Phase II)

This scheme includes three boreholes with nos. 42/82, 47/82 and 55/82. Steel mains of 6", 8" and 10" dia and total length 3,350 m convey the water from the boreholes into the Stavrovouni Balancing Reservoir. The yield of these boreholes is 90m³/hr.

TABLE VIII - 3 NICOSIA WATER SUPPLY SYSTEM
Villages and other Consumers Served

Community Served	Consumption in MCM				
	1979	1980	1981	1982	1983
Kokkinotrimithia	0.050	0.057	0.063	0.091	0.082
Mammari-Dhenia	0.046	0.064	0.040	--	--
Mosphiloti (26.8.82)	--	--	--	0.017	0.052
Psevdhas (14.9.82)	--	--	--	0.009	0.031
Pyrga (25.9.82)	--	--	--	0.006	0.021
Lymbia, Sha, Kornos regional W.S. scheme (1.11.82)	--	--	--	0.018	0.060
Alambra (22.11.82)	--	--	--	0.004	0.014
Dhali (15.10.83)	--	--	--	--	0.009
Various Camps. Industries and miscellaneous consumers	0.024	0.034	0.041	0.049	0.083
TOTALS	0.120	0.155	0.144	0.194	0.352

Note: The dates given in parentheses are the dates when these villages were connected to the Dhypotamos-Nicosia Pipeline due to the serious water shortage experienced by these villages as a result of the 1981-82 drought.

New Schemes Completed

Yermasoyia-Vasilikos Project

Construction by direct labour commenced in April 1982. The project comprises the laying of a 350mm steel/A.C./ductile iron pipeline to convey up to 3.5 MCM of water per annum from Yermasoyia Dam to Khirokitia Water Treatment Works and includes new equipment for the existing pumping stations at Yermasoyia and Vasilikos which will be utilized for the purpose. The project was given top priority and was put into commission in May 1983. During 1983 a total quantity of 2.04 MCM of water were conveyed to Khirokitia Treatment Works.

1983 Emergency Schemes

The following is an outline of the various schemes carried out during 1983 in order to supplement the water supply sources of both Nicosia and of the Central Water Supply System as a whole. They are all presented under the Nicosia Water Supply section even though many of the schemes are not directly connected to the Nicosia system for two reasons:

- A unified and complete picture of the 1983 Emergency Schemes is presented and
- The implementation of schemes in the Larnaca Area has by substitution enabled the conveyance of more water to Nicosia from Lefkara Dam which would normally be allocated to Larnaca-Famagusta demand centres.

Thus the total quantity of water produced in 1983 was 9,581,549m³ of which 7,459,710m³ came from Government sources, 453,300m³ was the yield of the Nicosia Water Commission Sources and 1,668,539m³ was purchased from private sources.

Although the operation of the First Phase of the Vasilikos Pendaskinos Project conveying water from Lefkara dam to Nicosia and the 1982-1983 Emergency Schemes of Stavrovouni, Dhenia and Dhali-Kattoudhia added 1,569,280m³ to the existing sources of the Nicosia System, the total production compared to 1982, was by 620,775m³ less. There was therefore a reduction in yield of the old sources of about 708,000m³ as a result of the drought. Most affected were the Dhali and Peristerona-Akaki Sources which are located in river aquifers and are dependent on direct recharge from river flows. The decrease in the annual production of Peristerona-Akaki Sources was 120,000m³ whilst Dhali sources produced no yield at all.

The production of the Dhikomo-Sykhari Source also showed a dramatic reduction of 86,000m³ down to 112,000m³ compared to a normal yield of around 900,000m³ per annum.

Restrictions on Water Supply

Of the total 1983 of 9.6 MCM only 9.0 MCM reached Nicosia. The remaining 0.6 MCM was partly consumed en-route by various villages camps and industries connected to the system and partly unaccounted for.

Thus, compared to the estimated unrestricted demand of Nicosia of 13.13 MCM there was a shortage of 4.13 MCM or 31% during the year, and restrictions on the hours of supply continued to be enforced throughout the year. The restrictions provided for a supply of 18 hours every 48 hours.

Although production decreased, the water supply was maintained at acceptable levels for the following reasons: (a) the commissioning in 1982, of the First Phase of the Vasilikos-Pendaskinos Project which made it possible to convey large quantities to Nicosia during days of increased demand or failure of other sources, (b) the operation in 1982 of the new Lakatamia Service Reservoir of 40,000m³ capacity which doubled the storage available to meet short term peaks etc. (c) the operation of the 1982/1983 Emergency Schemes and the effects of the campaign to save water, (d) the sensible use of water by consumers due to the increased water rates imposed in 1982 and finally (e) the subdivision of large areas of supply in Nicosia into smaller areas of more uniform elevation so that the restrictions could be imposed more effectively whilst at the same time ensuring that all consumers received their fair share of the quantities available.

Villages and Other Consumers served by the Nicosia Water Supply System

Table VII-3 gives the communities and other consumers served by the Nicosia Water Supply System and the quantities supplied to them over the years 1979-1983.

face and rectify promptly such emergencies. The Government repairs or replaces damaged pumping equipment installed on sources of the system 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 secure continuous supplies to the town.

A good spirit of co-operation is maintained between the two sides in their genuine effort to face the common problem of water shortage facing Nicosia as a whole. The contribution of the United Nations personnel to this end 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 accurately. Nevertheless, it is estimated that this demand was of the order of 13.13 MCM per annum during 1983 which corresponds to an average daily demand throughout the year of 36000m³. The seasonal variation in demand would push this figure to about 43,000m³ during the summer months with single day maximum peaks as high as 50,000m³. This assumes an average daily consumption of 700l/day per consumer meter.

Sources and production

The main water supply sources of Nicosia town and their production over the years 1979 to 1983 are given in Table VII-2.

TABLE VII - 2 NICOSIA WATER SUPPLY
Yield of Sources in MCM per annum 1979-83

Source	Year				
	1979	1980	1981	1982	1983
1. Morphou Bay Scheme	3.232	3.349	3.252	3.198	3.230
2. Dhikomo-Sycheri	1.007	0.950	0.501	0.198	0.112
3. Paliometochos, Kokkinotimiithia Dhenia, Airport	0.659	0.543	0.568	0.565	0.466
4. Teeri	1.028	0.940	0.891	0.812	0.788
5. Dhali	--	0.294	0.268	0.077	Nil
6. Peristerona-Akaki	0.211	1.195	1.316	1.040	0.950
7. Latsia, Athalassa, Makedonitissa	0.401	0.276	0.367	0.268	0.350
8. Nicosia Water Commission Sources	0.633	0.768	0.689	0.521	0.453
9. Purchased from private b/h	2.013	1.528	1.366	2.101	1.669
10. Leikara Dam (CWS)	--	--	--	0.891	0.042
11. 1982/83 Emergency Schemes					
(a) Stavrovouni-Pyrge	--	--	--	0.277	0.362
(b) Dhenia	--	--	--	0.314	0.389
(c) Dhali-Kattoudhia	--	--	--	--	0.276
Totals	9.184	9.878	9.718	10.202	9.581

New Water Rates

During 1983 this Department prepared and submitted to Government a detail report on water production cost of the Government water supply projects. It was evident from this report that the existing water rates which were introduced in 1982 could not cover the production cost and new water rates should be adopted. The increased production cost can be attributed to the reduction in the yield of water supply sources due to the drought and the execution of a series of additional emergency schemes to encounter the effects of the drought. The Council of Ministers by its decision No 23.619 dated 15.9.1983 approved the imposition of an additional special rate of 7.5 cent per cubic meter of water sold by Government to all consumers, with effect from 1.6.83 for all Water Boards and for the various communities with effect from 1.1.1984.

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.

Several important sources and conveyance systems serving the town of Nicosia are located within the Turkish occupied area. These sources are the Morphou-Pandayia 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 sector. There are service reservoirs in both sectors. The water supply of the whole town thus operates as a single unified system and the co-operation of both sides is necessary to achieve the desired results.

One meeting was held with the Turkish side in May 1983 to review the water supply situation and to plan for the operation of the common water supply system in order to face the severe shortage by the imposition of agreed restrictions on supply and by speedy repairs in the event of breakdowns. The meeting was held under the auspices of the United Nations Force in Cyprus at the Ledra Palace Hotel in Nicosia.

At the meeting it was agreed to continue the daily telephone communication between the two sides, in order to facilitate the exchange of information on production and consumption. This was implemented and any break-downs and faults were reported to the United Nations who undertook the transport from and to the Turkish side of the necessary equipment making it possible to

TABLE VIII -1 - URBAN WATER SUPPLY IN CYPRUS

Year	Nicosia			Limassol			Larnaca			Paphos		
	Consumers *		Input into Service Reservoir (at Outlets) m ³	Consumers		Input into Service Reservoir (at Outlets) m ³	Consumers		Input into Service Reservoir (at Outlets) m ³	Consumers		Input into Service Reservoir (at Outlets) m ³
	Number at end of year	Increase %		Number at end of year	Increase %		Number at end of year	Increase %		Number at end of year	Increase %	
1972	17601	-	7,564,804	17927	-	4,952,521	5812	-	1,659,680	-	-	-
1973	18989	7.9	7,460,286	19015	6.1	4,999,405	5950	2.4	1,313,750	-	-	-
1974	20796	9.5	7,550,913	19435	2.2	4,990,401	6065	1.9	1,528,990	-	-	669,19
1975	21978	5.7	7,532,363	19800	4.1	4,175,035	6023	0.7	1,819,820	3.3	645,22	645,22
1976	23628	7.5	8,137,580	20305	2.6	5,181,567	7515	24.7	2,015,900	7.2	777,80	777,80
1977	25646	8.5	8,551,570	20989	3.4	5,935,146	8133	8.3	2,315,590	8.2	808,77	808,77
1978	27944	9.0	8,307,170	21908	4.4	6,342,758	9513	17.0	2,523,680	8.6	889,66	889,66
1979	30337	8.6	8,559,184	23840	8.8	6,560,782	10578	11.2	2,669,100	31.0	973,36	973,36
1980	34181	12.7	8,152,909	26416	10.8	7,214,542	11776	11.3	2,543,540	14.6	1,119,05	1,119,05
1981	35366	3.5	8,676,120	28392	7.5	7,411,301	13487	14.5	2,931,690	11.5	1,200,59	1,200,59
1982	37518	6.1	9,001,875	30311	6.7	7,692,378	15047	11.6	2,770,700	13.8	1,247,97	1,247,97
1983	39554	5.4	8,984,890	31885	5.2	7,711,306	16453	9.3	2,471,510	9.9	1,293,88	1,293,88

*Due to lack of information on the number of consumers in the Turkish occupied sector the figures in these columns 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

Town	Year	Total number of application received	Total number of application approved	Total number of application subsidized
Nicosia	1982	847	689	375
	1983	525	410	332
Limassol	1983	4	4	4
Larnaca	1983	167	144	82

More details of the Emergency Schemes completed in 1983 are given elsewhere in this Chapter.

Nicosia Town: Restrictions on the hours of supply continued to be imposed throughout the year. During summer the supply to the consumers was 18 hours every 48 hours.

Larnaca Town: The water supply of this town is supplemented from the Nicosia Famagusta-Larnaca Water Supply System. Due to the dry year water supplied to this town from the above system was limited and restrictions on the supply were imposed throughout the year. The supply to the consumers during the summer months was as little as 10-12 hours every 48 hours.

Limassol Town: Despite the effects of the drought, the water Board's sources met satisfactorily the water supply demand and the town enjoyed a regular supply throughout the year.

Paphos Town: Due to the limited capacity of the main conveyor, the water supply of the town was supplemented from the Paphos Lower Villages Scheme. Due to the increased water demand restrictions on the supply had to be imposed during the summer months.

Table VII-1 gives some useful statistical data on the water supply of the towns over the last twelve years.

Water Supply Situation in General

The year 1983 was the second consecutive year of drought. The rainfall during the 1982-83 winter season was unsatisfactory both from the point of view of its volume as well as its temporal and geographical distribution. This resulted in unusually low riverflows, affecting both the volume of water impounded in dams and the recharge of the aquifers. Thus, from the point of view of water supply the year 1983 was recognised quite early as a year of drought.

In 1982, in order to counter the effect of the resulting reduction in the yield of the various water supply sources a series of emergency borehole schemes were put forward in collaboration with the Geological Survey Department as part of a more general plan which included also a campaign to save water. The emergency schemes were approved by the Council of Ministers together with the necessary funds, and a special committee was set up under the chairmanship of the Director-General of the Ministry of Agriculture and Natural Resources with wide powers to decide on all relevant matters and by-pass certain procedure in order to achieve their timely implementation. This arrangement proved very effective and by the end of July 1982 the first phase of the emergency schemes was completed. Work on the second phase of the emergency schemes continued during 1983 and by August 1983 the majority of boreholes included in the emergency schemes were connected to the conveyors of Nicosia-Larnaca-Famagusta Schemes Central Water Supply System and put into operation. The total expenditure on the Emergency Schemes during 1983 was £81.785 and the total quantity of water produced by all boreholes of the 1982/1983 emergency schemes was 2.289 MCM of water.

The Yermasoyia-Vasilikos Project which is comprised of a 350 mm steel/A.C./ductile iron pipeline, from Yermasoyia Dam to Khirokitia Treatment works, and of a conveyance capacity of 3.5 MCM per annum, was completed early in 1983. During 1983 a total quantity of 2.04 MCM of water was conveyed to Khirokitia Treatment Works. These quantities proved invaluable in maintaining the water supply of the three towns and the numerous communities connected to the system, at acceptable levels.

As a further measure to save potable water in Nicosia, the scheme implemented in 1982 for subsidizing the drilling of private boreholes for irrigation of gardens and other secondary uses, thus saving a corresponding volume of potable water, was continued in 1983, and was extended to cover consumers in the Areas of supply of Limassol and Larnaca Water Boards. The scheme provided for £50.- subsidy for new boreholes drilled within the Area of Supply of the three aforementioned Water Boards. A total of 696 applications were received by the end of the year of which 558 were approved and the subsidy was actually paid for 418 cases totalling £20,900.- More details are given in Table VI below

VIII DIVISION OF OPERATION AND MAINTENANCE
TOWN WATER SUPPLY

By: Elias Kambourides
Executive Engineer I

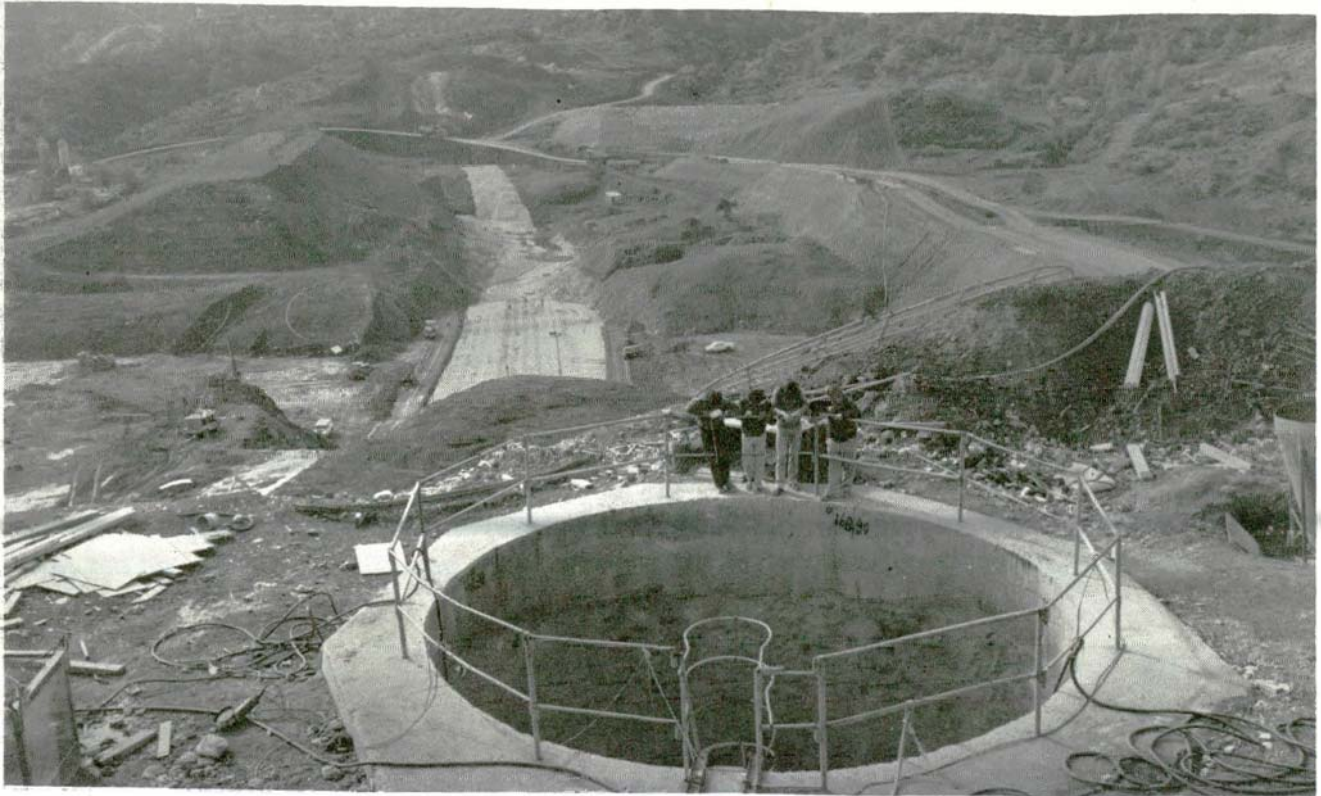
Ag. Head of Division

Introduction

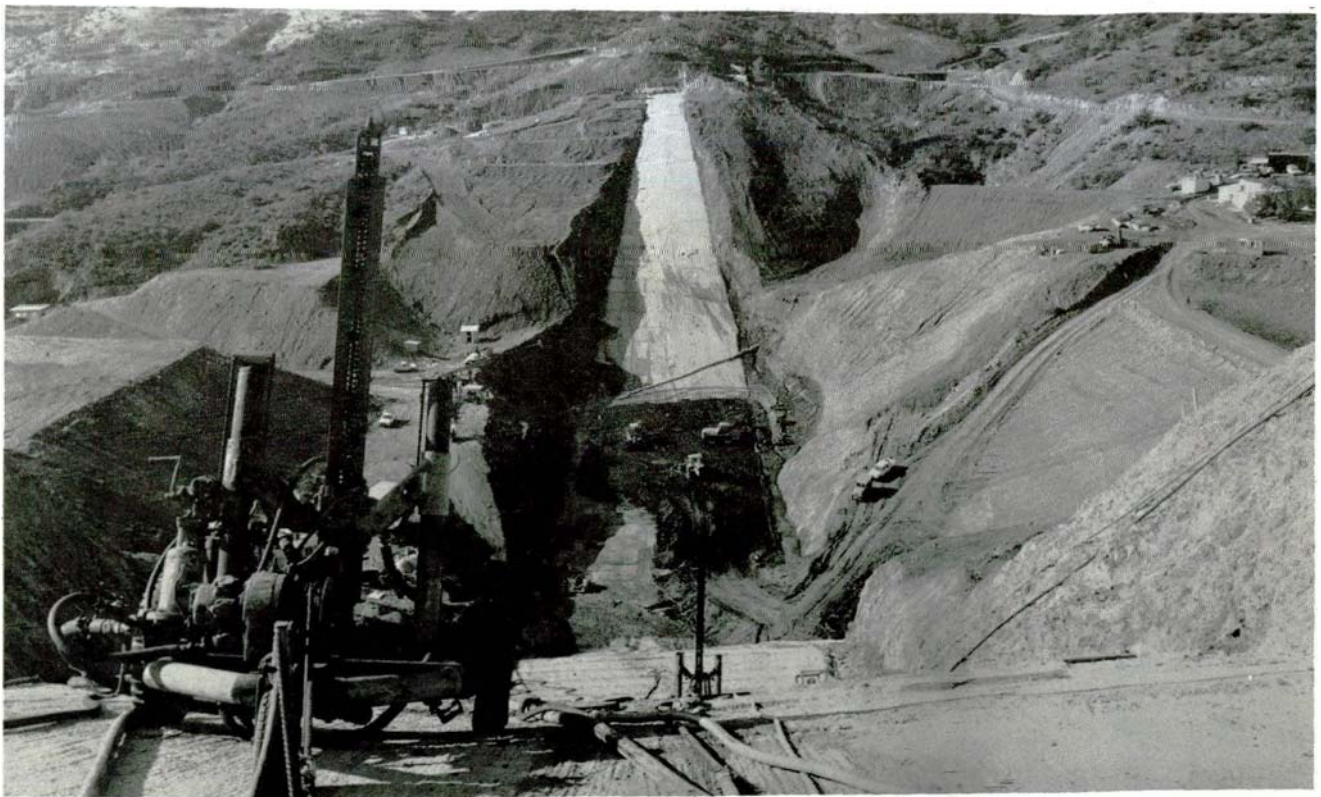
The main activities of this Division are the administration, operation and maintenance of Government Town Water Supply schemes and Rural Regional Water Supply schemes. Presently, the following Government schemes are in operation:

- 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, Larnaca and of over 30 communities and refugee housing estates in the above two districts and
 - (b) The First Phase of the Nicosia Water Supply component of the Vasilikos Pendaskinos Project. This phase of the Project comprises Dhipotamos Pumping Station, Stavrovouni Balancing Reservoir and the pipeline from Dhipotamos Pumping Station to Nicosia. It was commissioned early in 1982 and now forms part of the Central Water Supply System supplying supplementary water to Nicosia and a number of village en route.
- 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

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 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 the design and construction work for major developments in their distribution systems.



Kalavassos dam under construction. Valve Shaft seen in foreground,
WDD Photo D96-5, 7.12.83



Dhyptomamos Dam. General view of cut-off trench and right abutment with clay
placing at the bottom and grouting operations into the foreground. WDD Photo
E1-11, 3.1.84

TABLE VII.2 - I (Cont.)

Item No.	Description	Expenditure 1983 £	Total Expenditure upto 1983 £
42	DHYPOTAMOS DAM - Contract 2		
42A	Constructional expenditure	1 203 368	1 807 368
42B	Supply of materials	296 714	330 027
41&42	Laboratory equipment for Dhyp. & Kalavasos Dam	25 333	25 333
42(1-4)	Lefkara diversion & ancillary pipeline		
42(1.1)	Permanent access road	51 030	52 661
42(1.2)	Pipeline construction (inc. 42(1.4) 42(6))	131 403	131 403
42(1.3)	Removal of existing pipeline	8 120	8 120
42(3&4)	Maroni/Pendaskinos Irrg. & domestic pipelines	55 493	57 559
42(5)	Ayios Theodoros diversion pipeline	9 721	9 721
43	MARONI DIVERSION - Contract 3		
44(1-4)	KALAVASOS-KHIROKITIA PIPELINE- Contract 7	29 049	29 049
45	PENDASKINOS IRRIGATION - Contract 9		
46	VASILIKOS IRRIGATION - Contract 8		
47	ELECTROMECHANICAL EQUIPMENT FOR PS - Contr. 4A	15 749	15 749
48	CONSTRUCTION OF KORNOS WTWORKS & PS - Contr. 5B	228 833	228 833
49	ELECT?MECH. EQUIP. FOR KORNOS WT. PLANT - Contr. 5A	135 664	135 669
50	CONSTRUCTION OF KALAVASOS (TOKHNI) PS - Contr. 4B	3 036	3 036
51	ACQUISITION OF LAND	1 518	1 318
52	TELEMETRY - Contract 6		
	TOTAL	<u>4 932 140</u>	<u>6 113 723</u>
	GRAND TOTAL	<u>5 003 438</u>	<u>8 984 157</u>

TABLE VII/2 - I
VASILIKOS-PENDASKINOS PROJECT - EXPENDITURE 1983

a) Nicosia Water Supply 1st phase

Item No	Description	Expenditure 1983 £	Total Expenditure upto 1983 £
1	Electricity & telephone	-	70 837
2	Land acquisition	-	-
3-7	Materials handling & storage supervision, investigations, miscellaneous and contingencies	8 211	115 629
8	Civil engineering works Contract No. 39/78/38 - J & P	49 661	971 714
9	Mechanical & electrical works Contract No. 39/78/39 - Mather & Platt	10 761	351 629
10	Steel pipes Contract No. 39/78/40 - P Epiphaniou	-	482 196
11	A C Pipes Contract No. 39/78/41 - C P I	-	610 811
12	Valves Contract No. 39/78/42 - Pont-a-Mousson	-	45 943
13	Valves Contract No. 39/78/42- S Blakeborough	1 760	40 985
14	Dhypotamos pumping station Irish Bridge	-	105 222
15	Consultant fees	905	67 744
16	Construction of additional pipes & fittings	-	5 450
17	Wages for the operation and maintenance of the pumping station Dhypotamos	-	2 274
	Total	71 298	2 870 434

b) Agricultural Development

31	Groundwater development - Maroni	2 464	2 464
32	Erection of building - Khirokitia HQ	16 354	62 110
33	Agricultural research - ARI building	16 843	40 185
34	Purchase of vehicles & machinery	33 232	89 059
35	Consultant's fees	156 267	448 636
36	Hydraulic model testing	-	39 930
37	Works by WDD (Topography, Investigations etc.)	24 151	92 459
38	Administration/Transport/Supervision	-	8 039
38A	Kalavassos Dam	54 295	54 295
38B	Dhypotamos Dam	62 067	62 067
38C	Kornos Treatment Works.....	2 655	2 655
38D	Maroni River Diversion	189	189
38E	Kalavassos-Khirokitia pipeline	-	-
39	Commuted allowance to Deputy Project Manager	663	1 947
40	Land consolidation	46 410	52 128
41	KALAVASSOS DAM - Contract 1	-	-
41A	Constructional Expenditure	2 314 036	2 314 036
41B	Supply of materials	-	-
41C	Construction of flow gauging station upstream	7 483	7 483

KORNOS TREATMENT WORKS - Contract No. 5B

Contractor: Ch Apostolides & Co Ltd. of Cyprus

This contract commenced in November 1983 and the Contractor made good progress with the excavation for the foundation of the structures.

The relevant details for the mechanical and electrical equipment and sub orders were checked and finalised. (Degremont Laing of U.K. Contract No. 5A)

TELEMETRY - Contract No. 6

The prequalification documents for the telemetry contract of the project, were received from 33 tenderers. The consulting engineer started the evaluation of all the submissions.

KALAVASOS -KHIROKITIA PIPELINE - Contract No. 7

The Construction Division of the Water Development Department undertook the laying of the Kalavasos-Khirokitia pipeline and the construction of the balancing tank and the break pressure tank.

Initial levelling of the pipeline route started in 1983 and the levelling and site preparation of the balancing tank and break pressure tank.

Orders have been placed for all the pipeline materials at very competitive prices i.e. C£1,187,000 approx.

During 1983 an amount of C£29,049 was spent on the preliminary works of the pipeline construction.

VASILIKOS IRRIGATION NETWORK - Contract No. 8

The documents with the schedules of materials were finalised so that materials tenders would be invited early in 1984.

The implementation of the network will be done by the Construction Division of the Department.

PENDASKINOS IRRIGATION NETWORK - Contract No. 9

Tenders for the supply of materials were received in November 1983 and are being evaluated.

MARONI IRRIGATION NETWORK - Contract No. 10

Tenders for the supply of pipes and fittings were invited at the same time as for Pendaskinos irrigation network and are similarly being evaluated.

In late November 1983 the Water Development Department decided to restore the originally calculated *capacity* of the reservoir by raising the crest and top water level by 2.0 meters.

By the end of 1983 an amount of C£2,334,186 was spent on Kalavassos Dam.

DHYPOTAMOS DAM - Contract No. 2

Contractor: Joint Venture of Shephard Hill of U.K. and G P Zachariades Ltd. Cyprus

The construction work on Dhypotamos Dam has also progressed very well throughout the year on all the critical items of work but the valve shaft and the spillway were behind even the revised programme. However the embankment started some 12 weeks earlier than shown on the tender programme. The clay core has also proceeded very well.

The Contractor has developed the clay borrow areas, the quarry and the filters areas.

The Water Development Department's Construction Division, responsible for the division of the Lefkara Khirokitia pipeline, which formerly passed through the dam site completed their work and reinstated the area around the pumping station at Dhypotamos and along the pipeline routes.

By the end of 1983 an amount of C£1,768,515 was spent on Dhypotamos dam and the ancillary works.

MARONI RIVER DIVERSION - Contract No. 3

The tender documents for this Contract have been prepared and issued to the tenderers on the 1st of December 1983.

ELECTRICAL PLANT FOR THE PUMPING STATIONS - Contract No. 4A

Contractor: Weir Pumps Ltd of U.K.

The pump sets have been tested at the manufacturer's works and have performed in accordance with the guarantee figures stated in the manufacturer's tender.

During the year an amount of C£15,749 was spent on the supply of mechanical and electrical plant.

TOKHNI PUMPING STATION - Contract No. 4B

The Construction Division of the Water Development Department undertook the construction of the Tokhni Pumping Station and the bulk excavation started in November 1983.

VII/2 VASILIKOS - PENDASKINOS PROJECT

by

D M Patsalides
Executive Engineer I
Deputy Project Manager (Eng.)

GENERAL

The implementation of construction on the Vasilikos - Pendaskinos Project, excluding the Nicosia Water Supply first phase, started in November 1982 with the commencement of Dhypotamos Dam and the award in November and December of the mechanical and electrical plant contracts for Tokhni and Kalavasos Pumping Stations and for Kornos Treatment Works.

During 1983, the two most important parts of the project namely Kalavasos and Dhypotamos were under construction and proceeded very well throughout the year.

Towards the end of the year the works at the Kornos Treatment Plant started with the excavation of foundation for the structures.

The Construction Division of the Water Development Department undertook the laying of the Kalavasos - Khirokitia pipeline and the relevant ancillary works and the construction of the Tokhni Pumping Station.

The total expenditure incurred during 1983 for the Vasilikos-Pendaskinos Project amounted to C£4,932,140.

More details about each individual contract are given in section Progress of Works.

PROGRESS OF WORKS

KALAVASOS DAM - Contract No. 1

Contractor: Joint Venture of J & P and Medcon Ltd. of Cyprus

The construction work on Kalavasos Dam started in January 1983 and continued very well throughout the year.

Early diversion of the river through the diversion tunnel enabled the embankment to start on programme.

Clay was placed in the core trench to a depth of 8.0 metres. Rockfill has been carried and carted to the embankment and placed in the upstream and downstream shoulders.

Large quantities of processed filter materials have been stockpiled.

The embankment foundations have been largely completed and grouting proceeded very quickly.

The operation and maintenance cost including power cost, totalled £ 372,776 Breakdown regarding this expenditure is given on the tables

Staff

With regard to the staffing of the division set out for the operation and maintenance of the Paphos Irrigation Project the Department had allocated from the existing personnel the following number of Staff.

MONTHLY

1 Executive Engineer II
1 Mechanical Engineer II
1 Technician I
6 Technicians II (4 daily)
1 Assist. Chief foreman

HOURLY

3 foremans
8 water inspectors
3 Electricians-Mechanics
10 skilled labourers
13 Unskilled labourers
9 Drivers
2 Machine drivers

ADMINISTRATIVE STAFF

1 Administrative officer
1 Accounting officer
5 Clerical Assistants
1 Telephonist
1 Messenger
1 Office cleaner

Note: See also under chapter IX

DEVISION OF OPERATION AND MAINTENANCE (IRRIGATION)

(A) Eastern Area

(B) Western Area

Farm lines 99 cases (1,5%)
Main lines 14 cases (0,84%)

Farm lines 128 cases (5,3%)
Main lines 16 cases (2,1%)

The main cause of pipe breakages is considered to be the heavy clayey soils which due to the swelling effects cause dislocation of the pipes. With time the position of the lines is gradually stabilised. The recorded breakages in the Eastern Area during the year 1983 were about 19% less than the breakages recorded the previous year. The reason of higher percentage of breakages in the Western Area is the damages caused due to the works for construction of the road network by L.C.A. (109 cases were due to that reason).

The other serious problems were faced during 1983 were:

- (1) Blockage of the hydrants water meters and outlets with algae or silt (533 cases were recorded)
- (2) Repairing of leaking riser valves (560 cases) and getting stuck pressure regulators (495 cases)
- (3) Removal by farmers of the flow limiting device from hydrant outlets (51 cases).

Irrigation supplies to the farmers started from the beginning of the year mainly for green houses and little later for the vines. Up to the middle of April the demand has been low and the total quantity of water supplied was of the order of 800,000 m³ and could be met by diverting the surface flow of Dhiarizos and Ezousa rivers into the canaletti in order to feed the main canal, with the exaction during January when the extraction of water by pumps was necessary due to low river flow during that month. With the planting of summer crops such as ground nuts towards the end of April water requirements had increased considerably and the well pumps were put into peration. Up to 9/6/1983 the requirements of water were satisfied without using any water from the Dam. Releases from the Dam reservoir started that date and continued up to the end of the year. The total quantity of water released from the dam was estimated at 8,7 M.C.M. as no water meter has been installed on the temporary supply to the main canal (Permanent connection of the dam irrigation pipe-lines with the main canal was not possible due to construction of Power Station). The water impounded in the reservoir of Asprokremmos dam reached a maximum by 9/6/1983 of about 20.03 M.C.M.

Appart from the irrigation supplies, the project had provided also certain quantities of water for industrial use mainly for the Anatolikon Co-operative industries.

Details regarding water utilization and crops is given on the tables

The total gross income from the sale of water at the nominal rates of 26σ/m³ up to 9/9/83 and 3½ σ./m³ after 9/9/83 and 35 σ./m³ and 8.9 σ./m³ for industrial uses amounted to about £ 314,000.

The amount of water which was released from the dam was estimated approximately on the basis of reservoir level and opening of the gate. By comparing the results of these measurements however with the quantity of water pumped out of the main canal as recorded at the water meters of the Pumping stations recordings give bigger quantity than inflows into main canal. The above discrepancy may be attributed to the following two reasons: (a) Leakages through the non-return valves of the P.S. by-passes back to the main canal and (b) Pumping station's water meters are overrecording the flows of water. These reasons appear to be valid due to the fact that difference between the P.S. water meters and the sum of all the networks' water meters was bigger than expected and on an average it was found to be about 15% higher at the level of Pumping Stations.

PAPHOS IRRIGATION PROJECT
OPERATION AND MAINTENANCE

During the year 1983 the whole project was put in operation by W.D.D. covering all Project Area between Koukليا and A. Yeorgios as well as supplies to the irrigated areas from Mayrokolymbos. The last portion of Western Area was commissioned by the contractor to W.D.D. and put into operation in June 1983. For the irrigation of 7,950 donnums of permanent plantations and about 13,650 donnums of permanent plantations and about 13,650 donnums of seasonal crops 8,680,000 c.m. of water were provided from Asprokremmos dam 6,425,000 c.m. from the project boreholes and diversion of surface river flow from Dhiarizos and Ezousa and 745,000 cm from Mavrokolymbos dam.

The main tasks and difficulties which were faced during the year 1983 in connection with the maintenance of the Project i.e. Wellfields, main canal, pumping stations and Irr. Networks covering an area of 5,000 ha are summarised here below.

In addition to the routine general cleaning of all concrete structures and painting their metal work on the wellfield conveyance system the most serious problem was the same as the previous year i.e. the formation of algae in the open conveyors of the project, the main canal and canaletti and its consequential adverse effects on the operation of the pumping stations and distribution systems details of which were mentioned in the annual report of 1982. To reduce the formation of such algae the inner surface of canaletti and rectangular canal were cleaned by scraping 3 times during the reporting year. No other measures have been taken so far to remedy the situation, such as installation of a movable self-cleaning screen at the end of canaletti.

Considerable growth of plants was also appearing on the invert of the main canal over of which large deposits of silt and sand have been occurring with the result of reduction on the maximum capacity of the canal and the danger of blockage of its syphons. It is considered necessary to provide suitable machinery for the regular cleaning of the main canal. The lack of such machinery made impossible the cleaning of the main canal during 1983.

Apart from the general cleaning of all the installations in the pumping stations and repair of certain electrical failures a lot of work was required in order to keep the non-return valves clean so that water was not returning back to the canal due to leakages through these valves. Algae and other dirt found in the water of the main canal were the cause of the above problems.

In the current year 1983 tariff 90 (off peak) of Electricity Authority was applied to all pumping stations of the Project as the most economical one. Applications of tariff 90 started in January 1983 and completed in June of the same year. As a result of this change a saving of nearly £ 56,470 in electricity supply cost during 1983.

The main problem experienced with the operation of the distribution systems were the breakages of A.C. pipes mainly on the farm lines and less on the main lines. During the reporting year the following breakages have been recorded:

TABLE VII/1 PAPHOS IRRIGATION PROJECT-EXPENDITURE 1983 (cont.)

Ser No	Description	1983 expenditure	Total expenditure up to 31.12.83
11	<u>Maintenance & Operation of the Project</u>		
	Wellpumps & Conveyance system		
	(a) Operation and Maintenance	16 968	37 799
	(b) Electricity	29 784	101 206
	Main Canal	-	-
	(a) Cleaning	2 266	7 120
	(b) Maintenance & Operation	7 844	27 090
	Purchase of equipment	12 277	62 954
	Operation of vehicles	10 802	12 985
	Electrotechnician & Mechanic	-	-
	Hiring charges EMS	16 746	26 135
	Pumping Stations & Western Conveyor		
	(a) Operation and Maintenance	11 948	21 479
	(b) Electricity	171 961	373 401
	Maintenance of Irrigation Network	59 437	110 068
	Maintenance of Asprokremmos Dam	2 337	2 337
		<u>342 170</u>	<u>342 170</u>
12	<u>Irrigation Network & Reservoir</u>		
	<u>Western Area Contract No.</u>	568	568
	Installation of Irrigation Network	271 680	1 331 344
	Supply of pipes	-	481 219
	Handling of pipes	1 060	34 634
	Supply of valves	-	55 154
	Supply of hydrants	-	76 560
	Topographical control works	1 209	7 236
	Compensations	3 950	6 036
13	<u>Road Network</u>		
	Construction of roads	482	164,157
	Topographical control works	-	1 708
	Total	£1 666 969	£ 25 263 212

ANALYSIS OF 1983 ACTUAL EXPENDITURE

2D-02-841	Construction	£ 1 294 193
20A-35-244	O & M	372 776
		<u>£ 1 666 969</u>

TABLE VII/1 PAPHOS IRRIGATION PROJECT-EXPENDITURE 1983 (cont.)

Ser No	Description	1983 expenditure	Total expenditure upto 31.12.83
8	<u>Other works by WDD</u>		
	Purchase of equipment	-	74 744
	Agriculture research activities	-	36 191
	Agriculture development	3	7 836
	Land acquisition	100 738	112 451
	Installation of six automatic recorders	-	4 118
	Soil and concrete laboratory	2 466	64 257
	Operator drawing/printing machine	-	5 054
	New agriculture research station at Akhelia	16 578	64 794
	Green House Akhelia	897	15 646
9	<u>Management</u>		
	Furniture and fittings	-	4 625
	Office requirements	9 622	49 786
	Wages of drivers	26 261	191 601
	Operation of motor transport	1 447	47 660
	Maintenance of project vehicles	2 544	22 466
	Trading programme	-	5 562
	Travelling	2 699	56 104
	Purchase of tools	-	-
	Advertisements	-	3 743
	Overtime fees	262	101 724
	Poster "Paphos Irrigation Project"	100	733
	Computer charges	-	291
10	<u>Consultants Fees</u>		
	SOGREAH	63 384	571 339
	MacDonalds & Partners	61 985	545 203
	PAC	9	2 626
	Mr G Post	-	4 256
	Extention services (J Hanan-Dr Providenti)	-	7 661
			6 990
	Mr Sabarly	-	1 748
	Mr Nonvellier	-	-

TABLE VII/1 PAPHOS IRRIGATION PROJECT-EXPENDITURE 1983 (cont.)

Ser No	Description	1983 expenditure	Total expenditure up to 31.12.83
4	<u>Main Contract. Western Conveyor Pumping Stations and Remote Indication</u>		
	Supply and installation of pumping stations western main pipeline and remote indication (COSTAIN)	-	3 615 484
	Topographical control works	-	5 944
	Compensation to damages	-	449
	Investigation western conveyor	-	444
	Installations of four private wires-remote	-	8 978
	Supply and Installation of louvers for 13 pumping stations for ventilation	-	2 161
	Roofing of pumping stations	-	601
	Installation of steel gates	-	3 745
	Connection of main pumping station with the canal	5 723	16 582
	Asphalting Roads	-	10 152
	Overhead Line for connection Ayia Varvara P.S.	-	205
5	<u>Asprokremmos Dam</u>		
	Construction of Asprokremmos Dam (J & P) & Medcon Joint Venture)	638 436	10 809 248
	Model Testing	-	18 834
	Asprokremmos Dam investigations	-	21 610
	Diversion of services	-	1 509
	Asprokremmos Dam, laboratory triaxial tests	-	-
	Design of spillway	-	530
	Supply of progress photographs	-	1 985
	Topographical control works	1 041	13 573
	Pentonic clay dispersion tests	-	-
	Alkali activity reaction tests abroad	-	1 500
	Compensations: Water supply to Mandria	54 543	213 996
6	<u>Erection of Buildings and Offices</u>	-	72 232
7	<u>Electricity Supply</u>		
	Electricity supply	11 065	236 363
	Metering units	-	-

TABLE VII/1 PAPHOS IRRIGATION PROJECT - Expenditure 1983

Ser No	Description	1983 expenditure	Total expenditure up to 31.12.83
1	<u>Wellfield Conveyance System</u>		
	Drilling and testing of boreholes	-	81 914
	Supply and installation of well pumps	-	143 813
	Supply of pipes and valves	-	212 535
	Supply of canaletti	-	71 013
	Installation wellfield conveyance system (NCS by ASPFM)	-	25 157
	Installation of WCS by WDD	-	239 027
	Topographical control works	612	2 397
	Development of boreholes and lowering Well pumps	-	3,015
	Diversion of river water into the canaletti	-	10 413
2	<u>Construction of Main Canal</u>		
	Main canal construction (GCC)	-	937 363
	Diversion of services	-	9 239
	Main canal investigations	-	17 307
	Alkali activity tests	-	1 759
	Compensation to field crops	-	1 472
	Fencing of main canal	-	4 665
	Repairs and additional works	-	14 159
3	<u>Irrigation Network Eastern Area</u>		
	Installation of irrigation network (SOCEA)	45 244	2,132 629
	Supply of AC pipes (CPI)	-	1 264 533
	Handling of AC pipes	-	41 577
	Topographical control works	-	18 476
	Inspection of cast iron fittings	-	316
	Survey works eastern area	-	2 595
	Preparation of steel fittings (WDD Workshop)	-	8 227
	Compensation of damages to field crops	-	4 632
	Inspection of CPI factory	-	1 570
	Reinstallation of AC pipes at Akhelia	-	5 899
	Inspection of hydraulic equipments installed by SOCEA	-	1 086
		<hr/>	<hr/>
		45 856	5 256 788

of claims amounting to a total of about £ 5 million has still to be settled between the W.D.D. and the Contractor through arbitration proceedings.

2. Installation of Irrigation Networks and Construction of Reservoirs for Western Sectors - Contract No. C9 39/77/40
Contractor: G.P. Zachariades Ltd.

The Contractor has continued from the previous year to perform his work in a satisfactory manner without increasing his delay of 9 months recorded the previous year.

The remaining from 1982 Irrigation Networks of Western Area were completed, tested and taken over by W.D.D. with the following schedule:

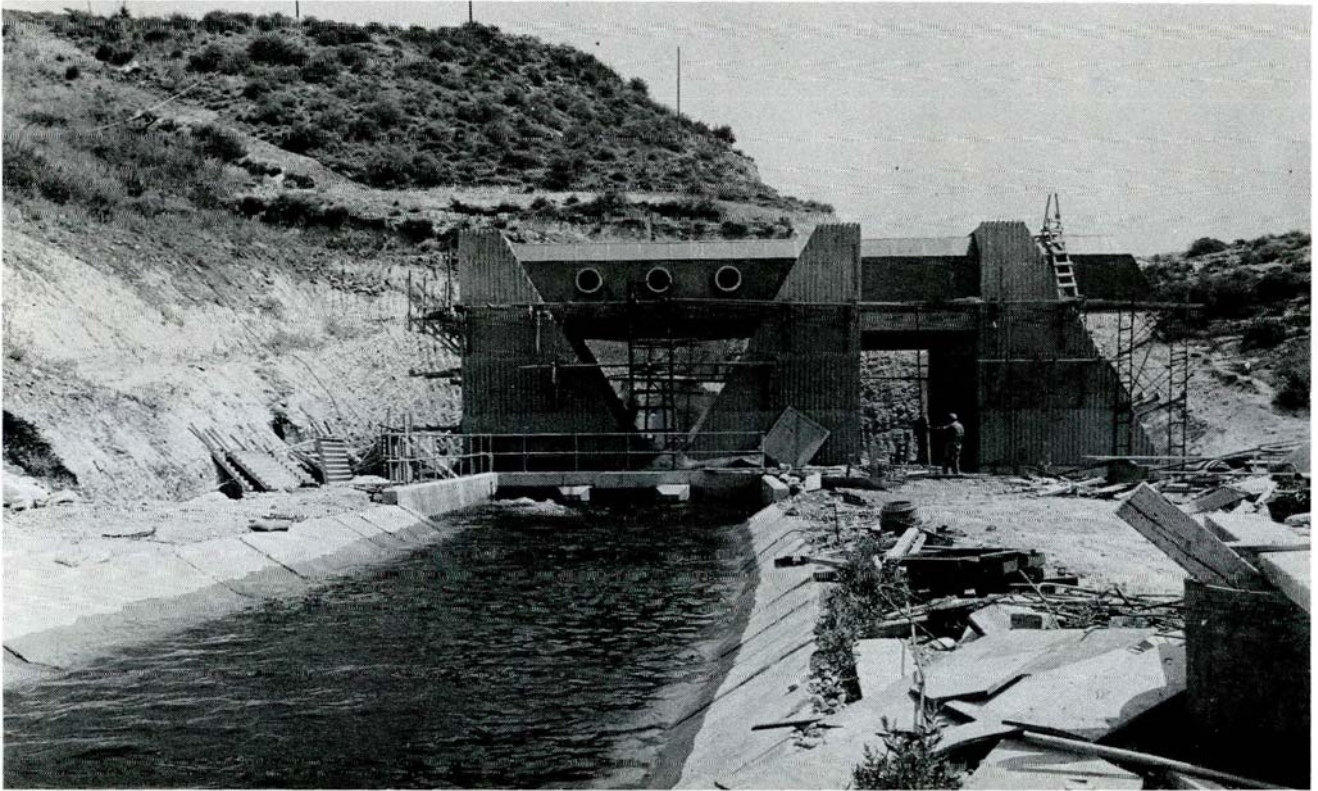
Emba South 20/1/83, Emba North 19/2/83, A. Yeorgios 20/4/83 2nd portion of Peyia Sector 4/6/83. The total work executed by the Contractor during reporting year is summarised as follows:

- a) Laying of A.C. pipes 1,200 m.
- b) Installation of farm risers (252 No) Hydrants (41 No) air valves (40 No) Control Sluice valves (21 No) and water hammer protectors (14 No).

After completion of the above mentioned Sectors the contractor was working with one crew on the repairs of pipe breakages appearing during the operation of the Networks and with other finishing works on the Installations of Irr. Networks and reservoirs.

Finance

The total cumulative amount paid to the contractor up to the end of 1983 was £ 1,331,3/4 while the amount paid during 1983 was £ 271,680.



Asprokremos dam hydroelectric power station under construction. 2.8.83.
WDD Photo D70-2

VII/1 PAPHOS IRRIGATION PROJECT

by K Spanos

In 1983 all works under contracts have been completed i.e. J&P-Medcon completed the last item of Asprokremmos dam (Power Station) and "Zachariades Ltd" the installation of Irr. Networks of Western Area.

Minor construction works out of contract were executed by W.D.D. and is expected to be completed gradually up to the end of 1985.

The total expenditure incurred during 1983 for continuation of construction works for the project, amounted to £ 1,294.193. The total expenditure up to the end of 1983 reached the amount of £ 24,450,000 which is about 98% of the total estimated cost of £ 25 million.

By the end of the year 1983 all the staff previously working with the supervision of construction works had been transferred to the division of operation and maintenance and other projects under construction.

The two Engineering firms "SOGREAH" and "SIR M MACDONALD and PARTNERS" continued the supervision of contract works with their respective Res. Engineers up to the substantial completion of contract works. Sogreah Res. Engineer left Cyprus by June 1983 and the Res. Engineer for Asprokremmos dam left Cyprus by end of March 1983. The other expatriate civil engineer assisting the dam Res. Engineer left Cyprus at the end of December 1983.

The Project Manager Mr. Branco Milinusic, F.A.O. Senior Irrigation Engineer, has terminated his services with our Department as from April 1983 due to retirement from his work.

Progress of Works

The following two construction contracts were still under execution during the year 1983.

1. Asprokremmos dam - Contract No C2 39/77/26

Contractor: Joint Venture of J&P and MEDCON

With the exception of Power Station the Contractor had finished the main works (Substantial completion Certificate was issued by Sept. 1982) and from the beginning of 1983 he was occupied with the remaining finishing works like construction of measuring weirs at the outlets of drainage galleries, the remainder works across the crest of the dam, installation of metal ladders etc.

The construction of Power Station including the supply and installation of Electro Mechanical equipment by Elin-Union and JM Voith has been completed by September 1983. The final testing and commissioning of that equipment was not possible in 1983 due to inadequate water level in the dam reservoir. It is expected that final testing will take place by the end of May 1984 when the head lowering equipment will be installed too.

Finance

The total cumulative amount paid to the contractor the end of December 1983 was £ 10,809,248 while the amount paid to the contractor during 1983 was £ 638,436. Although the remaining part of the work up to completion has a value of about £ 20,000 only, a large number

Village authorities normally apply to our Department for the execution of such schemes because they do not have the means and the experience to carry out themselves such work and also due to the fact that the original schemes were constructed by the Water Development Department.

SCHEMES UNDERTAKEN FOR PRIVATE DEVELOPERS

For the same reasons as in the case of village authorities our Division responds to the request of private developers for the construction of water works, mainly distribution systems for land development.

During 1983 the Division responded to 209 requests undertaking the construction of identical number of schemes for private developers. It should be noted that the Department charges 20% over and above the cost of construction a scheme for a private developer as Departmental charges. This is a Ministerial Council's decision which is followed by all Government Departments and it aims all recovering the actual cost of the work.

During the year an amount of £177,009 was deposited by the private developers for the construction of these 209 schemes and by the end of the year the expenditure incurred on all schemes reached the amount of £165,620.

For very specific cases an approval was given by the Department for the execution of a water supply scheme by a private experienced Contractor under the supervision of the Construction Division. This trend is ^{now} becoming more demanding, as more private developers want to do the work privately but with the approval of the Department.

TABLE VI.16

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT
DEPARTMENTS DURING 1983

Ser No.	Description	Amount allocated for 1983 £	Expenditure incurred in 1983 £
58	Skarinou - Lefkara road	13 300	10 494
59	Government buildings	100	78
60	MMAD WS	800	420
61	XEKTE WS	172	172
62	Larnaca Airport	11 000	10 633
63	Palekhorí road	319	319
64	Trakhoni - Zakaki WS	65	65
66	Nicosia - Astromeritis road	5 118	3 653
66	Naos tou Apollona WS	686	637
67	Agriculture Department (repairs to storage tank)	800	500
68	Troulli Irrigation	100	100
	Total	<u>£269 558</u>	<u>£232 973</u>

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR VILLAGES FROM DEPOSITS

During 1983 the Division of Construction had to respond to the requests of Village Water Commissions or Village Irrigation Committees for the execution of 101 schemes of various types.

The amount deposited during 1983 for the construction of those schemes was £227,584. The expenditure incurred by the end of the year was only £61,372.

The majority of these schemes relate to maintenance works, especially the maintenance of pumping plants for village water supply schemes, or irrigation schemes. In such cases the cost is not shared in the usual way between the Government and the villages but it is paid in full by the beneficiaries.

Another type of water work undertaken from deposits on behalf of village authorities is the extension of distribution networks for village water supplies, or even irrigation schemes.

TABLE VI-16

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT
DEPARTMENTS DURING 1983 (Cont)

Ser No.	Description	Amount allocated for 1983 £	Expenditure incurred in 1983 £
30	G Rousos WS	5 100	3 965
31	Kophinou Irrigation	3 000	1 998
32	Pyrgos WS	784	784
33	Lordos Kantara WS	3 700	2 539
34	Pano Kividhes WS	1 176	951
35	Aplanda - Anaphotia WS	2 300	1 490
36	Klavdhia WS	117	117
37	Asgata WS	492	492
38	Pyrga WS	113	113
39	Yeni WS	76	60
40	Perakhorio - Nisou WS	500	295
41	Ayios Therapon WS	42	42
42	Zyyi - Tokhni WS	232	232
43	Ayia Phyla WS	60	60
44	Pyrga 'Phase A' (self housing)	1 915	897
45	Klavdhia livestock WS	5 200	3 326
46	Hawai Holiday WS	2 140	2 031
47	Kelia WS	60	24
48	Famagusta pipeline WS	150	119
49	Amathus M/ce	70	70
50	Ayia Napa - Kryo Nero WS	12 500	12 314
51	Ayia Napa - Makronisos	7 500	5 535
52	Nicosia - Limassol road WS	21 100	18 752
53	Kyperounda Irrigation	350	
54	Nicosia - Palekhorio road WS	6 462	4 218
55	Apliki WS	3 370	3 370
56	Saittas - Karvounas road	14 000	11 064
57	Astromeritis - Prodhromos road	11 150	11 150

TABLE VI-16

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT
DEPARTMENTS DURING 1983

Ser No.	Description	Amount allocated for 1983 £	Expenditure incurred in 1983 £
1	Athalassa WS	2 400	2 036
2	Sotira WS	3 000	2 148
3	Perakhorio Veterinary WS	950	661
4	Aradhippou Irrigation	3 200	3 302
5	Amiandos BH	580	580
6	Mammari WS	19 889	14 186
7	Mari Irrigation	43 350	41 474
8	Amathus WS	2 000	1 945
9	Kalopanayiotis M/ce	2 149	2 149
10	Fire Hydrants	6 400	6 313
11	Yermasoyia (removal of pipes) Irrigation	5 164	5 544
12	St. Demosthençys WS	8 800	7 368
13	Pieris 'Sumea' WS	1 000	772
14	Ypsonas - Trakhoni Irrigation	870	870
15	Yermasoyia Irrigation	350	350
16	Ayios Athanasios WS	6 000	6 000
17	Kl. Kilanides WS	3 100	2 705
18	Advances (Ministry of Interior) WS ..	1 000	413
19	Kandou WS	3 500	3 490
20	Aphrodite Appartments WS	2 000	1 136
21	Dhromolaxia WS	220	168
22	Jacobee Department (Georgina Appartments) WS	3 000	2 988
23	Moutayiaka Irrigation	200	190
24	Mathiati WS	9 283	9 283
25	Menoyia WS	100	70
26	Limonia Appartments WS	360	166
27	Thera Land Development WS	1 800	1 299
28	Palodhia - Polemidhia National Guard WS	1 800	1 618
29	Vrysoulles Cemetery	976	670

SUMMARY OF ALL DISTRICTS

Ser No.	Description	No. of scemes	Amount allocated in 1983 £	Expenditure incurred in 1983 £
<u>A. Housing Estates</u>				
(i)	Treatment Plants	3	145 490	111 576
(ii)	Sewerage Systems	6	126 908	112 848
(iii)	Water Supplies	20	107 071	78 143
<u>B. Water Supply for Self-Housing Schemes</u>				
(i)	Nicosia District	8	10 326	7 220
(ii)	Famagusta District	4	49 761	28 542
(iii)	Limassol District	10	19 935	13 092
(iv)	Larnaca District	6	37 723	27 881
Totals		57	£497 214	£379 302

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS

As already stated the Division of Construction responds to the requests by other Government Departments for the construction of water works included in their development budgets. Such water works are the Pitsilia Integrated Rural Development Project, the Refugee Housing and Self-housing Schemes and a considerable number of other smaller schemes covering a wide field of activities.

For the two major groups, referred to above, ie the Pitsilia Integrated Rural Development Project and the Refugee Housing and Self-Housing Schemes detailed reports have been given in previous chapters of this report..

In addition to these major groups of works we had to respond to the requests of various Departments for the execution of 68 separate schemes, all over the island.

The amount allocated during 1983 for the construction of these 68 schemes was £269 558 and the expenditure incurred by the end of the year was £232.973.

Table VI-16 that follows shows in detail all these 68 schemes, the amount allocated for their construction and the expenditure incurred on each one separately.

TABLE VII-15

REFUGEE HOUSING AND SELF HOUSING SCHEMES
 UNDERTAKEN FOR CONSTRUCTION IN 1983 (Cont.)

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £
<u>(ii) Famagusta District</u>			
1	Akhna	18 600	17 019
2	Akhna B	5 000	310
3	Akhna C	25 000	11 060
4	Avgorou	1 161	153
	Total	£49 761	£28 542
<u>(iii) Limassol District</u>			
1	Ayia Phyla	60	53
2	Kandou	774	19
3	Kolossi D	8 046	7 495
4	Kolossi E	627	524
5	Moutayiaka	4 306	4 199
6	Polemidhia Pano	50	47
7	Polemidhia Kato	398	50
8	Trakhoni B	30	15
9	Trakhoni C	2 901	410
10	Trakhoni D	2 743	280
	Total	£19 935	£13 092
<u>(iv) Larnaca District</u>			
1	Dhekelia	9 500	7 729
2	Kophinou B	13 973	10 927
3	Livadhia H	9 500	5 989
4	Oroklini	1 000	546
5	Psevdhas	1 850	1 170
6	Xylophaghou	1 900	1 460
	Total	£37 723	£27 881

TABLE VI-15

REFUGEE HOUSING AND SELF HOUSING SCHEMES
UNdertaken FOR CONSTRUCTION IN 1983 (Cont.)

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £
3	Anthoupolis (Nicosia)	3 500	3 053
4	Arkhangelos Phase II (Nicosia) ..	1 506	1 326
5	Arkhangelos (Nicosia) Phase I....	1 191	311
6	Aspres (Nicosia)	23 036	21 562
7	Ayios Ioannis (Limassol)	1 317	1 279
8	Ayios Ioannis Extension (Limassol)	568	532
9	Ayios Pavlos (Nicosia)	883	883
10	Ayios Eleftherios (Nicosia)	2 700	1 741
11	Khrysospiliotissa (Dheftera)	26 705	26 705
12	Kokkines (Nicosia)	12 163	---
13	Kokkines (Larnaca)	1 681	271
14	Makarios III (Larnaca)	300	105
15	Sotira G. H. Estate	420	304
16	Strovolos III	1 700	1 072
17	Strovolos II	3 200	951
18	Tsakileron (Larnaca)	1 857	563
19	Tsiflikoudhia (Limassol)	876	525
20	Yerani (Limassol)	5 066	5 066
	Total	<u>£107 071</u>	<u>£78 143</u>

B. WATER SUPPLY FOR SELF-HOUSING SCHEMES

(i) Nicosia District

1	Agrokipia	188	25
2	Ayii Trimithias	232	19
3	Peristerona Z	238	50
4	Tseri C	116	23
5	Tseri H	2 500	2 004
6	Yeri C	691	129
7	Yeri D	3 136	1 817
8	Yeri Z	3 225	3 153
	Total	<u>£10 326</u>	<u>£7 220</u>

Out of the 57 schemes undertaken for construction during 1983, 29 schemes were related to housing estates and 28 to self-housing schemes. The 29 schemes for the housing estates include 3 schemes for treatment plants, 6 schemes for sewerage systems and 20 for water supplies.

The amount allocated during 1983 for the construction of these 57 schemes was £497,214 and the expenditure incurred by the end of the year reached the amount of £379,302.

All 57 schemes undertaken by our Division for construction in 1983 are shown in detail on Table VI-4 that follows:

TABLE VI-15
REFUGEE HOUSING AND SELF HOUSING SCHEMES UNDERTAKEN
FOR CONSTRUCTION IN 1983

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £
<u>A. HOUSING ESTATES</u>			
<u>SEWAGE DISPOSAL AND WATER SUPPLY SCHEMES</u>			
<u>(i) Treatment Plants</u>			
1	Apostolos Loucas (Nicosia)	19 000	4 714
2	Kophinou (Larnaca)	36 074	34 689
3	Zenon (Larnaca)	90 416	72 173
	Total	<u>£145 490</u>	<u>£111 576</u>
<u>(ii) Sewerage Systems</u>			
1	Ayios Pavlos (Nicosia)	40 529	40 529
2	Ayios Pavlos (Nicosia)	10 000	9 853
3	Kamares (Larnaca)	56 454	52 713
4	Kophinou (Larnaca)	1 383	1 383
5	Mouttalos (Paphos)	7 130	5 630
6	Zenon (Larnaca)	11 412	2 740
	Total	<u>£126 908</u>	<u>£112 848</u>
<u>(iii) Water Supplies</u>			
1	Apostolos Loucas (Nicosia).....	10 937	10 678
2	Apostolos Andreas (Nicosia)	7 465	1 216

By the end of 1983 some 45 % of the pond works were completed. One variation order was issued to the Contractor concerning the introduction of chimney drain in the embankment of the pond.

The contractor submitted to the Water Development Department intention to claim in relation to (i) possession of site, (ii) delayed delivery of inlet and outlet pipe by the employer, (iii) 'unsuitability' of fill material, and (iv) disruption of work as a result of the variation order issued.

REFUGEE HOUSING AND SELF-HOUSING SCHEMES

The construction programme for 1983 included 57 schemes of various types for the housing of the refugees.

As it has been stated in previous reports the amounts approved for this purpose by the Ministerial Council are budgeted under the Department of Planning and Housing votes.

The Division of Construction has always dealt with prompt action giving always first priority towards the construction of schemes relating to the housing of refugees, since the Turkish invasion of Cyprus in 1974. An enormous achievement has been accomplished by all appropriate authorities concerned in this urgent and human task for the housing of our refugees, and it is obvious that the vast volume of work in this sector has already been covered. Very little is left to be done in the near future.

In addition to the usual water supply schemes for Government Housing Estates and Self-Housing Schemes, our Division has undertaken the construction of a number of sewage schemes for the housing estates. This field of activities was inaugurated in 1981 and beyond the execution of sewage schemes for housing estates the Division has extended its activities to other sectors as well. The introduction of sewage treatment plants in Cyprus has been considered as essential both for health purposes and for the better management of waste water purposes. The treated effluent resulting from these treatment plants is planned to be used for the enrichment of underground water aquifers for irrigation purposes, or for watering grass for athletic stadiums.

TABLE VII-14
W D D PITSIILIA INTEGRATED RURAL DEVELOPMENT PROJECT - BOREHOLE IRRIGATION SCHEMES

Ser No	Scheme	B H Nos	Irrigated area (hectares)	Completed in or expected to be completed in	Actual or expected expenditure £	Design and Construction
1	Kalokhorio	11/77& 54/76	55.63	1981	56 618	WATER DEVELOPMENT DEPARTMENT
2	Potamitissa	67/76& 69/79B	29.49	1981	47 755	
3	Arakapas (Skoli)	106/76&107/76	24.13	1981	69 790	
4	Ayios Theodoros	105/76	12.60	1981	26 988	
5	Arakapas (Angoulos)	124/76	12.73	1982	43 795	
6	Polytistos	21/77	9.38	1982	36 520	
7	Ayion Konstantinos	123/76& 8/81	40.21	1983	123 200	
8	Kato Amiandos	31/76	70.64	1983	207 481	
9	Louvaras	32/76& 16/81	37.53	1983	91 150	
10	Zooplyi	9/81	13.00	1983	46 450	
11	Agros *	63/76	47.59	1983	103 332	
12	Dhymes	81/80	23.59	1984	76 000	
13	Sykopetra	48/82	13.94	1984	48 000	
14	Agros	21/82	23.46	1984	75 000	
15	Askas	98/80	19.44	1984	76 000	
16	Alona	46/80	12.73	1984	46 000	
17	Lagouthera	53/80	5.76	1984	38 000	
18	Dhieronas	14/82	12.73	1984	51 600	
19	Ayili Vavatsinias	35/81	14.34	1984	46 000	
	TOTAL		478.92		£ 1 303 079	

* Together with Agros Dam

TABLE VII-13

S B U PUTELETA IRRIGATED RURAL DEVELOPMENT PROJECT - CANALS AND THEIR DISTRIBUTION SYSTEMS

Ser. No	Schemes	Capacity (cub.metres)	Irrigated area (hectares)	Completed or expected (CE)	Actual or expected (AE)	Design	Construction by	Supervision of Construction
1	Xylistos (Dem)	1 250 000	-	1982	1 187 428		General Construction Co	
2	" Distribution System	-	308.31	1984	654 000		Water Development Dept.	
	" Eptagonia No.1	92 000	-	1960	83 722		Iacovou Bros	
3	" Distribution System	-	20.11	1981	24 509		Water Development Dept.	
	" Khandria	70 000	-	1980	105 940		CYBARCO	
4	" Distribution System	-	18.77	1982	26 906		Water Development Dept.	
	" Kalini	50 000	-	1980	67 815		Iacovou Bros	
5	" Distribution System	-	14.08	1980	15 350		Water Development Dept.	
	" Selendria & B H No 53/76	123 000	-	1980	132 266		FYCO Contracting	
6	" Distribution System	-	71.98	1981	73 550		Water Development Dept.	
	" Ayii Vavatsinias							
	a) Arch dam	53 500	-	1981	82 282		Water Development Dept.	
	b) Pond No 1	55 000	-	1981	72 330		Iacovou Bros	
7	" Distribution System	-	24.13	1981	28 333		Water Development Dept.	
	" Kato Ayice & B H No 66/76	104 000	-	1981	125 000		Phoenix Constructions	
8	" Distribution System	-	40.21	1982	71 313		Water Development Dept.	
	" Eptagonia No 2	127 000	-	1981	162 271		Phalikostrandina-Fiscetzides & Charalambous Co.	
9	" Distribution System	-	-	1981	97 686		Iacovou Bros	
	" Eptagonia No 3	65 000	-	1982	66 362		Water Development Dept.	
10	" Distribution System	-	35.52	1981	177 390		Iacovou Bros	
	" Akappon-Eptagonia	132 000	-	1982	39 084		Water Development Dept.	
11	" Distribution System	-	24.80	1982	177 975		Iacovou Bros	
	" Arakapas No 1	151 000	-	1982	49 954		Water Development Dept.	
12	" Distribution System	-	36.19	1982	89 510		Iacovou Bros	
	" Agridhia	59 000	-	1983	27 787		Water Development Dept.	
13	" Distribution System	-	12.33	1983	315 314		Iacovou Bros	
	" Kyprouda No 2	270 000	-	1983	193 555		Water Development Dept.	
14	" Distribution System	-	71.05	1983	148 870		Phoenix Constructions	
	" Lagoudhara	71 500	-	1983			KYKON	
15	" Distribution System	-	17.43	1984	35 000		Water Development Dept.	
	" Ora & B H Nos 27/81 & 66/81	60 000	-	1983	104 522		Phoenix Constructions	
16	" Distribution System	-	18.10	1983	68 340		Water Development Dept.	
	" Ayii Vavatsinias No 2	43 500	-	1984	105 000		Chr Charalambous	
17	" Distribution System	-	7.37	1983	15 710		Water Development Dept.	
	" Pharmakas No 1	21 000	-	1984	235 000		Iacovou Bros	
18	" Distribution System	-	-	1983	25 214		Water Development Dept.	
	" Pharmakas No 2	65 000	-	1984	160 000		Chr Apostolides	
19	" Distribution System	-	16.76	1984	15 900		Water Development Dept.	
	" Arakapas No 2	113 000	-	1984	220 000		Chr Apostolides	
20	" Distribution System	-	25.47	1984	95 500		Water Development Dept.	
	" Delerona	159 000	-	1983				
	" Distribution System	-	40.21	1983				
	TOTAL	13 187 500	802.82		5 406 658			

Villages benefiting from Xylistos Dam are Ayii Marina with 20% of the irrigated area, Khandria 25%, Xylistos 20%, Kyprouda 9%, Lagoudhara 5% and various other villages 13%.

Construction Division of WATER DEVELOPMENT DEPT. OF AGRICULTURE
 K Y L I S T O S K Y P R O U D A K H A N D R I A L A G O U D H A R A

SUMMARY OF ALL PITSILIA INTEGRATED RURAL DEVELOPMENT SCHEMES
UNDERTAKEN FOR CONSTRUCTION DURING 1983

Ser No.	Description	Amount allocated for 1983 £	Expenditure incurred in 1983 £	Number of schemes
1	Ponds and distribution systems	1 373 992	972 841	38
2	Xyliatos dam and distribution system	246 194	185 004	3
3	Borehole schemes	814 051	529 734	16
4	Village water supply schemes	91 436	45 248	19
5	Rehabilitation schemes	138 685	77 639	29
6	Other works	19 256	13 719	3
	Grand Total	£2 683 614	£1 824 185	108

LARNACA ORINI PROJECT

KHIROKITIA POND

Construction works for Khirokitia Pond commenced early in May 1983. The contract was awarded to Iacovou Brothers Ltd and the contract period is twelve months. Supervision is undertaken by the Construction Division of the Water Development Department.

The pond to be constructed will have a capacity of 205,000 m³. It will be an earth pond lined with 0.5 mm thick PVC membrane, similar to the ones constructed for the Pitsilia Project. Water will be diverted into the pond by gravity through a 200 mm asphalt coated steel pipe utilizing water from the nearby Ayios Minas river. The length of the diversion pipeline will be around 2.5 km. The whole schemes will be combined with the development of a nearby borehole No. 136/78. All the water utilized will be used for irrigation. Construction works for the distribution network are expected to take place in 1984. Impounding of the pond is expected to commence in November 1984.

During 1983 £118,292 were expended for the construction of Khirokitia pond out of total allotments amounting to £133,125. The total estimated cost for the scheme is £386,700 (ie £238,700 for the construction of the pond and its auxilliary works and £148,000 for the development of the borehole 136/78 and the distribution network). The scheme is contributory. Two thirds of the cost will be borne by the Government and one third by the beneficiaries.

TABLE VI-12
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT
SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1983 (Cont.)

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks
86	Ayios Ioannis 'Makheras'	260	---	Completed
87	Ayios Theodoros 'Koufes' ...	207	---	Completed
88	Ayios Theodoros 'Maroudes' ..	7 560	3 751	Completed in 1983
89	Ayios Theodoros 'Kavatzia' ..	5 600	2 068	Substantially completed in 1983
90	Ayios Pavlos 'Dhima tou Khoriou and Dhomes'	15 743	11 515	Completed in 1983
91	Ayii Vavatsinias 'Diploma' ..	3 500	1 039	To be completed by end of January 1984
92	Dhymes 'Kambos-Kardama'	1 164	46	Completed
93	Dhierona 'Mylos'	4 800	3 752	Completed in 1983
94	Kato Amiandos - Pelendria 'Kardhama - Hji Physouni' ...	460	---	Completed
95	Louvaras 'Paralonia'	294	---	Completed
96	Odhou 'Odhou B'	1 656	---	Completed
97	Palekchori (O) 'Skliiridhes - Kamini'	14 800	10 602	Completed in 1983
98	Pharmakas 'Ayios Yeoryios' ..	670	385	Completed
99	Pelendria 'Dhyma - Korypi - Kolokasi'	740	151	Completed
100	Pelendria 'Kato Phylagra' ...	22 800	11 415	Completed by 60% by end of December 1983
101	Potamitissa 'Hasanis'	3 125	2 958	Completed in 1983
102	Sarandi 'Agrosykia'	4 080	2 498	Substantially completed in 1983
103	Spilia 'Verouti and Stravarkaka'	13 060	---	To be executed in 1984
104	Sykopetra 'Kountourka'	508	51	Completed
105	Zoopiyi 'Kato Votano'	960	505	Completed in 1983
	Total	£138 685	£77 639	
<u>(F) OTHER WORKS</u>				
106	Melini BH (test pumping)	3 800	2 647	
107	Purchase of membrane	513	---	
108	Test pumping	14 943	11 072	
	Total	£19 256	£13 719	

TABLE VII-12

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT
 SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1983 (Cont.)

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks
64	Ayios Pavlos	6 000	4 602	Completed in 1983
65	Dhierona	4 700	---	Completed
66	Gourri	600	---	Completed
67	Gourri BH 99/83	40 350	17 906	Substantially completed in 1983
68	Kannavia	900	806	Completed in 1983
69	Khandria	68	---	Completed
70	Louvaras	7 000	2 212	Completed
71	Ora	1 543	11	Completed
72	Palekhoris (Orini) BH 71/79 ..	1 256	376	Completed
73	Palekhoris (M)	1 558	---	Completed
74	Pelendria BH 69/81	14 639	13 090	Completed in 1983
75	Pelendria (old plan)	812	---	Completed
76	Sykopetra 'Profitis Elias' ...	138	---	Completed
	Total	£91 436	£45 248	
<u>E REHABILITATION SCHEMES</u>				
77	Agros 'Anastasia'	1 766	1 207	To be completed by February 1984
78	Agros 'Kaoukaris'	3 420	1 416	To be completed by March 1984
79	Agros 'Sykamiero'	4 200	2 939	To be completed by March 1984
80	Agros 'Vrysi ton Tourtzion' ..	1 500	559	To be completed by March 1984
81	Agridhia 'Kato Enetikos'	2 900	2 471	Substantially completed by the end of 1983
82	Agridhia 'Konisero'	3 192	2 165	Substantially completed by end of 1983
83	Alona 'Kolymbos tis Pernias'	3 060	---	Completed
84	Ayios Ioannis - Kato Mylos 'Angoulos - Dhypotamia'	16 000	16 140	Completed in 1983
85	Ayios Ioannis 'Yerambelos' ..	660	---	Completed

TABLE VI-12

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT
 SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1983 (Cont.)

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks
44	Alona BH 46/80	42 353	20 808	To be completed by end of April 1984
45	Amiandos Kato BH 31/76	204 994	163 435	To be completed by April 1984
46	Arakapas BHs 106/76 and 107/76	873	195	Completed
47	Arakapas BH 124/76	9 443	8 247	Completed in June 1983
48	Askas BH 98/80	61 166	36 181	To be completed by end of March 1984
49	Ayios Konstantinos BHs 123/76 and 8/81	104 699	89 738	To be completed by January 1984
50	Ayii Vavatsinias BH 35/81 ...	39 550	18 936	To be completed by April 1984
51	Dhieronas BH 14/82	38 300	109	Completed
52	Dhymes BH 81/80	65 187	40 330	Completed in 1983
53	Lagoudhera BH 53/80	21 000	8 697	To be completed by February 1984
54	Louvaras BHs 32/77 and 16/81	73 900	67 715	Completed in 1983
55	Polystipos BH 21/77	9 747	267	Completed
56	Sykopetra BH 48/82	36 961	14 695	To be completed by April 1984
57	Zoopiyi BH 9/81	32 865	13 668	To be completed by April 1984
	Total	£814 051	£529 734	

D VILLAGE WATER SUPPLY SCHEMES

58	Agros	280	---	Completed
59	Alithinou	1 250	---	Completed
60	Apliki	1 181	80	Completed
61	Arakapas	4 700	3 002	Completed in 1983
62	Ayios Ioannis (Agros)	2 461	2 037	Completed in 1983
63	Ayios Ioannis	2 000	1 126	Problem with replenishment of aquifer/springs

TABLE VI-12
PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT
SCHEMES UNDERTAKEN FOR CONSTRUCTION IN 1983 (Cont.)

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks	
30	Melini pond	---	---	Completed	
31	Melini distribution system...	---	---	Completed	
32	Melini pond (repairs)	3 520	2 404	Completed	
33	Ora pond	91 709	85 259	Completed in December 1983	
34	Ora distribution system	53 750	32 777	To be completed by February 1984	
35	Pelendria pond	---	---	Completed	
36	Pelendria distribution system	19 845	15 960	Completed	
37	Pharmakas pond No. 1 and 2 ..	210 125	160 241	To be completed by March 1984	
38	Pharmakas distribution system No. 1 and 2	37 500	23 087	To be completed by April 1984	
	Totals	£1 373 992	£972 841		
39	<u>B XYLIIATOS DAM</u>				
i	Construction	44 422	44 422	Completed	
ii	Supervision	3 074	371	Completed	
iii	Construction of access road	1 982	1 981	Completed	
40	<u>Xyliatos Distribution System Phase A</u>				
i	Construction	8 329	---	} Both phases to be completed by May 1984	
41	<u>Xyliatos Distribution System Phase B</u>				
i	Construction	154 187	138 230		
ii	Purchase of pipes				
iii	Purchase of valves				
iv	Purchase of gravel filters ..	34 200	---		
	Total	£246 194	£185 004		
	<u>C BOREHOLE SCHEMES</u>				
42	Agros BH 63/76	26 071	24 097	Completed in June 1983	
43	Agros BH 21/82	46 942	22 616	To be completed by the end of March 1984	

TABLE VI-12

PITSILIA-INTEGRATED RURAL DEVELOPMENT PROJECT - SCHEMES
UNDERTAKEN FOR CONSTRUCTION IN 1983 (Cont.)

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks
10	Ayii Vavatsinias arch dam ...	881	79	Completed
11	Ayii Vavatsinias No. 1 (repairs)	1 137	502	Completed
12	Ayii Vavatsinias pond No. 2	74 450	62 637	To be completed in March 1984
13	Ayii Vavatsinias distribution system No. 2	18 000	14 262	To be completed early in 1984
14	Dhierona pond	187 067	135 080	To be completed in April 1984
15	Dhierona distribution system	99 000	90 683	To be completed in April 1984
16	Ephtagonia pond No. 1	---	---	Completed
17	Ephtagonia pond No. 1 distribution system	---	---	Completed
18	Ephtagonia pond No. 1 (repairs)	4 589	2 583	Completed
19	Ephtagonia pond No. 2	7 319	681	Completed
20	Ephtagonia pond No. 3	6 857	315	Completed
21	Ephtagonia ponds No. 2 and 3 distribution	7 361	1 663	Completed
22	Kato Mylos pond	9 755	999	Completed
23	Kato Mylos distribution system borehole 66/76	5 650	2 965	Completed
24	Khandria pond	5 464	---	Completed
25	Khandria distribution system	92	---	Completed
26	Kyperounda pond No. 2	81 795	39 670	Completed in July 1983
27	Kyperounda pond No. 2 distribution system	116 173	88 418	1st phase completed in June 1983. 2nd phase to be completed by March 1984
28	Lagoudhera pond	78 944	71 681	
29	Lagoudhera distribution system	14 652	4 830	To be partially completed in June 1984. Beneficiaries do not sign additional loan.

For all these schemes an amount of £2,683,614 was allocated through the budget during 1983, and by the end of the year the expenditure incurred on all these schemes reached the amount of £1,824,185.

All schemes that were undertaken for construction during 1983, are shown in detail on Table VII-12 that follows:

The PVC lined earth ponds are mainly off stream man made reservoirs which are fed with water (essentially by gravity) from diversion weirs (constructed on nearby streams) through diversion pipelines laid for this purpose. The ponds are filled during the winter and early spring months, so that water can be used for irrigation during the dry summer period.

For more details on the Pitsilia Water Development schemes... please refer to tables VII-12, VII-13 and VII-14.

TABLE VII-12

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT-- SCHEMES
UNDERTAKEN FOR CONSTRUCTION IN 1983

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks
<u>A. PONDS AND DISTRIBUTION SYSTEMS</u>				
1	Agridhia pond	14 719	7 228	Completed in January 1983
2	Agridhia distribution system	6 257	4 244	Completed in February 1983
3	Akapnou-Ephtagonia pond	9 975	1 711	Completed
4	Akapnou-Ephtagonia distribution system	3 137	2 221	Completed
5	Arakapas pond No. 1	2 200	122	Completed
6	Anakapas pond No. 1 distribution system	2 256	1 220	Completed
7	Arakapas pond No. 2	147 034	89 265	To be completed in March 1984
8	Arakapas pond No. 2 distribution system	46 000	29 679	To be completed by April 1984
9	Ayii Vavatsinias pond No. 1	6 779	375	Completed

By the end of 1983 the total expenditure incurred in the sector of water development reached the amount of £6,563,410 as follows:

1978	• £49 407
1979	£471 542
1980	£881 326
1981	£1 577 069
1982	£1 759 881
1983	£1 824 185
Total	<u>£6 563 410</u>

1983 has been a year of intensive activity in the sector of water development in the Pitsilia area. This sector of development has absorbed the vast majority of funds allocated for the Pitsilia Integrated Rural Development Project, which is financed by the International Bank for Reconstruction and Development (IBRD).

During the year the activities were continued on the construction of ponds, distribution systems, borehole schemes, rehabilitation schemes and domestic water supply schemes.

In addition work was continued on the Xyliatos dam distribution system, which will cover an area of 2,300 donums, and is expected to be completed early in 1984.

The Pitsilia Integrated Rural Development Project is expected to be completed by mid 1984 and as it has already been mentioned it will cover 49 villages. It is expected that the original target in the sector of water development as laid down at the commencement of the project will be overwhelmingly covered.

The construction programme for 1983 included 108 schemes of various types for the Pitsilia project. 38 of these schemes were ponds and distribution systems, 3 schemes were for the Xyliatos dam and its distribution system, 16 schemes were boreholes schemes, 19 schemes were village water supply schemes, 29 were rehabilitation schemes and 3 were sundry works.

The project region is an area of traditional agriculture with a marked trend of depopulation.

The project aims at improving the standard of living of the people of Pitsilia region, by developing the productive resources of the area and improving the social services, such as health and education. Pitsilia Integrated Rural Development Project is a multipurpose project the main component of which is water development.

The project was inaugurated in 1978 and was scheduled to be completed over a period of five years, i.e. by the end of 1982, but eventually it was decided to extend the period of implementation to six years, so as to catch up with certain minor delays over the design and construction of a few schemes, but mainly in order to expand its targets, especially in the field of water development, with the construction of all the feasible schemes acceptable by the farmers concerned.

The total investment on this project will exceed the amount of about £10 million (US\$10 million have been secured through a World Bank Loan and the balance will be covered by the Government of Cyprus) out of which an amount of £7.2 million will be allocated for the development of the regions water resources so as to irrigate 11,000 donums of land (the initial target was 8,600 donums) through the following schemes:

- * The construction of a rockfill type of dam at Xyliatos with a capacity of 1.25 million cubic meters of water to irrigate 2,300 donums.
- * The construction of an arch dam at Ayii Vavatsinias with a capacity of 53,500 cubic meters.
- * The construction of 19 PVC lined earth ponds with a total capacity of 1,872,000 cubic meters for the irrigation of 2,600 donums of land.
- * The development of 30 boreholes with a combined yield of approximately 1.3 million cubic meters per year for the irrigation of 3,000 donums of land.
- * The rehabilitation of existing minor irrigation schemes for the irrigation of 1,500 donums of land.

In addition to the above schemes the domestic water supply of some 23 villages has been improved within the project activities.

The involvement of the Division of Construction as regards Evretou Dam was mainly on Technical Committee level, where the Head of Construction is a member of this Committee, apart from giving any technical advice to the Project manager whenever required. As this project was given out to contract, the other direct involvement of the Division was that of the Tender branch which dealt with a number of tenders for Khrysokhou Irrigation Project throughout the year.

Amount allocated for Khrysokhou^{Irrigation} Project for 1983 £900 000.

Amount spent during 1983 £824 982.

Table VII-11

KHRYSOKHOU IRRIGATION PROJECT

Expenditure 1983

	£
1. SHEPHARD HILL & ZACHARIADES LTD.	800 000*
2. Surveys & Investigations	24 695
3. Advertisement	287
Total	£ 824 982

* Being advance payment on signatures of contract.

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

The Pitsilia Integrated Rural Development Project covers 49 villages with a total area of 60,000 hectares and a population of 21,000 inhabitants. In the area of the project a rugged topography prevails and the terrain is dissected by numerous streams and small deep valleys.

Although the special parts and fittings were expected on site middle of January 1984, the trench excavation and the construction of the containment channels started early in November 1983 with the target to complete the job by the end of April 1984.

Upto the end of the year 1983 an amount of about £20,000 was spent for the commencement of the work. It is worth mentioning here that this was the first time that a pipeline of such big diameter (1400 mm) was ever installed in Cyprus, and this work was successfully undertaken by the Technical staff of the Division of Construction, who, with the experience available in pipelaying, in general did a very good job. A warm congratulation should be extended to all those officers of the Division from the Engineer's level to the foreman whose direct contribution was most valuable.

TABLE VI-10
SOUTHERN CONVEYOR PROJECT

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks
1	Supply of pipes and fittings	897 000	547 162	
2	Administration		12 702	
3	EAC section construction ...		19 375	
4	Surveys and investigations		9 984	
5	Sir William Halcrow & Partners (Consultants)		188 703	
6	Sogreah (Consultant fees) ..		85 450	
7	Bhra Fluid Engineering		10 922	
	Total	£897 000	£874 298	

KHRYSOKHOU IRRIGATION PROJECT

A progress report on Khrysokhou^{Irrigation} Project and specifically on Evretou Dam appears elsewhere in this report.

SOUTHERN CONVEYOR PROJECT

The Southern Conveyor Project whose phase I design was prepared, in 1983 for implementation between 1984-1989 includes:

- * Kouris Dam - A 100 m high zoned earthfill dam on the Kouris river with capacity 115 MCM.
- * Main Conveyor - A 110 km long pipeline of dia ranging from 1400mm to 800mm will convey the stored water by gravity from Kouris Reservoir to the Kokkinokhoria Irrigation Area and to a terminal Reservoir at Akhna.
- * Akhna Dam - A 16 m high earthfill dam with capacity 5.8 MCM to act as a balancing storage for the Kokkinokhoria Irrigation Area.
- * Kokkinokhoria Irrigation Area - An irrigation system which provides water to 5125 ha of land in the south eastern corner of Cyprus both by gravity and pumping.

Although this project is due to commence early 1985 with Kouris Dam already on the way since August 1984, the Division of Construction has undertaken by direct labour the laying of part of the main pipeline at the end of 1983, as described below, in view of the fact that these sections of work came under prospective highways due to commence shortly, thus having to be completed earlier, so that the Public Works Department could proceed with awarding the contracts.

Specifically the Division of Construction has undertaken by Force Account the EAC section, so called because of the route passing under the EAC Pylon and along the Limassol by-pass (highway). As the construction of the highway has been programmed to start early in June 1984, that part of the conveyor, the EAC lines and all other services had to be ready before that date. This work was undertaken by the Division of Construction for the total sum of £150,000. The main features of the job was the laying and testing of 1400 meters of 1400 mm dia ductile iron pipes, the construction of six containment channels for the EAC pylon and to install cathodic protection system.

- 662 m \varnothing 550 mm steel pipes
- 743 m \varnothing 300 mm steel pipes

- b. Break pressure tank.
- c. Balancing reservoir (capacity 8,000 m³).
- d. Connections to Khirokitia Treatment Plant.

The construction of the above project has been undertaken by the Construction Division by Force Accounts for the amount of £2,839,000. Preliminary works commenced in October by checking the quantities and inviting local tenders for materials and machinery plant with the target to start construction 1st November.

The main activities during November and December were setting out, initial levelling, access road and mass excavation for the balancing reservoir.

The project is programmed to be completed by the end of May 1985.

Tokhni Pumping Station - Contract 4B

The pumping station is sited adjacent to the Nicosia-Limassol old road and the branch road to Tokhni. Water from Kalavassos reservoir will flow up to Tokhni pumping station by gravity and then will be pumped to the balancing reservoir, to the west of Khirokitia Treatment Plant.

The building construction has been undertaken by the Construction Division by forced account for the amount of £152,000 with the target to complete the work by the end of 1985. Measures are taken to start the pump installation, if it is necessary, by the end of October 1984.

The construction was started by the end of the year with mass excavation and cutting and bending of the reinforcement. Construction work were actually in full speed early 1984.

It is worth mentioning here that Contract 7A and 4B of total estimated amount of £2.84 million was one of the most important project of such value undertaken by the Division of Construction by direct labour in the recent years. A warm congratulation should again be extended to all those officers of the Department who were directly responsible in constructing and supervising mass works for the successful task (they have carried out). I believe this view is also showed by the Consulting Engineers who were really impressed by the capabilities of the Construction Division in such projects.

SUMMARY OF ALL TOWN WATER SUPPLY SCHEMES APPROVED FOR
CONSTRUCTION IN 1983

Description	No. of schemes	Amount allocated for 1983 £	Expenditure incurred in 1983 £
(i) Improvements to sources of supply, treatment plants, pumping stations and main conveyors	5	50 000	23 908
(ii) Supplementary water supply schemes	4	50 000	50 000
(iii) New water supply schemes	<u>42</u>	<u>609 637</u>	<u>476 903</u>
Total	51	£709 637	£550 533

MAJOR PROJECTS

VASILIKOS-PENDASKINOS PROJECT

A report on the progress of the various constructions of Vasilikos-Pendaskinos Project during the year 1983 appears elsewhere in this report.

In this particular section a description of the progress of the works is given for forced account work (Contract 7A and 4B) constructed and supervised directly by skilled personnel of the Division at a much lower cost than if it were given to Contract.

Kalavassos-Khirokitia Pipeline - Contract 7A

The scheme provides for the conveyance of water from the Kalavassos dam to Maroni area for irrigation and to Khirokitia treatment plant. From here the water is treated and distributed to Larnaca and Nicosia districts as potable water.

The scheme mainly consist of the following:

- a. Pipelines
- * 6517 m Ø 900 mm ductile iron pipes
 - * 2030 m Ø 800 mm ductile iron pipes
 - * 430 m Ø 700 mm ductile iron pipes
 - * 7561 m Ø 600 mm ductile iron pipes

TABLE VII-9

TOWN WATER SUPPLY SCHEMES (Cont.)

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks
<u>(c) Yermasoyia-Vasilikos</u>				
32	Valves		466	
33	Pumps for Yermasoyia Pumping Station 39/81/50		1 834	
34	Pumps for Vasilikos Pumping Station 39/81/45		1 666	
35	Materials for Central Stores		1 004	
36	Vasilikos Pumping Station		1 000	
37	Preliminary works		8 555	
38	Trenching and laying		650	
39	Reinstatement and relocation of PHS		189	
40	Chambers		57	
41	Vasilikos Transformer House etc..		393	
42	Yermasoyia Pumping Station		9	
43	Transport		82	
44	Supervision		47	
45	Contingencies		22 069	
46	Acquisition of land		105	
	Sub-total		<u>£38 126</u>	
<u>(d) Others</u>				
47	Xylophagou WS		62	
48	Alethriko		26 177	
49	Skar'inou		38 173	
50	Pyla WS		3 327	
51	Menoy'ia-Anaphotia		2 038	
	Sub-total		<u>£69 777</u>	
	Grand Total		<u>£476 903</u>	

TABLE VI-9

TOWN WATER SUPPLY SCHEMES

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks
<u>(ii) Supplementary Water Supply Schemes</u>				
6	Kattoudhia		26 747	
7	Pyrga		2 236	
8	Stavrovouni	50 000	6 660	
9	Yeri		14 357	
	total	<u>£50 000</u>	<u>£50 000</u>	

(iii) New Water Supply Schemes

An amount of £609,637 was allocated during 1983 for all the schemes of this category.

(a) Nicosia Emergency Scheme

10	Alethriko-Mazotos-Kivisil ...		4 941	
11	Contract 39/82/31 pipes		5 193	
12	Dhali-Kattoudhia		10	
13	Episkopi - Limassol WS new sources		1 514	
14	Kophinou, Menoyia, Skarinou, Klavdhia, Dhenia		57 595	
15	Miscellaneous expenses		3 446	
16	Peristerona recharge		15 003	
17	Psematismenos		1 756	
18	Pyrga		25 088	
	Sub-total		<u>£114 546</u>	

(b) Kouris Delta

19	Excavation of trenches		39 255	
20	Concrete works		16 013	
21	Maintenance and operation		42 985	
22	Machinery		49 493	
23	Machinery installation		6 404	
24	Miscellaneous		6 031	
25	Materials and labour		13 589	
26	Preliminary expenses		484	
27	Removal of Yermasoyia pipeline near Vasilikos Pumping Station		16 025	
28	Supervision		19 731	
29	Trakhoni - Ypsonas		162 723	
30	Trakhoni - Ypsonas Pumping ...		2 172	
31	Vitia		5 125	
	Sub-total		<u>£380 030</u>	

harder measures for the consumers. A number of boreholes were drilled in various sites for this purpose and all the successful ones were utilized immediately for the relief of the towns with the greatest demand.

The continuous prevailing drought has affected all sources of supply including those of a considerable number of villages along the routes of the main conveyor pipelines of Nicosia, Larnaca and Famagusta towns. As a result of this, our Department in consultation with the District Officers and the appropriate Government authorities had to respond to the urgent request for the connection of a number of villages onto the main conveyors of these towns. By the end of 1983 a considerable number of villages situated along the routes of the main conveyors, in the Nicosia, Larnaca and Famagusta districts were drawing considerable quantities of water for their domestic needs.

Though the situation regarding the position of the towns water supply has been remedied in a way by the implementation of so many schemes, still it cannot be anticipated that the problem of these towns will be solved before the completion of the Vasilikes-Pendaskinos Project and the Southern Conveyor Project.

All 51 schemes undertaken for construction by our Division are shown in detail on Table VII-9 that follows:

TABLE VII-9
TOWN WATER SUPPLY SCHEMES

Ser No.	Description	Amount allocated in 1983 £	Expenditure incurred in 1983 £	Remarks
<u>(i) Improvements to Sources of Supply Treatment Plants, Pumping Stations and Main Conveyors</u>				
1	Peristerona recharge works (gabions)		3 000	
2	Improvement of boreholes		715	
3	Relocation and replacement of Kokkini Trimithia conveyor	50 000	13 057	
4	Ayii Trimithias		3 719	
5	Kokkini Trimithia pumping station		3 417	
	Total	£50 000	£23 908	



Dhypotamos dam. Cut-off trench excavation and left abutment viewed from top of right abutment. WDD Photo D94-7, 6.12.83



Yermasoyia dam. Reservoir aeration. WDD Photo D58-3, 24.5.83.

TOWN WATER SUPPLY SCHEMES

During 1983 the Construction Division had to deal with 51 town water supply schemes of a total estimated cost of £709,637. The expenditure incurred on all town water supply schemes during the year reached the amount of £550,533.

All these town water supply schemes which were undertaken by the Division for construction were split into three main groups as follows:

- Improvements to sources of supply, treatment plants, pumping stations and main conveyors.

For this category of works an amount of £50,000 was allocated in the 1983 Development Budget. Eventually by the end of the year five schemes were executed under this vote at a total expenditure of £23,908.

- Supplementary water supply schemes.

For this category of works an amount of £50,000 was approved in the 1983 Budget. During the year four schemes were executed under this vote of expenditure, at a total cost of £50,000.

- New water supply schemes.

For this category of works an amount of £609,637 was approved in the 1983 Development Budget. This main category of works was sub divided into four smaller groups as below:

- Nicosia Emergency Scheme
- Kouris Delta
- Yermasoyia-Vasilikos, and
- others

By the end of 1983 fortytwo schemes were executed under this vote of expenditure, at a total cost of £476,903.

It should be noted that the execution of so many, mostly emergency schemes for the augmenting of the water supply of the main towns of Cyprus was a result of the prevailing drought over the Island for the past consecutive years. The acute shortage of water in Nicosia and Larnaca towns became even worse during 1982-1983 with a result to implement even

TABLE VI-8 OTHER MAJOR IRRIGATION WORKS - EXPENDITURE 1983

Ser. No.	Description	Amount Allocated		Expenditure		Remarks
		Government	Village	Government	Village	
1	<u>Akrounda-Phinikaria-Yermasoyia-Polemihia</u> . Compensations	2 000	-	-	-	
2	<u>Erimi Kolossi</u>	882	441	109	54	
3	<u>Evretou Dam</u> . Advertisement for prequalification of tenderers	1 008	-	1 002	-	
4	<u>Khirokitia pond</u>	88 750	44 375	78 861	39 431	Works commenced in May 1983. Completed by 45% inpounding to start in Nov. 1984
5	<u>Lefkara Dam</u> . Maintenance works.	130	-	130	-	
6	<u>Mavrokolymbos</u> . Compensations	256	-	132	-	
7	<u>Paiekhori-Sklidhros</u> . Piped distributions system	117 511	39 170	109 439	36 480	Work in progress
8	<u>Pissouri-Alekhtora</u> . Installation of water meters	1 500	-	-	-	
9	<u>Pissouri</u> . Extension of distribution system	30 961	15 480	26 917	13 459	Work in progress
10	<u>Polemihia Kato</u> . Distribution system	5 217	2 608	4 240	2 120	Completed
11	<u>Trakhoni-Ypsonas</u> . Extension of distribution system	1 280	-	-	-	
12	<u>Yermasoyia distribution system</u> -Extension	4 267	2 133	2 927	1 463	Completed
		£253 762	£104 207	£223 757	£93 007	
			£357 969			£316 764

TABLE VII-7 MINOR IRRIGATION SCHEMES - EXPENDITURE 1983 (Cont.)

Ser. No.	Scheme	Amount Allocated		Expenditure		Remarks		
		Government	Village	Government	Village			
			Total	Total	Total			
1	PAPHOS DISTRICT							
	<u>Kholi</u> . Grousos. Storage tank	2 800	1 400	4 200	2 655	1 327	3 982	Work in progress
2	<u>Kelokedhara</u> . Psathaes A'. Pumping scheme, storage tank and distribution	10 000	5 000	15 000	6 689	3 345	10 034	Work in progress
3	<u>Kelokedhara</u> . Ziripillis A'. Pumping scheme, storage tank and distribution	36 667	18 333	55 000	17 541	8 770	26 311	Work in progress
4	<u>Kato Akourdhalia</u> . Milarka	4 220	2 110	6 330	-	-	-	Not started
5	<u>Kritou Terra</u> . Kephlovrysos	5 000	-	5 000	-	-	-	Not started
6	<u>Miliou</u> . Kolokouris. New engine and pump	4 000	2 000	6 000	-	-	-	Not started
7	<u>Miliou</u> . Liskiar	15 780	7 890	23 670	-	-	-	Not started
8	<u>Nata 'A'</u> Pumping scheme, storage tank and distribution	20 000	10 000	30 000	5 397	2 699	8 096	Work in progress
9	<u>Nikoklia 'A'</u> . Pumping scheme, storage tank and distribution	20 000	10 000	30 000	6 321	3 160	9 481	Work in progress
10	<u>Skoulli-Ayios Andronikos ID</u> . Installation of pumping unit	913	457	1 370	-	-	-	
11	<u>Trakhpedhoola</u> . Pumping scheme, storage tank and distribution	20 000	10 000	30 000	8 983	4 492	13 475	Work in progress
	Total for Paphos District	£139 380	£67 190	£206 570	£ 47 586	£23 793	£71 379	

TABLE VI-7 MINOR IRRIGATION SCHEMES - EXPENDITURE 1983 (cont.)

Ser. No.	Scheme	Amount Allocated		Expenditure		Remarks
		Government	Village	Government	Village		Total
16	<u>Orounda</u> . RCC channels	14 000	7 000	-	-	-
17	<u>Pedhieos River</u> . Recharge near Episkopio	934	-	607	-	607
18	<u>Peristerona</u> . RCC channels	16 097	9 253	14 910	8 570	23 480
19	<u>Phlasou-Evrykhou-Korakou</u> . Kousouliotis RCC channels	4 333	2 167	-	-	-
20	<u>Potami-Stavrodhromi</u> . A C pipes	23 000	-	22 515	-	22 515
21	<u>Potami</u> . Sykamos tou Phlouri	2 059	1 030	350	175	525
22	<u>Yerakies-Xeros</u> . Pumping irrigation scheme	964	321	817	272	1 089
	Total for Nicosia District	£232 672	£119 236	£138 472	£64 068	£202 540
	LARNACA DISTRICT					
1	<u>Psematismenos</u> . Drakonties . Pumping irrigation scheme	7 825	3 913	5 195	2 598	7 793
	Total for Larnaca District	£7 825	£3 913	£5 195	£2 598	£7 793
	LIMASSOL DISTRICT					
1	<u>Apsiou</u> . Distribution system	18 800	9 400	15 249	7 624	22 873
2	<u>Trimiklini</u> . Fraktis. Diversion pipeline	3 600	1 800	1 646	823	2 469
	Total for Larnaca District	£22 400	£11 200	£16 895	£8 447	£25 342
						Work in progress
						Will commence in 1984

TABLE VI-7 MINOR IRRIGATION SCHEMES - EXPENDITURE 1983

Ser. No.	Scheme	Amount Allocated		Expenditure			Remarks
		Government	Village	Total	Government	Village		Total
1	NICOSIA DISTRICT <u>Akaki</u> . Riatiko Nero tou Hodja RCC channels	4 584	4 584	9 168	4 211	4 211	8 422 Completed
2	<u>Argates</u> . RCC channels	9 500	9 500	19 000	-	-	- Not started
3	<u>Astromeritis</u> . RCC channels	12 675	12 675	25 350	7 108	7 107	14 215 Work in progress
4	<u>Ayios Epiphanius</u> . Maroulena RCC channels	31 476	15 738	47 214	25 595	12 798	38 393 Work in progress
5	<u>Ayios Ioannis-Malounda</u> . Pitsillis RCC channels	7 060	5 112	12 172	3 782	2 739	6 521 Work in progress
6	<u>Ayios Ioannis-Malourida</u> . RCC channels	10 000	5 000	15 000	65	33	98 Work in progress
7	<u>Chakistra</u> . Yefiri. Pumping irrigation scheme	245	82	327	22	8	30 Completed
8	<u>Chakistra-Yierakies</u> . Pumping irrigation scheme	3 831	-	3 831	3 831	-	3 831 Completed
9	<u>Galata-Sina Oros</u> . RCC channels	12 723	6 362	19 085	12 285	6 142	18 427 Completed
10	<u>Kakokhorio-Klirou</u> . RCC channels	14 000	7 000	21 000	-	-	- Will commence in 1984
11	<u>Kambos</u> . Potamos Kaloyirou. Pumping irrigation scheme	1 095	365	1 460	677	225	902 Completed
12	<u>Katydhata</u> . Dhimma tis Tziamis RCC channels	16 467	9 233	25 700	16 467	9 172	25 639 Completed
13	<u>Katydhata-Linou-Skouriotissa</u> . Limnas RCC channels	21 062	10 531	31 593	20 727	10 364	31 091 Completed
14	<u>Kochati</u> . RCC channels	12 567	6 283	18 850	-	-	- Pending issue of loan
15	<u>Linou</u> . Linopsas RCC channels	14 000	7 000	21 000	4 503	2 252	6 755 Work in progress

MINOR IRRIGATION SCHEMES

The construction programme for 1983 included 36 minor irrigation schemes of an estimated cost of £603,816. The overall expenditure incurred on all these schemes during the year reached the amount of £307,054.

This category of schemes covers a wide field of constructional activities, such as the lining of irrigation channells, pumping schemes, involving the installation of pumping units on new boreholes and the installation of piped distribution systems, recharge works, improvement of springs and piping the water to the fields, etc.

These 36 schemes were split in the four districts as follows:

District	No. of schemes	Amount allocated for 1983 in £	Expenditure incurred during 1983 in £
Nicosia	22	351 908	202 540
Limassol	2	33 600	25 342
Larnaca	1	11 738	7 793
Paphos	11	206 570	71 370
Totals	36	£603 816	£307 054

Table VII-7 below shows in detail all 36 schemes that were undertaken for construction during 1983.

MAJOR IRRIGATION WORKS

During the year 1983 an amount of £316,764 (as indicated analytically on Table VII-8) was spent for the construction of new distribution schemes, or the extension and maintenance of existing ones.

The more important ones were those of Palekhorri-Sklidros (£145,919), Pissouri Irrigation (£40,376) and Khirokitia Pond, distribution system (£118,292)

TABLE VII-6 RURAL DOMESTIC WATER SUPPLY SCHEMES-EXPENDITURE 1983 (cont.)

Ser. No.	Scheme	Amount Allocated		Expenditure		Remarks
		Government	Village	Government	Village		Total
11	Paphos lower villages. <u>Compensations</u>	642	-	113	-	113
12	<u>Polis-Prodhromi</u> . New main conveyor pipeline and storage tank	6362	6362	6013	6013	12026
13	Tala. <u>Supplementary supply from BH 247754</u>	10500	10500	6327	6326	12653
14	<u>Tsadha-Kili</u> . <u>Supplementary supply from BH13778</u>	35287	35287	22111	22111	44222
	Total for Paphos District	£1114560	£99659	£74120	£72017	£146137
	* Excess expenditure to be deposited					

TABLE VII-6 RURAL DOMESTIC WATER SUPPLY SCHEMES--EXPENDITURE 1983 (cont)

Ser. No.	Scheme	Amount Allocated		Expenditure		Total f	Remarks
		Government f	Village f	Government f	Village f		
11	Trimiklini. Supplementary supply from <u>Arkolakhania</u> spring	17347	17347	13359	13359	26718	Work in progress
12	Troodhitissa Monastery. Supplementary supply, storage tank and distribution	6250	6250	4902	4902	9804	Work in progress
	Total for Limassol District	£155525	£144894	£93475	£91296	£184771	
	PAPHOS DISTRICT						
1	Argaka-Magounda. Supplementary supply and new storage tank	13762	13762	12105	12106	24211	Work in progress
2	Arkhimandrita Pano. New main conveyor pipeline from spring to village	4700	4700	3121	3121	6242	Completed
3	Arodhes Pano. Supplementary supply	3880	-	993	-	993	Work in progress
4	Emba. Improvements to distribution system	26829	26829	18917	18916	37833	Completed
5	Kilinia. Improvements to the village spring	900	-	645	-	645	Completed
6	Kholetria-Kritou Terra	7000	-	-	-	-	Pending issue of loan
7	Lyso-Philoussa-Peristerona. Improvements to main conveyor pipeline from Xeropiya spring	2219	2219	1940	1939	3879	Completed
8	Mesoyi. New storage tank at higher level	4115	4115	3217	3218	6435	Completed
9	Miliou. Improvements to distribution system	1179	-	1486	1485	2971*	
10	Nata. Improvements to main conveyor pipeline	1300	-	349	-	349	Completed

TABLE VI-6 RURAL DOMESTIC WATER SUPPLY SCHEMES-EXPENDITURE 1983(cont.)

Ser. No.	Scheme	Amount Allocated		Expenditure		Remarks	
		Government £	Village £	Government £	Village £		Total £
3	Paralimni(Protaras). New storage tank and distribution system to tourist area	159297	-	122785	-	122785	Completed
4	Paralimni	9500	9500	-	-	-	Revoted for 1984
	Total for Famagusta District	£207753	£48456	£150132	£27347	£177479	
	LIMASSOL DISTRICT						
1	Amathus. Extension to distribution system.	2000	-	1762	-	1762	
2	Asgata. Supplementary supply from BH 60/80.	15000	15000	4822	4823	9645	Work in progress
3	Ayios Athanasios. New distribution system within the village	23081	23081	19915	19915	39830	Completed
4	Ayios Tykhonas. New storage tank	10500	10500	10440	10439	20879	Completed
5	Kellaki.	8000	-	-	-	-	Suspended
6	Omodhos. Supplementary supply from BH 92/77	11700	11700	3856	3856	7712	Work in progress
7	Polemihia Kato. Improvements to distribution system	9800	9800	7581	7581	15162	Completed
8	Paramytha-Palodhia-Spitali. Supplementary supply from BH 8/82	36455	36455	18354	18354	36708	Work in progress
9	Pyrgos. Improvements to distribution system	13500	13500	7234	7233	14467	Work in progress
10	Trakhoni. Supplementary supply	1892	1261	1250	834	2084	Suspended

TABLE VII-6 RURAL DOMESTIC WATER SUPPLY SCHEMES-EXPENDITURE 1983(cont.)

Ser. No.	Scheme	Amount Allocated		Expenditure		Remarks
		Government	Village	Government	Village	
			Total		Total	
6	Famagusta Larnaca . Connection of BHs 114/80 and 127/80 onto Alethriko balancing tank at Klavdhia	2723	-	-	-	Completed
7	Kalavassos.Improvement to distribution system.	7105	7105	6442	12884	Completed
8	Kalokhorio. Supplementary supply from BH 79/83 and Famagusta pipeline	46500	-	20491	20491	Work in progress
9	Kiti-Pervolia. Emergency connections on private BHs	800	-	146	146	Completed
10	Kiti. Supplementary supply from private BH	8500	-	4265	4265	Completed
11	Meneou-Dhromolaxia-Tersephanou. Supplementary supply.	2850	-	2537	2537	Completed
12	Pyla . Supplementary supply	750	-	750	750	Completed
13	Voroklini	2250	9750	2250	8719	Completed
14	Xylophaghou	403	403	-	-	Completed
15	Xylophaghou. Emergency connection on private BH	2000	-	2000	2000	Completed
	Total for Larnaca District	£138375	£71718	£75047	£44202	£119249
	FAMAGUSTA DISTRICT					
1	Ayia Napa. New storage tank and improvements to distribution system	31706	31706	21581	43162	Completed
2	Ayia Napa (Monopetra).Supplementary supply from BH hydr. No.26	7250	7250	5766	11532	Completed

TABLE VI-6 RURAL DOMESTIC WATER SUPPLY SCHEMES-EXPENDITURE 1983(cont.)

Ser. No.	Scheme	Amount Allocated		Expenditure		Remarks
		Government £	Village £	Government £	Village £		Total £
12	Laxia. Improvements to distribution system	10000	10000	-	-	Pending issue of loan
13	Laxia. BH 97/78	488	488	185	185	Completed
14	Linou. Replacements of conveyor	5000	5000	2411	2411	Work in progress
15	Malounda Extension of distribution system	4500	1500	2163	721	Work in progress
16	Meniko. Supplementary supply from BH 83/81	17888	5963	17	5	Will start February 84
17	Paleometokho. Supplementary supply from BH 17/81	9750	9750	3521	-	Completed
18	Politiko. Supplementary supply from BH 48/79	13350	8750	13146	8546	Work in progress
	Total for Nicosia District	£24885	£185308	£102712	£83250	£185962
	LARNACA DISTRICT					
1	Athienou. New pump and engine for BH	1500	-	1500	-	Completed
2	Aradhippou. New distribution system	44995	44995	28618	28618	Work in progress
3	Anglisidhes. Supplementary supply	9929	4965	2470	3	Scheme revised
4	Ayios Minas Monastery. New storage tank, pumping scheme and distribution	4500	4500	2670	2670	Work in progress
5	Famagusta-Larnaca. Connection of BH 45/61 to system	3570	-	908	-	Completed

TABLE VI-6 RURAL DOMESTIC WATER SUPPLY SCHEMES-EXPENDITURE 1983

Ser. No.	Scheme	Amount Allocated		Expenditure		Remarks
		Government	Village	Government	Village	
		Total	Total	Total	Total	
1	NICOSIA DISTRICT Akaki. Supplementary supply from new BH 124/61. Two storage tanks 30,000 gallons each	490	1055	1545	908	Completed
2	Argates. Supplementary supply from new well hyd.No. 143	1475	1475	2950	2536	Completed
3	Ayia Varvara. Improvements to distribution system	34100	34100	68200	64110	Completed
4	Ayios Theodoros. Supplementary supply from new borehole	28000	14000	42000	8764	Work in progress
5	Dhali. Supplementary supply and improvements to distribution system	50000	46000	100000	28470	Work in progress
6	Dheftera Pano & Kato. Supplementary supply from BH 45/81	682	341	1023	960	Completed
7	Klirou. Supplementary supply from new BH.	9350	6000	15350	8150	Work in progress
8	Koutraphas. Improvements to distribution system.	2533	1267	3800	3726	Completed
9	Kokkini Trimithia. Supplementary supply from BH 31/81	12960	12960	25920	17824	Completed
10	Lakatamia Pano & Kato. Supplementary supply from BHs 41/75, 135/65 and two storage tanks (500 m ³)	28678	14339	43017	15192	Work in progress
11	Laxia. BH 41/80. Pumping unit, storage tank 50m ³ , gravity main pipeline, chlorinator etc.	16641	8320	24961	2011	Completed

RURAL DOMESTIC WATER SUPPLY SCHEMES

The construction programme for 1983 included 63 village water supply schemes of an estimated cost of £1,420,363. The expenditure incurred on all these schemes during the year reached the amount of £820,033. These schemes were split in the five free districts of the Island as shown on the summary below:

SUMMARY OF THE RURAL DOMESTIC WATER SUPPLY SCHEMES

District	No. of schemes	Amount allocated for 1983 in £	Expenditure incurred during 1983 in £
Nicosia	18	431 193	185 962
Limassol	12	300 419	184 771
Famagusta	4	256 209	177 479
Larnaca	15	210 093	119 249
Paphos	14	222 449	152 572
Totals	63	<u>£1 420 363</u>	<u>£820 033</u>

A list showing in detail all 63 schemes that were approved in the 1983 budget for construction is given on Table VI-6 below:

of Cyprus. Cement in small quantities, below 6 tons, was purchased through GCS. In total during 1983, 1786 tons of cement were purchased at a value £39,948.

During 1983, the Division purchased and used various materials of a value of £181,705.

Table VII-5 below shows in detail all building materials used by the Division of Construction during 1983, for the execution of the works.

TABLE VII-5

MATERIALS PURCHASED AND WATER METERS INSTALLED

I BUILDING AND OTHER MATERIALS USED DURING 1983

Ser No	Description	Quantity	Value £
1	Cement	1 786 tons	39 948
2	Havara	1 629 m ³	1 250
3	Koutrouvi	6 m ³	19
4	Shingle	5 586 m ³	16 192
5	Sand - soil	38 235 m ³	29 233
6	Sea sand	13 369 m ³	27 115
7	Aggregate	2 945 m ³	7 253
8	Mild steel	199 tons	38 033
Total			<u>£159 043</u>

II WATER METERS INSTALLED DURING 1983

Ser No	Dia inches	Number	Value £
1	1/2"	1 371	5 477
2	1"	3	22
3	1 1/4"	8	61
4	1 1/2"	3	37
5	2"	121	4 748
6	2 1/2"	17	666
7	3"	59	2 636
8	4"	84	5 936
9	6"	15	162
10	8"	11	2 743
Total			<u>£22 488</u>

TABLE VII-4

MACHINERY HIRED DURING 1983 (Cont.)

Ser No	Description	Quantity	Unit	Value £
22	Diggers	32	w/days	190
23	Diggers	4 163	W/hrs	15 782
24	Diggers	1 801	m ³	475
25	Diggers	agreed	--	89
26	Tractor	370	w/hrs	1 417
27	Tractor	156	m ³	58
28	Tractor	agreed	--	280
29	Vibrator	4	w/days	20
30	Mixers - elevators	agreed	--	1 455
31	Water - pump	18	w/days	84
32	RH9 excavator	26	w/hrs	260
33	Drilling	8	w/hrs	60
34	Compressors	7	w/days	40
35	Caterpillars	agreed	--	400
36	Caterpillars	259	w/hrs	1 794
37	Bawzer excavator	41	w/hrs	255
38	Dumper	14	w/days	28
39	Buses	91	w/days	339
40	Taxi	36	trips	71
41	Tipper lorries	--	--	7 926
42	Excavation	59 301	rm	69 894
43	Excavation	23 288	m ³	12 192
44	RH9 excavator	178	w/hrs	2 112
45	RH6 excavator	96	w/hrs	1 199
	Total			<u>£445 483</u>

BUILDING AND OTHER MATERIAL

Most of the building materials used for the construction of all the schemes undertaken during 1983 were purchased locally from the private sector through open tenders. Such materials that are available at the GCS, i.e mild steel and water meters are requisitioned in the usual way. Cement was purchased direct from the Vasiliko Cement Factory after invitation of tenders for all the needs of the Government

During 1983 the Division hired machinery both from the EMS and from the private sector. In total during the year an amount of £445,483 was paid for all types of machinery hired for the execution of the works. The hiring of land-rovers, or such type of transport for the transportation of the foremen with their gang to the site of the works is increasing each year. It has almost become a practice that each works-foreman engages transport for the transportation of his gang to the site of the work and for general use for any type of minor transport that might arise. During 1983 an amount of about £75,000 was paid for the hiring of transport.

Table VII-4 below shows in detail all machinery hired for the execution of the works during 1983.

TABLE VII-4
MACHINERY HIRED DURING 1983

Ser No	Description	Quantity	Unit	Value £
1	Tipper lorries	--	agreed	32 336
2	Tipper lorries	1 941	w/hrs	6 111
3	Tractor	3 912½	w/hrs	12 194
4	Traxcavators	2 719	w/hrs	34 514
5	Compressors	3 844½	w/hrs	6 036
6	Electrowelding machines ..	4 483	w/hrs	5 085
7	Electrowelding machines ..	20	w/days	200
8	Braker	47½	w/hrs	404
9	Buldozers	2 71½	w/hrs	3 226
10	Computer - services	--	1.1-31.12.83	3 863
11	Digger	29 434	w/hrs	107 067
12	Buses	765	w/days	12 062
13	Water carrier	31	trips	638
14	Water carrier	721	w/hrs	2 505
15	Cranes	822½	w/hrs	5 985
16	Cranes			50
17	Cranes	1 812 983	tons	7 305
18	Digger braker	1 431¾	w/hrs	11 778
19	Land rovers	7 453	w/days	65 121
20	Saloon cars	2 346	w/days	11 543
21	Mixers	337	w/days	1 040

V PVC/POLYTHENE PIPES - (6 atm and 10 atm)

Dia inches	Length m	Value £
½"	5 990	708
¾"	1 379	497
1"	4 808	1 822
1½"	52	15
2"	1 415	586
2½"	1 139	254
3"	1 695	948
4"	5 043	3 833
6"	5 360	7 632
8"	18	64
Total	26 899	£16 359

SUMMARY OF ALL TYPES OF PIPES LAID DURING 1983

Ser No	Type	Length m	Value £
I	Galvanized steel pipes	217 970	470 469
II	Steel pipes (coated) P.E	42 962	350 880
III	Asbestos cement pressure pipes		
	- class 15	123 799	600 878
IV	Asbestos cement pressure pipes		
	- class 20	30 000	126 467
V	PVC/Polythene pipes	26 899	16 359
Total .. ..	.. .. .	441 630	£1 565 053

CONSTRUCTION PLANT

For the execution of the schemes approved in the 1983 budget, and all other schemes undertaken for construction during 1983, the Division had to apply to the Department of Electrical and Mechanical Services (EMS) for any type of machinery considered necessary for the execution of the work.

If Government machinery is not available, then the Division had to hire machinery from the private sector through open tenders.

II STEEL PIPES (COATED-PLAIN ENDED OR VICTAULIC)

Dia mm	Length m	Value £
168.3	16 402	71 307
219.1	17 763	97 067
273.0	894	5 193
323.9	1 180	13 376
355.6	3 211	37 294
508.0	136	4 106
559.0	3 240	117 582
610.0	136	4 955
Total	42 962	£350 880

III ASBESTOS CEMENT PRESSURE PIPES - CLASS 15

262	2 112	289
75	19 274	11 791
100	43 354	89 114
150	20 980	67 154
200	15 191	73 746
250	8 043	47 510
300	5 388	47 836
350	138	1 448
400	2 782	56 476
500	702	18 043
600	5 835	187 471
Total	123 799	£607 878

IV ASBESTOS CEMENT PRESSURE PIPES - CLASS 20

75	1 968	27 715
100	9 296	24 249
150	7 775	30 122
200	6 857	43 238
250	4 104	26 143
Total	30 000	£126 467

PIPES AND PIPE FITTINGS

The vast majority of pipes and fittings of all types used by the Division during 1983 for the construction of all the schemes, 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.

The yearly requirements of our Department in pipes and pipe fittings of all types are assessed by the planning branch of the Construction Division as soon as the Development Budget is approved by the Ministerial Council and an order is put through the GCS early before the commencement of the schemes.

In exceptional cases where our requirements cannot be met through the GCS, due to the execution of emergency schemes where a special type of pipes is used, then pipes and fittings may be purchased direct by our Department through the usual procedure of tenders.

During 1983 a length of 441,630 m of pipes of various types and diameters were laid all over the island for all schemes executed by our Department at an expenditure of £1,565,053.

Table VII-3 below shows in detail all types, lengths and value of pipes laid during 1983.

TABLE VII-3

PIPES LAID DURING 1983

I GALVANIZED STEEL PIPES

Dia inches	Length m	Value £
½"	7 056	2 760
¾"	1 146	626
1"	2 670	1 587
1 ¼"	2 460	1 749
1 ½"	5 730	5 867
2"	42 891	62 975
2 ½"	56 916	108 556
3"	43 967	104 721
4"	55 134	181 628
Total	<u>217 970</u>	<u>£470 460</u>

and other senior officers carry out periodic visits to the Regional Offices and to the sites of the works under construction.

The Construction Division is kept informed on the progress of all the schemes in the districts through the Technical co-ordinator and monthly progress reports which are utilized for the preparation of the ^{general} monthly progress report which covers all the budgeted schemes under construction.

LABOUR FORCE

For the construction of a project the Division engages a gang, usually consisting of a monthly or weekly paid foreman, 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 1983, for the construction of all the projects was 801 employees. Out of this figure 542 employees were regular covering a variety of trades, i.e builders, carpenters, pipelayers, etc and 259 employees were casual, mostly unskilled labourers

TABLE VII-2
LABOUR FORCE 1983

Month	Skilled	Unskilled	Regular	Casual	Total
January	471	235	516	190	706
February	475	246	515	206	721
March	475	246	516	205	721
April	492	263	516	239	755
May	505	296	537	264	801
June	529	309	545	293	838
July	542	303	551	294	845
August	547	296	546	297	843
September ...	564	285	564	285	849
October	555	283	565	273	838
November	568	288	567	289	856
December	566	275	566	275	841
Daily average %	65 %	35 %	68 %	32 %	100 %
Daily average No. ...	524	277	542	259	801

• The acquisition of immovable property which is affected by the construction of the schemes.

• The supply of services towards the installation of electricity supply, telephone etc, at the site of various works.

CONTROL BRANCH

The main activity of this branch is to exercise control over the construction of all the schemes. 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 is attained at reasonable standards and 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.

A most important objective of this branch is to ensure that the schemes undertaken for construction are completed within the estimated amount. As most of the budgeted schemes are contributory (village water supplies, minor irrigation schemes etc) enormous problems arise if a project is put in hand and the funds allocated are not sufficient for its completion. In such cases where the funds approved or allocated are not sufficient for the completion of the schemes, then it has to be revised prior to the commencement of the work, so that the beneficiaries and the Government approve the extra amount needed. The technical staff of this branch works 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 a project.

^{projects}
All other than Nicosia District projects are constructed direct by the three Regional Offices of the Department i.e Larnaca-Famagusta, Limassol and Paphos in close association with a senior officer of the Construction Division who acts as the co-ordinator between the Regional Offices and the Headquarters in Nicosia. In addition the Head of the Division

PLANNING BRANCH

Though this branch has not been properly staffed since the time of its creation in 1979, still it continued to play its role during 1983. A lot more could be achieved through this branch provided it was adequately staffed and its activities expanded.

During the year 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 monthly progress report showing all budgeted schemes, the progress and expenditure incurred up to the end of each month. This report is being distributed to the Ministry of Agriculture and Natural Resources, the Planning Bureau, senior officers of the Department and technical officers supervising the construction of projects.
- The assessment of the Department's requirements in materials and equipment, such as pipes, pipe fittings, pumping units, etc, and their order through the Government Central Stores Department (GCS) in time so that the schemes approved are executed smoothly, with no interruptions or delay.
- The checking of the estimates of the schemes designed by other Divisions of our 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 'Schedules of Rates and Prices' manual, which was reprinted and distributed at the end of 1983.
- 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 GCS, i.e building materials, and for the hiring of machinery from the private sector when such machinery is not available at the EMS.

Table VI-1 below gives an outline of the volume of work executed by the Division during 1983. More detailed information and lists showing all the projects are given in the tables that follow, further on in this report.

TABLE VI-1
SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1983

Ser No.	Description	No. of schemes	Amount allocated during 1983 £	Expenditure incurred during 1983 £
1	Minor irrigation schemes	36	603 816	307 054
2	Vasilikos - Pendaskinos Project.	1	5 543 883	5 003 438
3	Southern Conveyor Project..	1	877 000	874 298
4	Khrysokhou Irrigation..Project	1	900 000	824 982
5	Other major irrigation works..	12	357 969	316 764
6	Town water supply schemes	51	709 637	550 533
7	Rural ^{domestic} water supply schemes..	63	1 420 363	820 033
8	Pitsilia Integrated Rural Development Project	108	2 683 614	1 824 185
9	Refugees housing and self-housing schemes	57	497 214	379 302
10	Schemes undertaken for other Government Departments	68	269 558	232 973
11	Village water supply and irrigation schemes (non-budgeted) executed from funds deposited by villages	101	227 584	61 372
12	Schemes undertaken for private developers from deposits	209	177 009	165 620
	Total	708	£14 287 647	£11 360 554
13	Paphos Irrigation Project expenditure not included in the above figure	1	1 388 403	1 294 193
	Grand Total	709	£15 676 050	£12 654 747

All these projects undertaken for construction during 1983, 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 Ministry of Agriculture and Natural Resources.
- * All water supply schemes for the housing of the Refugees, approved in the budget of the Department of Planning and Housing,
- * All types of projects, covering a wide range i.e water supply schemes for livestock or industrial areas, improvements to existing water supply and irrigation schemes for Turkish Cypriot villages, etc, approved in the budgets of a number of Ministries or Departments, and
- * All types of water projects, non-budgeted, i.e improvements to existing water supply and irrigation schemes, laying of distribution mains for the parcellation of new building sites, etc carried out from deposits by villages or private developers.

In total during 1983 the Department had to deal with the construction of 709 projects of an estimated value £15,676,050. The Division of Construction had to deal with the vast majority of these projects. The overall expenditure incurred on all these projects reached the amount of £12,654,747 which is a record figure in our Department's life. This figure includes expenditure in Paphos Irrigation Project (£1,294,193) and Vasilikos-Pendaskinos Project (£5,003,438).

The proper staffing of the Division of Construction existed again in 1983 especially in the lower ranks of Technicians. Now that the Department of Water Development is expanding rapidly undertaking the construction or supervision of major projects, such as the Southern Conveyor Project, the Vasilikos-Pendaskinos Project, the Khrysokhou Irrigation Project, etc, the proper staffing of the Division and its reorganization should be looked into with the scope of taking a more active part in such major projects where the skill and experience of several officers of the Division could be fully utilized.

In addition to the above technical staff, the Division engaged 542 regular employees of various trades, mostly skilled, and a daily average of 259 casual employees, mostly unskilled, for the execution of the various schemes approved for construction during the year.

The Division continued during 1983 the collection of data regarding actual rates of construction, standards of materials and equipment, and by the end of the year an up-to-date manual 'Schedule of Rates and Prices' was published and distributed to all Divisions and Technical Officers of the Department for guidance in planning and cost estimating of future projects. The collection of data will be continued on a permanent basis and the manual will be revised periodically as necessary.

The commencement of the construction of the new projects for 1983 again started late, as usually, due to the delay in the allocation of the funds. Though the development budget was approved in time by the House of Representatives still the completion of the formalities especially for contributory schemes take a lot of time causing a lot of problems during the early months of each year, as well as during the summer months at the greatest demand for construction. These administrative problems have to be solved in a way so that there is an even distribution of funds for the smooth implementation of the construction programmes on a twelve month basis.

CONSTRUCTION PROGRAMME AND PROGRESS

As usual the Planning Branch of the Division prepared a construction programme for 1983 which included all water projects that were approved for execution during the year. These projects were approved in the development budgets of our Department, or in the budgets of other Ministries or Departments. In general the Division had to deal with the constructional activities relating to all water projects scheduled for construction during 1983, except some specific major projects where the role of the Division is rather limited due to financing procedures. etc.

VII DIVISION OF
CONSTRUCTION

by

A P Georghiades
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, whether by direct labour, or by contract. During 1983 the Workshops branch which previously was under the Division of Construction, was placed under the direct control of the Assistant Director. After this partial reorganization the Division is sub-divided into three main branches:

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

During 1983 the Division consisted of the following staff:

- 1 Senior Water Engineer - Head
- 1 Executive Engineer, 1st Grade - Assistant Head
- 5 Executive Engineers, 2nd Grade
- 1 Senior Technical Superintendent
- 2 Technical Superintendents
- 8 Senior Technicians
- 4 Technicians 1st Grade
- 4 Chief Foremen
- 9 Assistant Chief Foremen
- 3 Technicians 2nd Grade
- 28 Monthly paid Foremen
- 29 Weekly paid Foremen

- 95 Total Staff

TABLE VI...-10

SEWAGE SCHEMES PREPARED IN 1983

Ser. No.	Description	Est. Cost £
<u>NICOSIA DISTRICT</u>		
1.	Kakopetria (Sewerage Scheme- Drg.No.L/SD/3)	115 000
2.	Mental Hospital-Athalassa (Sewerage scheme - Drg. No. P/SD/1)	62 000
3.	Mental Hospital-Athalassa (Effluent pipeline to Earth Pond -Drg.No. P/SD/3)	24 000
4.	Ayios Pavlos (Main Sewer to Nicosia sewerage system - Drg. No. A/SD/7).....	23 250
5.	Apostolos Loucas-Laxia (Effluent pipeling to Earth Pond - Drg. No F/SD/5)	19 000
6.	Ayios Ioannis-Maloundas (Sewer Outfall from ELDYK Camp.- Drg. No. M/SD/2)	7 500
7.	Khrysospiliotissa (Effluent pipeline to Filter - Drg. No. D/SD/4)	5 500
	Total	£ 256 250
<u>LARNACA DISTRICT</u>		
1.	Zenon-Kamares II (Effluent pipeline from Biological Station to New Larnaca Stadium and Rizoelia Dam - Drg. No. G/SD/4/2)....	81 350
2.	Kophinou-(Effluent storage Pond-Drg. No. E/SD/9)	11 500
	Total	£ 92 850
<u>PAPHOS DISTRICT</u>		
1.	Kholetria (Sererage scheme-Drg.No.N/SD/1)	72 000
2.	Mouttallos (Pano Paranges Sewerage scheme -Drg. No. I/SD/4)	36 000
3.	Mouttallos (Effluent pipeline to Filter Phoni River - Drg. No. I/SD/7).....	5 450
	Total	£ 113 450
	Grand Total	£ 462 550

TABLE VI. -10

SEWAGE SCHEMES PREPARED IN 1983

Ser. No.	Description	Est. Cost £
<u>NICOSIA DISTRICT</u>		
1.	Kakopetria (Sewerage Scheme- Drg.No.L/SD/3)	115 000
2.	Mental Hospital-Athalassa (Sewerage scheme - Drg. No. P/SD/1)	62 000
3.	Mental Hospital-Athalassa (Effluent pipeline to Earth Pond -Drg.No. P/SD/3)	24 000
4.	Ayios Pavlos (Main Sewer to Nicosia sewerage system - Drg. No. A/SD/7).....	23 250
5.	Apostolos Loucas-Laxia (Effluent pipeling to Earth Pond - Drg. No F/SD/5)	19 000
6.	Ayios Ioannis-Maloundas (Sewer Outfall from ELDYK Camp.- Drg. No. M/SD/2)	7 500
7.	Khrysospiliotissa (Effluent pipeline to Filter - Drg. No. D/SD/4)	5 500
	Total	£ 256 250
<u>LARNACA DISTRICT</u>		
1.	Zenon-Kamares II (Effluent pipeline from Biological Station to New Larnaca Stadium and Rizoelia Dam - Drg. No. G/SD/4/2)....	81 350
2.	Kophinou-(Effluent storage Pond-Drg. No. E/SD/9)	11 500
	Total	£ 92 850
<u>PAPHOS DISTRICT</u>		
1.	Kholetria (Sererage scheme-Drg.No.N/SD/1)	72 000
2.	Mouttallos (Pano Paranges Sewerage scheme -Drg. No. I/SD/4)	36 000
3.	Mouttallos (Effluent pipeline to Filter Phoni River - Drg. No. I/SD/7).....	5 450
	Total	£ 113 450
	Grand Total	£ 462 550

TABLE VI -8

WATER SUPPLY SCHEMES WITHIN PITSILIA PROJECT
PREPARED AND SUBMITTED IN 1983.

Ser. No.	Village	Nature of scheme
1.	Louvaras	Additional supply from BHs 32/77 and 16/81£ 7000
2.	Pharmakas	Extensions£ 1900

TABLE VI -9

IRRIGATION SCHEME WITHIN PITSILIA
PROJECT PREPARED IN 1983.

Ser. No.	Village	Division or Association	Locality	Nature of proposed work	Est. Cost	Vill. Cont.	Donums
1.	Kourdhalii..	Division..	Bathy	Distribution pipeline	6500	1/3	15
2.	AyiosTheodoros	Division	Kavatsia	Distribution pipeline	5600	1/3	12

TABLE VI -7 (cont.)

LIMASSOL DISTRICT

Ser. No.	Village	and Nature of Proposed Work
1.	Lemithou	Use of BH 134/78
2.	Yerasa	Use of BH 106/82
3.	Kellaki	New scheme
4.	Pelendria	New scheme
5.	Phini	Extensions
6.	Perapedhi	Use of BH 109/77
7.	Ayios Ioannis	Improvements
8.	Ayios Ioannis	New storage tank and pipelines
9.	Kapilio	Improvements
10.	Agridhia-Kyperounda	New scheme
11.	Louvaras	New scheme
12.	Zoopiyi	New scheme
13.	Saittas-Moniatis	Intake weir and main conveyor

PAPHOS DISTRICT

1.	Kedhares	Plistra
2.	Khoulou	Kartavines, pumping scheme
3.	Salamiou	Pumping scheme
4.	Kholetria	Pumping scheme
5.	Kato Pyrgos	Platis, pumping scheme
6.	Yiolou-Miliou	Pumping scheme
7.	Pano Akourdhalia	Pumping scheme
8.	Kritou Terra	Improvements
9.	Mamonia	River training
10.	Yiolou	Ayios Nipios pumping scheme
11.	Yiolou	Ayios Yeoryios pumping scheme
12.	Inia	Pond
13.	Pendalia	Pumping scheme
14.	Miliou	Pumping scheme
15.	Kato Pyrgos	Katouris, improvements
16.	Souskiou	Pumping scheme
17.	Mamonia	Pumping scheme
18.	Kili	Pumping scheme

TABLE VI -6

SMALL IRRIGATION SCHEMES APPROVED BY THE
INTERDEPARTMENTAL COMMITTEE IN 1983

Ser No	Village and Scheme
1	Pano Koutraphas - Pumping scheme BH 77/80
2	Spilia - Dexameni tis Stratias - Distribution pipelines
3	Moutoullas - Pharkonia - Pumping scheme BH 104/80
4	Kato Akourdhalia- Diversion weir and pipeline
5	Souskiou - Pumping scheme BH 96/62
6	Polemi - Pumping scheme BH 7/79

SCHEMES NOT APPROVED

1	Kakopetria - Pano and Kato Apotheri- pipelines
2	Kato Arodhes - Repairs to Irrigation tank and distribution pipes

TABLE VI -7

IRRIGATION SCHEMES IN THE COURSE OF PREPARATION UNDER
INVESTIGATION OR PENDING DURING 1983

Ser No	Village and Nature of proposed work
1	Yerakies - Construction of 4 irrigation tanks
2	Kakopetria - Kakopetria distribution pipeline
3	Ayios Theodoros-Ayios Yeoryios distribution pipeline
4	Pharmakas - Dexameni tou Kaminiou distribution pipeline
5	Ayios Ioannis- Peroyia distribution pipeline
6	Sykopetra - Agridhia-Konomidhes distribution pipeline
7	Ayios Theodoros - Fintoukia distribution pipeline

LARNACA DISTRICT

1	Kellia Irrigation Division-Pumping scheme
2	Livadhia - Antiflood works
3	Ormidhia - Construction of small Dam.

IRRIGATION SCHEMES PREPARED IN 1983 AND SUBMITTED TO DISTRICT OFFICERS (CONT.)

Ser No	Village	Division or Association	Locality	Nature of proposed work	Est. cost £	Village Cont. %	Donums Perm. Sea:
PAPHOS DISTRICT							
1	Kato Akourdhalia	Division	Milarka	Diversion weir and conveyor pipeline	16 500	1/3	120
2	Kato Pyrgos	Division	Phraktis	Improvements	3 000	1/3	-
3	Kouklia	Division	BH Mydr.No632	Pumping scheme and distribution system	56 000	1/5	166
4	Miliou	Division	Liskiarin	Diversion weir and conveyor pipeline	61 700	1/3	60
5	Polemi	Division	BH No.26/60	Pumping scheme and distribution system	30 600	1/3	80
				Total	<u>167 800</u>		

Summary of Table VI -5

District	No of schemes	Estimated Cost £
Nicosia	8	93 750
Limassol	3	10 510
Paphos	5	167 800
Total	<u>16</u>	<u>£ 272 060</u>

TABLE VI --5

IRRIGATION SCHEMES PREPARED IN 1983 AND SUBMITTED TO DISTRICT OFFICERS.

<u>No</u>	<u>Village</u>	<u>Division or Association</u>	<u>Locality</u>	<u>Nature of proposed work</u>	<u>Est. cost £</u>	<u>Village Cont. %</u>	<u>Donums Perm. Seas.</u>
<u>MESSIA DISTRICT</u>							
1	Peristerona	--	--	Inter-connection of T/C BH schemes	5 500	--	--
2	Kato Kopia	Division	Naos	Distribution pipeline.....	5 300	1/3	110
3	Spilia	Division	Dexamenitis Stratas	Distribution pipeline	3 300	1/3	20
4	Pano Koutraphas	Division	P. Koutrafas	Pumping scheme from BH 77/80 and distribution pipelines	34 500	1/3	80 79
5	Spilia	Division	Anastasis	Improvements	400	--	--
6	Moutoullas	Division	Moutoullas	Pumping scheme from BH 164/80 and pipeline	26 700	1/3	170
7	Astromeritis	Division	--	Repairs to damage to channels by defence works.....	2 850	--	--
8	Petekhori	Association	Maroullena	Distribution pipeline.....	15 200	44	25
Total					93 750		
<u>MESSOL DISTRICT</u>							
1	Agros	Division	Platania	Improvements	1 850	1/3	6
2	Agros	Division	Kacuros	Distribution pipeline	8 000	--	21
3	Prodhronos	Division	Khardji-Frakcis	--	660	--	220
Total					10 510		

LARNACA DISTRICT

- 1 Xylophaghon..... Improvements to distribution system
- 2 Anaphotia W S to government building sites
- 3 Voroklini New distribution system
- 4 Tersephanou Construction of new storage tank
- 5 Kellia Troulli road Replacement of pipeline
- 6 Salt lake New pumping scheme from sea water
- 7 Kophinou Connection with Famagusta pipeline
- 8 Tersephanou New distribution system
- 9 Pano Lefkara New distribution system
- 10 Kornos New distribution system
- 11 Khirokitia New distribution system

FAMAGUSTA DISTRICT

- 1 Paralimni New distribution system
- 2 Paralimni-Protaras Extensions
- 3 Paralimni-Ayia Napa New pumping scheme from Phrenaros Reservoir
- 4 Ayia Napa Extensions

TABLE VI -4

VILLAGE WATER SUPPLY SCHEMES PENDING DURING 1983

Ser No	Village	Nature of scheme
<u>NICOSIA DISTRICT</u>		
1	<u>Mitsero</u>	House to house
2	<u>Ayii Trimithias</u> ..	Construction of new storage tank
3	<u>Xeri</u>	Improvement of the existing house to house scheme
4	<u>Nisou</u>	Improvement of the existing house to house scheme
5	<u>Sha</u>	New storage tank and Improvements
6	<u>Vizakia</u>	New storage tank
7	<u>Lagoudhera</u>	Extensions
8	<u>Lymbia</u>	Improvements to the exist house to house scheme
9	<u>Paleometokho</u>	Extensions and Improvements to the exist house to house scheme
10	<u>Astromeritis</u>	Water supply boundary
<u>LIMASSOL DISTRICT</u>		
1	<u>Souni Zanaia</u>	Additional supply
2	<u>Perapedhi</u>	Additional supply
3	<u>Monagri</u>	Additional supply
4	<u>Moutayiakka</u>	Replacement of the Regional W S scheme main conveyer
5	<u>Phasoula</u>	Additional supply
6	<u>Phasoula</u>	Improvements
7	<u>Prastio (Kellaki)</u>	Extenstions
8	<u>Limnatis</u>	New storage tank
<u>PARHCS DISTRICT</u>		
1	<u>Akoursos</u>	Additional supply
2	<u>Khlorakas</u>	New distribution system
3	<u>Pomos</u>	Extensions
4	<u>Ayia Marina</u>	Replacement of conveyer pipeline
5	<u>Xeropiyi</u>	Replacement of conveyer pipeline
6	<u>Kannaviou</u>	Additional supply
7	<u>Nikoklia</u>	Additional supply
8	<u>Pano & Kato Pyrgos</u>	Replacement of main conveyer pipeline
9	<u>Khlorakas Touristic Area</u>	New supply, distribution system
10	<u>Kissonerga Touristic Area</u>	New supply, distribution system

TABLE VI. -3A

WATER SUPPLY SCHEMES FOR REFUGEE HOUSING OR SELF HOUSING ESTATES PREPARED AND SUBMITTED IN 1983

Ser. No.	Village	Nature of scheme	Est. Cost £
<u>LIMASSOL DISTRICT</u>			
1	<u>Moutayiaka</u>	W S to self housing estate Area "C"	4 000
2	<u>Pano Kividhes</u>	Self housing estate	4 500
3	<u>Kato Polemidhia</u>	Self housing estate "Area C"	9 100
4	<u>Evdhimou</u>	Self housing estate "Area B"	6 400
Total			£ 24 000

LARNACA DISTRICT

1	<u>Zenon-Kamares</u>	Improvements	1 500
2	<u>Dhromolaxia</u>	Self housing -Extensions	3 200
3	<u>Makarios III</u>	Government housing-Extensions	7 500
4	<u>Kophinou</u>	New distribution system ...	35 000
Total			£ 47 200

FAMAGUSTA DISTRICT

1	<u>Vrysoulles</u>	Extensions to cemetery ...	1 500
2	<u>Akhna Forest</u>	New Distribution system- Second phase	16 000
3	<u>Akhna Forest</u>	New distribution system- Third phase	30 000
Total			£ 47 500

SUMMARY OF TABLE VI. -3A

District	No of schemes	Est. Cost
Nicosia	-	-
Limassol	4	24 000
Larnaka	4	47 200
Famagusta	3	47 500
Paphos	-	-
Total	11	£118 700

PAPHOS DISTRICT

1	<u>Lemba</u>	Storage tank and new Distribution system	18 000
2	<u>Akamas-Loutra</u>	Storage tank, pumping unit and distribution system	180 000
3	<u>Lara-Coral Bay</u> ;..	Storage tank, pumping unit and distribution system	200 000
4	<u>Inia-Dhrousha</u>	Pumping unit, pumping main and storage tank	54 000
5	<u>Ayios Dhimitrios</u> .	Installation of water meters	1 560
6	<u>Ayios Ioannis</u>	Extensions	3 970
7	<u>Goudhi-Khrysokhou</u>	Pumping unit, pumping main and storage tank and conveyor pipeline	45 300
8	<u>Paphos Airport</u> ..	Distribution system	22 300
9	<u>Argaka</u>	New storage tank and conveyor pipeline	13 000
10	<u>Peyia</u>	Pumping unit, storage tank and conveyor pipeline	68 600
11	<u>Appidhes Regional scheme</u>	Additional supply from BH	22 200
12	<u>Ayia Regional scheme</u>	Additional supply from BH	24 000
13	<u>Kritou Marottou</u>	Improvements	10 000
14	<u>Panayia</u>	Additional supply from spring	4 900
Total			£667 830

SUMMARY OF TABLE VI -3

District	No. of Schemes	Est. Cost £
Nicosia	27	571 600
Famagusta	7	147 300
Larnaca	15	549 200
Limassol	21	507 510
Paphos	14	667 830
Total	84	2 443 440

9	<u>Kornos</u>	Extensions	7 000
10	<u>Pano Lefkara</u>	Improvements	6 500
11	<u>Kalokhorion</u>	Pumping scheme from BH 79/83	33 500
12	<u>Kophinou</u>	Water supply to livestock Farming area	6 000
13	<u>Larnaca Town</u>	Extensions fro Tourist Projects	75 000
14	<u>Ayia Anna</u>	Extensions	1 800
15	<u>Aradhippou</u>	Additional supply to livestock farming area	14 000
			<hr/>
Total			£549 200

LIMASSOL DISTRICT

1	<u>Kolossi</u>	W S to community building sites	16 500
2	<u>Kato Polemidhia</u> ..	W S to "Verengaria"area ...	7 000
3	<u>Lophos</u>	W S to Ayia Marina church..	7 300
4	<u>Ladies Mile</u>	W S from BH 97/70	108 000
5	<u>Kato Platres</u>	Additional supply from BH 81/81	62 000
6	<u>Episkopi</u>	W S to community building sites	58 000
7	<u>Ayios Amvrosios</u> ..	Extensions	5 000
8	<u>Pano Kividhes</u>	Replacement of main conveyer	42 300
9	<u>Klonari</u>	W S from Kellaki	7 900
10	<u>Aydhimou</u>	Improvements	4 500
11	<u>Pano Polemidhia</u> ..	Improvements	12 000
12	<u>Perapedhi</u>	New storage tank	10 300
13	<u>Mallia</u>	Supply of water to cemetary	850
14	<u>Apsiou</u>	Additional supply from new spring	4 800
15	<u>Polemidhia</u>	Distribution system within PASYDY area	3 500
16	<u>Episkopi</u>	New distribution system.	103 000
17	<u>Asgata</u>	New storage tank	8 900
18	<u>Episkopi</u>	W S to livestock area	17 500
19	<u>Yermasoyia</u>	Additional supply from BH 107/81	16 000
20	<u>Pissouri</u>	Additional supply	5 160
21	<u>Louvaras</u>	Additional supply from BH 32/77 and 16/81	7 000
			<hr/>
Total			£ 507 510

22	<u>Argates</u>	Extensxions	3 300
23	<u>Lakatamia</u> (CYTA centre)	Water supply to CYTA	5 000
24	<u>Agricultural..Res</u> <u>Institute</u>	Repair of irrigation tank ..	800
25	<u>Laxia</u>	Improvements	1 500
26	<u>Kalokhorio (Or)</u>	Laying of new pipelines	21 500
27	<u>Pharmakas</u>	Extensions	1 900
Total			£571 600

FAMAGUSTA DISTRICT

1	<u>Ayia Napa</u>	Additional supply from BH...	14 500
2	<u>Dherinia</u>	Improvements	30 000
3	<u>Ayia Napa</u>	Extensions	35 000
4	<u>Dherinia</u>	Extensions to Industrial Area	19 000
5	<u>Phrenaros</u>	Water supply to livestock farming area	17 000
6	<u>Liopetri-Paralimni</u> <u>road</u>	Relaying of pipeline	11 800
7	<u>Avgorou</u>	Construction of new Tower tank	20 000
Total			£ 147 300

LARNACA DISTRICT

1	<u>Aradhippou</u>	New distribution system.....	165 000
2	<u>Pano Lefkara</u>	Improvements	4 300
3	<u>Anglisidhes</u>	Pumping scheme from BH 3/70	19 000
4	<u>Athienou</u>	Pumping scheme-Additional supply	23 000
5	<u>Central Slaughter</u> <u>House at Kophinou</u> ..	Connection to F/sta main pipe- line	69 600
6	<u>Mari-Zyyi</u>	Pumping scheme from BH 62/82..	97 000
7	<u>Kalokhorio</u>	Connection to F/sta main pipe- line	13 500
8	<u>Xylophaghon</u>	Supply of water to community building sites	14 000

TABLE VI -3

VILLAGE WATER SUPPLY SCHEMES

PREPARED IN 1983 AND SUBMITTED TO

DISTRICT OFFICERS

D Ser. No.	Village	Nature of Scheme	Est. Cost £
<u>NICOSIA DISTRICT</u>			
1	<u>Ayii Trimithias</u>	House to house scheme	47 000
2	<u>Gourri-Lazania</u>	Relaying of pipelines	900
3		Supply from BH 92/82	3 900
4		Removing of pipes	700
5	<u>Ayios Theodoros (Sol)</u>	Additional supply from BH 150/82	42 000
6	<u>Anayia</u>	Laying of new dist. mains	1 800
7	<u>Mathiati military camp</u>	Supply from BH 129/83	18 700
8	<u>Klirou</u>	Additional supply from BH 50/83	12 000
9	<u>Episkopio</u>	Additional supply from BH 59/63	21 000
10	<u>Lekatamia</u>	Improvements	2 200
11	<u>Malounda</u>	New storage tank	6 000
12	<u>Akaki</u>	Additional supply from BH 65/82	14 000
13	<u>Dhali</u>	Additional supply from N/sia pipeline BH 3/83-Improvements	181 000
14	<u>Meniko</u>	Additional supply from BH 83/81	20 000
15	<u>Phikardhou</u>	Additional supply from BH 3/82	8 500
16	<u>Gourri</u>	Additional supply from BH 99/83	46 000
17	<u>Kapedhes</u>	Additional supply from BH 77/83	22 000
18	<u>Laxia</u>	New pipelines	1 900
19	<u>Anayia</u>	Additional supply from BH 18/83	22 000
20	<u>Lakatamia</u>	Additional supply from BH 24/83	20 000
21	<u>Analiondas</u>	Additional supply from BH 43/80	46 000

TABLE VI. -2

WATER SUPPLY SITUATION AT THE END OF 1983

District	Satisfactory piped supply Supply rate 90 litres/head/day & over						Unsatisfactory piped supply Supply rate below 90 litres/head/day						Total No. of Villages	Total Popu- lation 1969				
	Villages with House to house			Villages with fountains			Villages with House to house			Villages with public fountains								
	No	%	Pop.	No	%	Pop.	No	%	Pop.	No	%	Pop.						
Nicosia	144	85.21	116226	93.51	9	5.32	1169	0.94	10	5.92	6141	4.94	6	3.55	760	0.61	169	124296
Kyrenia	39	82.98	30786	93.50	2	4.26	59	0.18	1	2.13	540	1.64	5	10.63	1542	4.68	47	32927
Famagusta	82	83.68	82644	92.12	3	3.06	444	0.50	6	6.12	5695	6.34	7	7.14	954	1.04	98	89717
Limassol	104	91.23	72527	97.87	3	2.63	40	0.15	4	3.51	1417	1.91	3	2.63	124	0.17	114	74108
Paphos	104	78.79	46985	90.89	13	9.85	2202	4.26	11	8.33	2063	3.39	4	3.03	445	0.86	132	51695
Larnaca	55	93.22	39813	98.22	2	3.40	156	0.38	1	1.69	425	1.05	1	1.69	140	0.35	59	40534
Total	528	85.30	388981	94.12	32	5.17	4070	0.98	33	5.33	16281	3.94	26	4.20	3945	0.96	619	413277

TABLE VI -1

VILLAGE WATER SUPPLIES

Year	Villages with House-to-House distribution system					Village with Public Fountains			Village 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	24.23	-	-	-	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

Pitsilia Integrated Rural Development Project

The Division is dealing with the rural domestic water supply and rehabilitation of irrigation schemes within the PIRDP.

During 1983 two schemes were prepared (as per Table VI. 1-8) at a total estimated cost of £8,900.-

Two rehabilitation schemes were prepared at a total estimated cost of £12,100.- (as per Table VI. 1-9) and were submitted to the co-ordinator of the Pitsilia Project. These schemes are calculated with the internal rate of return method.

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 1983, 8 schemes have been considered by the Committee as per Table VI. 1-6)

Capital Aid from the Federal Republic of Germany

During 1983 a total sum of £76,981 was reimbursed from the loan of 18 Million D M for irrigation projects either completed or under construction as detailed below:

Major Projects

Total number of projects	3
Investment cost of projects	£1,279,041
Amount which can be claimed from loan.....	£1,279,041
Amount reimbursed in 1983.....	£ 28,893

Minor Projects (Up to £15,000)

Total number of projects	13
Investment cost of projects.....	£ 102,575
Amount which can be claimed from loan	£ 102,575
Amount reimbursed in 1983	£ 61,666

Total amount reimbursed from loan up to end of 1983 £90,559.

Encroachment in Rivers & Streams

Some 87 cases for land encroachment in rivers and streams were examined in 1983 and the Director of Lands and Surveys was advised accordingly.

Sewerage Schemes

During the year under review 12 sewerage schemes were designed and studied at an estimated cost of £462,550 (as per Table VI. 1-10)

Building and Division of Building Plots Permits

During 1983 a total of 1403 cases were investigated and sent to the District Officers for further action. The applications for Building permits were 647 and those for division of building plots were 756.

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 Officers. 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 1983 a total number of 16 irrigation schemes was prepared and submitted to District Officers at a total estimated cost of £272,060.- as per Table VI -5.

Another 41 schemes were in the course of preparation or under investigation by the end of 1983 as per Table VI -7.

Brief description of important irrigation schemes prepared during 1983.

Kouklia: Pumping scheme from B/H 632 to irrigate 166 donums. The estimated cost of the scheme is £56,000.-

Miliou: The scheme includes the construction of diversion weir on "Liskiari" river, the laying of conveyor pipeline and distribution pipes for the irrigation of 60 donums of citrus trees. The estimated cost of the scheme is £61,700.

Domestic water supply schemes for livestock areas, and touristic ones are also included in the schemes already mentioned.

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

Brief description of important water supply schemes prepared during 1983.

Ayii Trimitthias: Improvements to the existing house to house distribution system. Total Estimated cost £47,000.-

Ayios Theodoros (Sol): Additional supply from B/H 150/82. Total estimated cost £42,000.-

Dhali: Additional supply from B/H 3/83 and Nicosia pipeline. Also improvements to the existing house to house scheme. Total estimated cost £181,000.-

Gourri: Additional supply from B/H 99/83. Total estimated cost £46,000.-

Analiondas: Additional supply from B/H 34/83. Total estimated cost £46,000.-

Kato Platres: Additional supply from B/H 81/81 at an estimated cost of £62,000.-

Episkopi: A pumping scheme was prepared to provide water to community building sites at an estimated cost of £58,000.-

Pano Kividhes: Replacement of the village main water supply conveyor at a total estimated cost of £42,300.-

Episkopi: New distribution system to replace the existing old one at a total estimated cost of £103,000.-

Aradhippou: New distribution system to replace existing old one at a total cost of £165,000.-

Akamas-Loutra: Scheme for the supply of water from B/H 45/82 to the area from Latsi- Baths of Aphrodite for Touristic purposes, at an estimated cost of £180,000.-

Lara -Coral Bay: Scheme for the supply of water from B/H 134/80 to Coral Bay area for Touristic purposes, at an estimated cost of £200,000.-

Inia-Dhrousha Supplementary supply from B/H 112/59 at an estimated cost of £54,000.-

Goudhi-Khrysokhou: Supplementary supply from B/H 31/82 at an estimated cost of £45,300.-

Peyia: Supplementary supply from B/H 49/82 at an estimated cost of £68,600.-

VI RURAL PROJECTS PLANNING

by C Andreou
Senior Water Engineer
Head of Division

Introduction

The Rural Projects Planning Division is dealing 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 sewerage 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 1983 the staff of the Division was consisting of the following:

- 1 Senior Water Engineer - Head of the Division.
- 1 Executive Engineer I
- 1 Senior Technical Superintendent
- 2 Senior Technicians
- 7 Technicians I
- 1 Hourly paid Technician
- 1 Secretary - Typist

VILLAGE WATER SUPPLY SCHEMES

The general village water supply situation during 1983 is described in Tables VI -1 and VI -2. There are no villages in Cyprus without piped water.

During 1983 only 58 out of a total number of 619 villages remained with public fountains i.e. 1.94% of the total village population.

Out of 561 villages with house to house supply systems 528 enjoyed a per capita daily rate of over 90 litres (20 gallons).

Water Supply Schemes Prepared During 1983

A total number of 85 schemes were prepared and submitted to the District Officers during 1983, at a total estimated cost of £2,443,440 as shown on Table VI -3.

Another 39 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 11 water supply schemes were prepared for the housing of displaced persons (Refugee self-housing and housing estates), at a total estimated cost of £118,700 as per Table VI -3A, which were submitted to the Department of Town Planning and Housing.

w	Auxiliary services			
	(i) Library	1013	6.5	2.8
	(ii) Plan Registry	475	3.1	1.3
	(iii) Plan reproduction	2196	14.2	6.1
	(iv) Drawing materials store	333	2.2	0.9
	(v) Photographic section and photo process lab	1855	12.0	5.1
	Total for auxiliary services	5880	38.0	16.2
x	Leave etc			
	(i) Leave paid	4035	26.1	11.1
	(ii) Leave without pay			
	(iii) Sick leave	1253	8.1	3.5
	(iv) Maternity leave	911	5.9	2.6
	(v) D.C. (Including site visits)	396	2.6	1.1
	Total for leave etc	<u>6599</u>	<u>42.6</u>	<u>18.2</u>
	Grand total	36204	234	100

TABLE V-2
WORK CARRIED OUT BY THE DRAWING AND RECORDS BRANCH DURING 1983

Ref.	Description	Time spent in hours	Man months	% of total
a	Existing dams (completion plans, sedimentation maps, control monuments etc)	1001	6.5	2.8
b	Irrigation distribution systems for dams	164	1.1	0.5
c	Routine irrigation schemes	652	4.2	1.8
d	Routine domestic water supply schemes	1630	10.5	4.5
e	Paphos Irrigation Project	204	1.3	0.6
f	Pitsilia Integrated Rural Development Project	2878	18.6	7.9
g	Vasilikos-Pendaskinos Project	1597	10.3	4.4
h	Southern Conveyor Project	9951	64.4	27.5
i	Khrysokhou Irrigation Project	137	0.9	0.4
j	Solea Valley Project	1255	8.1	3.5
k	Larnaca-Orini Project	45	0.3	0.1
l	Recharge Works	178	1.2	0.5
m	Works for other departments	257	1.7	0.7
n	Sewage disposal for Refugee estates etc ...	590	3.8	1.6
o	Hydrological	352	2.3	0.9
p	Programmes and organisation	228	1.5	0.6
q	Water supply emergency schemes	317	2.0	0.9
r	Productivity centre course	155	1.0	0.4
s	Completion plans and reports	672	4.3	1.9
t	Reports	614	4.0	1.7
u	General	753	4.9	2.1
v	Odd jobs	108	0.7	0.3

A Pengeros. Pitsilia integrated rural development project. Mini feasibility study, for Sykopetra borehole No. 48/82 irrigation scheme. Nicosia, July 1983. Report No. D/139. Book Nos 9918, 9919.

WDD. Southern conveyor project. Analysis of the alternative to provide the domestic water demand for the Famagusta area through the Khirokitia system. Nicosia, July 1983.

P Neophytides - A Pengeros. Pitsilia integrated rural development project. Phterykoudhi borehole irrigation scheme. Mini feasibility study. Nicosia, August 1983. Report No. D/133/A. Book Nos 9938, 9939.

N Michael. Pitsilia integrated rural development project. Agros borehole irrigation scheme. Mini feasibility study. Nicosia, August 1983. Report No. D/140. Book Nos 9940, 9941.

WDD - CONSTRUCTION DIVISION. Construction programme for 1983. Nicosia, June 1983. Book Nos 9942, 9943.

T E H Sabben-Clare. Vasilikos-Pendaskinos Project. Progress report No. 10. Covering period from 1.1.83 to 30.6.83. Nicosia, November 1983. Report No. D/210. Book Nos 9992, 9993.

K C Hassabis. Water supply - unit cost of water from government sources to Nicosia, Larnaca and Famagusta areas for 1984-1985. Nicosia, December 1983. Report No. L/25. Book Nos 9996, 9997.

Κ Κ ΧΑΣΑΠΗΣ Ανασκόπηση της κατάστασης υδατοπρομήθειας για την περίοδο 1982-85 και των εκτάκτων μέτρων 1982-83. Λευκωσία, Οκτώβριος 1983. Αρ. εκθέσεως L/26. Αρ. Βιβλ. Α19, Α20.

K C Hassabis. Proposal for the revision of water rates for the water boards of Nicosia and Larnaca for 1984. Nicosia, November 1983. Report No. L/27. Book Nos A21, A22.

A Georghiou. Limassol water supply - Emergency schemes (New boreholes). Nicosia, June 1983. Report NO. H/58. Book Nos A17, A18.

CHR. IOANNOU. Possibilities for the development of the water resources in the Tylliria region. Nicosia. October 1983. Report No. H/59 Book Nos A35, A36.

M Michaelidou. Nicosia septage treatment plant at Kochati. Prefeasibility study. Nicosia, January 1984. Report No. D/141. Book Nos A52, A53.

WDD REPORTS (28 No.)

- N NEOCLEOUS - A MARANGOS. Pitsilia integrated rural development project. Kato Mylos pond. Completion report. Nicosia, October 1982. Report No. C/147. Book Nos 9812, 9813.
- B M MILINUSIC. Paphos irrigation project. Progress report No. 27 Covering period from 1.7.82 to 31.12.82. Nicosia, January, 1983. Report No. D/132. Book Nos 9814, 9815.
- CH KRIDIOTIS - J KAROGLANIAN - N PHILIPPIDES. Concrete laboratory design for preliminary concrete trial mixes. Nicosia, December, 1982. Report No. S/14 Book No. 9823.
- T E H SABBEN-CLARE. Vasilikos-Pendaskinos project. Progress report No. 9 Covering period from 1.7.82 to 31.12.82. Nicosia, February 1983. Report No. D/209 Book Nos 9828, 9829.
- N TSIOURTIS - S AFRODISIS. Pitsilia integrated rural development project. Pumping test results. Preliminary results. Nicosia, March 1983. Report No. D/135. Book Nos 9830, 9831.
- WDD. Khrysokhou irrigation project. Evretou dam. Panel of experts. Report No. 2 Nicosia, January 1983. Book No. 9832.
- WDD WATER RESOURCES DIVISION. Hydrological year-book of Cyprus 1975-1976. Nicosia, March 1983. Book Nos 9901, 9902.
- P NEOPHYTIDES. Pitsilia integrated rural development project. Phterykoudhi borehole irrigation scheme. Mini feasibility study. Nicosia, March 1983. Report No. D/133. Book Nos 9859, 9860.
- A Pengeros - N TSIOURTIS. Pitsilia integrated rural development project. Lagoudhera borehole irrigation scheme. Mini feasibility study. Nicosia, April 1983. Report No. D/136. Book Nos 9861, 9862.
- C KRIDIOTIS. PA.SY.D Y. New Nicosia building. Site investigation. Nicosia, April 1983. Book No. 9863.
- Dr C A CHRISTODOULOU - M C ARCHIMANDRITOU. Southern conveyor project. Feasibility study. Phase 1. Volume 1. Main report Nicosia, 1983.
- Dr C A CHRISTODOULOU - M C ARCHIMANDRITOU. Southern conveyor project Feasibility study. Phase 1. Volume 2. Annexes. Nicosia, 1983.
- P NEOPHYTIDES. Pitsilia integrated rural development project. Zoopiysi borehole irrigation scheme. Mini feasibility study. Nicosia, May 1983. Report No. D/131. Book Nos 9910, 9911.
- P NEOPHYTIDES. Pitsilia integrated rural development project. Ayii Vavatsinias borehole irrigation scheme. Mini feasibility study. Nicosia, March 1983. Report No. D/134. Book Nos 9912, 9913.
- N MICHAEL. Pitsilia integrated rural development project. Dhieronas borehole irrigation scheme. Mini feasibility study. Nicosia, June 1983. Report No. D/137. Book Nos 9914, 9915.
- N TSIOURTIS - S AFRODISIS. Pitsilia integrated rural development project. Pumping tests results - 1982. Final results. Nicosia, June 1983. Report No. D/138. Book Nos 9916, 9917.

BOOKS PURCHASED (7 No.)

SVEN R HED. Project control manual. USA, 1982. Book No. 9827
US\$147.00.

S J ARCEIVALA. Wastewater treatment and disposal. New York, 1981.
Book No. 9903 sFr. 215.

A S VERNICK - E C WALKER. Handbook of wastewater treatment processes.
New York, 1981. Book No. 9904 sFr.114.

UNITED NATIONS DEVELOPMENT PROGRAMME. Compendium of approved projects
as of 30 September 1982. New York 1982. Book No. 9934. US\$10.00.

ASCE. Transactions of the American Society of Civil Engineers. Vol. 147,
1982. New York, 1983. Book No. 9935. US\$ 54.50.

McGraw-Hill. 1980 yearbook to the McGraw-Hill encyclopedia of science
and technology. Philippines, 1980. Book No. 9804, C£ 30.225 mils.

McRAW-HILL. 1981 yearbook to the McGraw-Hill encyclopedia of science
and technology. Philippines, 1981. Book No. 9805, C£ 26.000 mils.

1983 SUBSCRIPTION TO PERIODICALS

ASCE. Construction Engineering and Management. US\$ 40.50

ASCE. Geotechnical Engineering. US\$ 70.00

ASCE. Hydraulic Engineering. US\$ 87.00

ASCE. Irrigation and Drainage Engineering. US\$ 37.00

ASCE. Structural Engineering. US\$ 112.50

ASCE. Surveying Engineering. US\$ 26.00

ASCE. Water Resources Planning and Management. US\$ 34.00

AWWA journal. US\$ 50.00

Employment Gazette. St 31.30

Water and Waste Treatment. St 24.00

Journal of the Irrigation Engineering and Rural Planning. US\$38.00

International Water Report. US\$ 37.00

Monthly visits were made to VPP works throughout the year for regular photographic coverage of progress of construction of Kalavassos and Dhypotamos dams. Towards the end of the year when construction of Kornos Treatment Plant and Khirokitia Balancing Reservoir commenced two consecutive days per month were needed for VPP photographic coverage including also the relocation of Lefkara-Khirokitia pipeline and sundry pipelines of VPP.

Photolithographic work continued also at the Department's photo process laboratory to cope with the requirements of all the projects for base maps, reproduction, reductions and enlargements of drawings.

Technical Library and Technical Information Section

In 1983 f491 was spent on the purchase of 7 technical books and subscription to 12 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, periodical subscriptions and WDD reports.

DRAWING AND RECORDS 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 the year under review the staff of the Drawing and Records Branch numbered 20 i.e. 14 Technician;I, 4 Technician;II (on Contract) and two hourly paid assistants of the Plan Reproduction Section. One of the Technician;I travelled every day to Khirokitia for the last two months of the year to work with the VPP team there.

The work carried out by the Drawing and Records Branch during the year is listed on table .V.2..

Drawing and Cartography Section

The largest single load of work as can be seen on table was for the Southern Conveyor Project design drawings for the main conveyor and the Kokkinokhoria distribution network prepared by a WDD - Halcrows team. The drawing work load for the SCP was such that part of it was diverted to the Drawing Office of the Paphos Regional Office of the Department. By the end of the year under review some work commenced on the preparation of colour maps for the four projects - SCP - VPP - PIRDP & KIP.

Plan Reproduction and Plan Registry Section

The department's two continuous process plan printing machines were used throughout the year for the production of some 40,000 prints of all sizes and types through 3,770 orders.

The plan registry work was shared by the staff of the Drawing Office.

The Photographic Section and Photo Process Laboratory

In mid 1983 the Photographic Section acquired a basic set of video equipment, through funds of the VPP to carry out records of the construction works of VPP plus for any other use of the Department. Thus photographic coverage of construction works of the Department is carried out on black and white, colour and colour slide still photography as well as colour 16 mm cine filming and video recording.

- Dhierona B/H No. 14/82, I.R.R. = 10.86%, completed in June.
- Sykopetra B/H No. 48/82, I.R.R. = 14.60%, completed in July.
- Agros B/H No. 21/82, I.R.R. = 12.64%, completed in August.
- Phterikoudhi B/H No. 9/82, I.R.R. = 8.07%, completed in August.

Brief description of each of the above schemes has already been given in the "Detailed Studies" section above, with the exemption of Phterykoudhi borehole. The safe yield of this borehole is only 10 m³/hr which is quite low and results also in a low value of Internal Rate of Return (I.R.R.) of 8.07%. The low yield compared to the relatively high cost made the interested farmers to reject the scheme.

Lagoudhera B/H

(No. 53/80)

The borehole was tested in 1981 and its safe yield is about 16 m³/hr. The scheme provides for the irrigation of a gross area of 45 donums (40 donums net). Out of this area 20 donums are already planted mainly with deciduous trees and suffer from water shortage whereas the rest 25 donums constitute new land.

The total cost of the scheme is estimated at £33,000.

Sykopetra B/H

(No. 48/82)

The test of the borehole started in November 1982 and was completed in March 1983. The safe yield of the borehole is about 25 m³/hr and will be used for the irrigation of a gross area of 90 donums (70 donums net). Part of this area, (about 20 donums) are already planted with citrus and belong to small Irrigation Divisions suffering from water shortage. The rest 70 donums constitute new land.

The total cost of the scheme is estimated at £47,400.

Louvaras B/H

(No. 32/77 and 16/81)

The safe yield of the two boreholes of the scheme was estimated at 30 and 80 m³/hr respectively. The total area to be irrigated is 265 donums gross (230 donums net) and land consolidation will be carried out on the 245 donums gross. About 20 donums belonging to an existing Irrigation Association will not be included in the Land Consolidation. The estimated cost of the scheme is £93,000.

Feasibility Studies

During 1983 feasibility studies for the following seven borehole schemes were prepared.

- Ayii Vavatsinias B/H No. 35/81, I.R.R. = 10.10%, completed in March.
- Lagoudhera B/H No. 53/80, I.R.R. = 9.15%, completed in April.
- Zoopiya B/H No. 9/81, I.R.R. = 9.83%, completed in May.

Zoopiyi B/H

(No. 9/81)

The test of the borehole started in September 1982 and was completed in February 1983. Its safe yield is estimated at 30 m³/hr. The scheme provides for the irrigation of a gross area of 100 donums (80 donums net). The cost of the scheme is estimated to reach £48,000.

Dhierona B/H

(No. 14/82)

The test of the borehole started in October 1982 and was completed in January 1983. Its safe yield is estimated at 34 m³/hr. About 30 m³/hr of this yield will be utilized for the irrigation of a gross area of 95 donums (75 donums net) whereas the remainder will be used to reinforce the domestic water supply of the village. Part of the scheme area (about 20 donums) is already planted with citrus which at present obtain water from the local springs but cannot be fully satisfied.

The total cost of the scheme is estimated at £56,000.

Ayii Vavatsinias B/H

(No. 35/81)

The borehole was tested in 1982 and its safe yield is estimated at 32 m³/hr. The borehole will be used for the irrigation of a gross area of 95 donums (75 donums net). Out of this area 25 donums are already planted with citrus which suffer from water shortage whereas the rest 70 donums constitute new land.

The total cost of the scheme is estimated at £48,000.

Agros B/H

(No. 21/82)

The scheme provides for the utilization of the second borehole which was drilled for Agros village. This borehole was tested in 1983, and its safe yield is estimated at 55 m³/hr. The borehole will be used for the irrigation of a gross area of 180 donums (150 donums net). Out of this area, 35 donums, which is planted with deciduous trees, belong to an existing Irrigation Division called "Vourni", and suffers from water shortage whereas the rest 145 donums constitute new land.

The total cost of the scheme is estimated at £73,500.

The whole area to be served by the scheme extends to 100 donums gross (85 donums net). The already cultivated area is now planted with deciduous trees mainly apples and hazelnuts. The total cost of the scheme is estimated at £49,000.

Dhymes B/H

(No. 81/80)

This borehole was tested in 1982 and its safe yield is estimated at 50 m³/hr. The borehole will be used for the irrigation of a gross area of 180 donums (150 donums net). Out of this area 120 donums belong to existing Irrigation Divisions which at present obtain their water from a number of local springs and small streams but cannot be fully satisfied, whereas the rest 60 donums constitute new land.

Most of the area of existing Irrigation Divisions is already planted with deciduous trees mainly apples, peaches and plums. The cost of the scheme is estimated at about £76,000.

Kato Amiandos B/H

(No. 31/76)

This borehole was tested in 1980 and its safe yield is estimated at 35 m³/hr. Its utilization was delayed due to administrative problems. The borehole will be developed in conjunction with surface water from the Amiandos river using six diversion weirs to irrigate 480 donums gross of a number of existing Irrigation Divisions with the addition of a new area of 50 donums gross. Most of the area is now planted with apples, pears, peaches and plums.

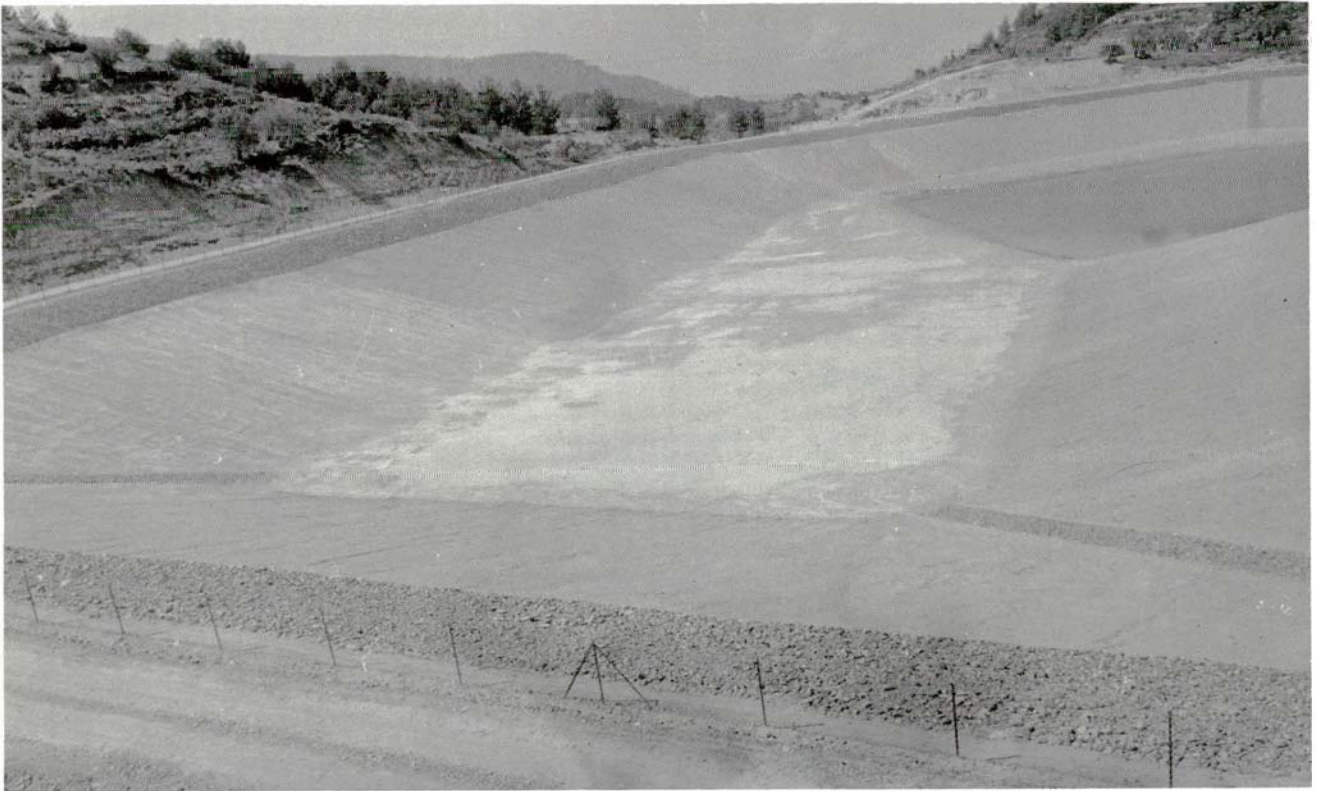
The total cost of the works is estimated at £210,000.

Askas B/H

(No. 98/80)

This borehole was tested in 1981. During the test period it was observed that a number of springs in the vicinity of the borehole were affected. These springs are used for the irrigation of several small Irrigation Associations which already suffer from water shortage. This shortage will be covered by the borehole. The safe yield of the borehole is estimated at 38 m³/hr and will be utilized for the irrigation of a gross area of 160 donums (140 donums net). Half of this area belong to existing plantations of mainly hazelnuts and the rest 80 donums constitute new land.

The total cost of the scheme is estimated at £75,000.



Pitsilia Integrated Rural Development Project.
Kyperounda Pond No. 2. WDD Photo D81-7, 19.9.83



Pitsilia Integrated Rural Development Project.
Xyliatos dam. WDD Photo D50-11, 15.4.83

Pe: Work pending due to
administrative problems

P : Pond

B/H: Borehole

D.S.: Distribution System

W.B.: World Bank

P.B.: Planning Bureau

Pond Schemes

Detailed Studies

Detailed designs for the distribution networks were prepared for the following four pond schemes:

- Arakapas Pond No. 2. Gross area 190 donums. Estimated cost: £46,000
- Dhierona Pond. Gross area 310 donums. Estimated cost: £99,000
- Ayii Vavatsinias Pond No. 2. Gross area 60 donums. Estimated cost: £18,000
- Ora Pond and Boreholes No: 27/81 & 66/81 (Combined scheme).

The boreholes were drilled near the pond and they will be utilized in combination with the pond. The boreholes were tested in 1982 resulting in the safe yields of 14 and 12 m³/hr respectively and will increase the irrigation area by 50 donums making the total irrigation area of the scheme 135 donums gross. The cost of the scheme is estimated to reach £78,600, excluding the construction cost of the Pond.

Borehole Schemes

Detailed Studies

Detailed designs were prepared for the following eleven borehole schemes.

Alona B/H

(No. 46/80)

This borehole was tested in 1981 and its safe yield was estimated at 32 m³/hr. Apart from the installation of a submersible pump, the scheme includes the following works:

- (a) The installation of a pressurized distribution network for the new area of 70 donums gross.
- (b) The rehabilitation works of several existing Irrigation Associations near the borehole. These works provide only for the replacement of the main existing irrigation channels by pipes.

Scheme	1	2	3	4	5	6	7
Agridhia P.							C
" D.S.							C
Lagouthera P.							C
" D.S.							Pe
Ora P.							C
" B/Hs		X		X	X		X
" D.S.							XC
Pharmakas Ps.							"
" D.S.							C
Dhierona P.							X
" D.S.					X		X
Arakapas P. No. 2							XC
" D.S.					X		XC
Ayii Vavatsinias P. No. 2							X
" " D.S.					X		XC
<u>BOREHOLE SCHEMES</u>							
Kalokhorio B/Hs							C
Potamitissa B/Hs							C
Arakapas B/Hs							C
(Nos 106 & 107/76							C
Ayios Theodoros B/H							C
Agros B/H (No. 63/76)							C
Polystipos B/H							C
Arakapas B/H							X
(No. 124/76)							
Ayios Constantinos B/Hs (123/76 & 8/81)							XC
Louvaras B/Hs					X		XC
Alona B/H (46/80)					X		X
Askas B/H (98/80)					X		X
K. Amiandos B/H (31/76)					X		XC
Dhymes B/H (81/80)					X		XC
Lagouthera B/H (53/80)		X	X	X	X		X
Dhierona B/H (14/82)		X	X	X	X		X
Ayii Vavatsinias B/H (35/81)		X	X	X	X		X
Zoopiyi B/H		X	X	X	X		XC
Sykopetra B/H (48/82)		X	X	X	X		X
Agros B/H (21/82)	XP	X	X	X	X		X
Phterikoudhi B/H (9/82)			X				X

X: Work carried out in 1983

C: Construction completed before end of 1983

XP: Pumping test in 1983

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

The overall co-ordination of the Project works has been undertaken by the Ministry of Agriculture and Natural Resources whereas the co-ordination of the WDD input into the Project was handled by the Division of Design.

An account of the progress achieved up to 1983 on Pond and Borehole schemes is given in tabular form in Table IV-1 below. Details of the progress of construction works during the year are given in Chapter V.

TABLE V-1

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

Major Irrigation Works - Progress up to the end of 1983

Scheme	Preliminary Design Pumping Test	Preliminary Approval	Feasibility Study	Approval by P.B. & W.B.	Final Designs and Contract Documents	Tendering	Construction
<u>POND SCHEMES</u>							
Pelendria P. B/H & D.S.							C
Ephtagonia P. No.1 & D.S.							C
Khandria P & D.S.							C
Melini P. & D.S.							C
Ayii Vavatsinias Dam, P. No. 1 & D.S.							C
Akapnou-Ephtagonia P & D.S.							C
Ephtagonia P. No. 2 & D.S.							C
Ephtagonia P. No. 3 & D.S.							C
Kato Mylos P. B/H & D.S.							C
Arakapas P. No.1 & D.S.							C
Kyperounda P.							C
" D.S.							C

Akaki-Malounda Dam

Work on the feasibility studies of this dam started during 1983.

The damsite is located on the Akaki River about 26 km south-west of Nicosia and 0.5 km west of Malounda village. After completion of the topographical surveys of the reservoir and dam site areas, geological mapping was carried out which was followed by subsurface geotechnical investigations at the proposed dam site. Investigations for construction materials were also initiated. Hydrological and flood studies were initiated and the preliminary design of the dam, spillway and tunnel started. Flood routing and spillway optimization were part of the studies which will examine also various dam sizes.

Both the damsite and reservoir areas lie within the volcanic complex of the Troodos Ophiolite. Rock of the Lower Pillow Lava outcrop over the area composed of basaltic dykes and sills. Geological and topographical conditions and the availability of construction materials favor the adoption of a zoned type of earthfill dam. The shoulders of the dam will be constructed of river and terrace gravels. The dam will be made watertight by the central day core bounded by filter zones. Topography and geology limit the maximum reservoir capacity to 2 million cubic meters. The corresponding dam height for this capacity, including the freeboard, will be 31.0 m above river bed.

The purpose of the dam is to irrigate land mainly in the vicinity of Akaki and Menico villages. Land belonging to Malounda, Klirou and Ayios Ioannis villages will also be irrigated. Final selection of the land will be made when the hydrological and technical feasibility studies are completed during 1984. The feasibility study of the scheme will continue in 1984 when it is expected to be completed. More details of the scheme will be given in the 1984 annual report.

Solea Valley Project

As mentioned above, work started on the location, identification and preliminary studies of all possible components or schemes of the Solea Valley Project. The work, will include topographical surveys and preliminary cost estimates and the preparation of general maps showing the proposed schemes, existing irrigation divisions and reinforced concrete channels and proposed irrigated areas. The work is hoped to be completed in the first half of 1984.

FEASIBILITY STUDIES

Feasibility studies are usually undertaken by the Division of Planning. These studies include topographical surveys geological mapping, geological and material investigations, hydrological studies, preliminary alternative designs of the proposed works, selection of suitable land for irrigation, cost estimates and economic analysis. Such studies were initiated during 1983 for two dams:

- a) the Vizakia off-stream dam and
- b) the Akaki-Malounda dam.

Vizakia Dam

This is an off the main stream dam near Vizakia village. The proposed dam is situated about 2 km south-east of the village on a small tributary of Elea river. Water will be diverted by gravity from Kannavia river, which is one of the two main tributary of Elea river. The water will be conveyed into the dam by a diversion pipeline 2 km long. A concrete diversion weir, will be constructed on Kannavia river, from which water will be drawn by the pipeline.

During 1983 most of the work was completed except for the final selection of land for irrigation the economic analysis and the report preparation. The remaining work is expected to be completed during the first half of 1984.

Two alternative reservoir capacities were considered $500,000 \text{ m}^3$ and $750,000 \text{ m}^3$. The dam for these alternatives will be a zoned earthfill type with maximum heights of 20.7 m and 23.7 m respectively. The total volume of the embankment will be $172,000 \text{ m}^3$ and $234,000 \text{ m}^3$ respectively, and the area to be irrigated will be about 830 and 1200 donums respectively belonging to Vizakia, Nikitari and Potami villages. The estimated cost for the dam and diversion works only for the two alternative amounts to £637,000 and £800,000 respectively. The total estimated cost will be known when the land to be irrigated is selected and the preliminary design and cost estimate for the irrigation network is completed.

The reservoir and damsite areas are within the Lower Pillow Lavas unit of the Troodos Igneous Complex. The igneous rocks in this area consists of basaltic lavas intersected by dykes and silk. The rock is covered in places by relatively thin superficial deposits composed of river bed deposits, talus and top soil. The material for constructing the embankment will be obtained from relatively weathered rock excavated from within the reservoir area just upstream of the dam, whereas the core material for the impervious core, from a borrow area just downstream of the dam site.

2. Alethriko Scheme

The scheme includes two boreholes (Nos 15/83 and 75/83) which have been connected to the Khirokitia-Famagusta pipeline through 100 mm and 150 mm diameter A.C. pipes having a total length of 2150 m. The construction cost of the scheme was £35,000 and the boreholes were put into operation in October 1983.

3. Anglisidhes Scheme

The scheme utilizes one borehole (No. 141/83) which will supplement the water supply of Anglisidhes village and the surplus water will be pumped into the Khirokitia-Famagusta pipeline. The designed pipeline will have a length of 2250 m and constructed with A.C. pipes of 150 mm diameter. The estimated cost of the scheme is £33,000 and the expected borehole yield 50 m³/hr.

4. Kakoratzia Scheme

This scheme includes borehole No. 132/83 from which water will be pumped into the Stavrovouni balancing reservoir through a 100 mm diameter galvanized steel pipe having a total length of 1330 m. The estimated cost of the scheme is £23,000 and the expected borehole yield 30 m³/hr.

Other Studies on Existing Town Water Supplies

Detailed studies for the following works were prepared.

1. Relocation of Existing Twin Pipelines Along Limassol By-Pass

The project comprises the laying of a 500 mm dia ductile iron pipeline, 2200 m long north of Limassol By-Pass. This pipeline substitutes the existing 300 mm dia steel and 400 mm dia ductile iron pipes of the Limassol Water Board which convey water from the Yermasoyia boreholes to Mesayitonia reservoir and are now affected by the new Nicosia-Limassol Highway. The project started late in 1983 and will be completed early in 1984.

Estimated cost: £180,000

2. Nicosia Water Distribution System - New Supply Main

a) Leophoros Aglandjias Pipeline

500 mm dia. A.C. pipeline, class 20, 1550 m long

450 mm dia. A.C. pipeline, class 20, 520 m long

b) Leophoros Kennedy (Pallouriotissa) Pipeline

200 mm dia. A.C. pipeline, class 20, 900 m long.

A number of reconnaissance surveys and preliminary studies have been carried out in the past to locate the best and most economical pond site. Detailed design and the preparation of construction drawings were carried out for the best available site in the area.

The storage capacity of the pond will be 33,000 m³. The water surface area at top water level will be 7,800 m² and the pond will have a maximum depth of 10.0 m. Water into the pond will be diverted from Ezzo-Galata river by gravity on which a concrete diversion weir will be constructed. The 100 mm diameter galvanised steel diversion pipeline will have a length of about 650 m. The estimated volume of excavations and fillings required for the construction of the pond will be 50,000 m³ and 31,000 m³ respectively. The large quantities of excavations and fillings required are due to the existing unfavourable topographical conditions at the site. This will make the construction cost of the pond quite high compared to its capacity. The pond will be made watertight use of PVC membrane lining.

Geologically the site is located in the igneous rocks of Troodos which at the site consists generally of weathered gabbros. Due to the rock weathering the excavations will be fairly easy with the use of rippers but some blasting might be required.

The estimated cost for the construction of the pond is £96,500. An additional amount of £10,000 has been allowed for improvements of the existing irrigation network. Although the estimated cost of the pond is quite high compared to its capacity, the scheme has been approved for construction in 1984, for social and other reasons.

Emergency Schemes for Water Supply

The designs of the following borehole emergency schemes were prepared during the year in order to supplement the water supply resources of Nicosia, Larnaca and Famagusta areas.

1. Skarinou Scheme

The scheme incorporates three boreholes (Nos. 55/83, 63/83 and 80/83) which have been connected to the Khirokitia-Famagusta pipeline with steel pipes of 100 mm and 150 mm diameter having a total length of 2,400 m. The scheme was constructed at a total cost of C£64,000 and the boreholes were put into operation in October 1983.

The construction of this pond will be decided after a general development plan is drawn for the Solea Valley Project and after a thorough examination of various technical and administrative problems such as the existing water rights existing irrigation divisions, existing crops in the area etc.

Vouppos Pond

This is another off-stream pond within the Solea Valley Project. The pond site is located adjacent to the main road joining Evrykhou and Pano Phlasou villages and is approximately 0.9 km south east of Pano Phlasou and 0.4 km south of Pano Phlasou Pond. The storage capacity of the pond will be 233,000 m³.

Water into the pond will be diverted from Karyiotis river through the same diversion pipeline which serves Pano Phlasou Pond. The total volume of excavations and fillings required for the construction of the pond is estimated at 224,000 m³. PVC membrane lining will be used to make the pond watertight. The depth of the pond will be 8.0 m and the surface area at the top water level will be 43,000 m².

The site is geologically located in the igneous rocks which are composed of weathered diabase and lavas. Over most of the site area the rocks are covered with soft superficial deposits.

The estimated cost for the construction of the pond is £300,000, excluding the cost of the diversion works and distribution network.

For the same reasons given for Pano Phasou Pond above, the construction of this pond will proceed after the problems mentioned are solved.

Esso-Galata Pond

The pond site is situated not far from the upper part of Solea valley, but it is not part of Solea Valley Project. It is located in the valley of Ess-Galata river which is a tributary of Karyiotis river, at a distance of about 2 km south-west of Galata village.

The purpose of the pond is to collect and store water during the winter months and release it for irrigation during the summer. The pond will be constructed for the existing Irrigation Division of Esso-Galata and will help to improve the management and operation of the available water resources of the Division which include a borehole, a number of springs and river flows and irrigate only part of some 300-donums which have been levelled and terraced.

MAIN ACTIVITIES

During 1983 the Design Division completed the design and preparation of construction drawings for three earth ponds. Two of the ponds were Pano Phlasou and Vouppos Ponds which will be constructed within the Solea Valley Project and the third one is the Ezzo-Galata Pond. The Division started also feasibility studies for the Vizakia off-stream dam and for the Akaki-Malounda dam. Work on the identification, and preliminary studies of the various schemes to be included in the Solea Valley Project was started towards the end of the year. The design of a number of borehole emergency schemes for supplementing the water supply sources of Nicosia, Larnaca and Famagusta areas was also undertaken by the Division.

The Division continued and completed the preparation of feasibility studies and construction drawings for the irrigation networks of various schemes of the Pitsilia Integrated Rural Development Project. Such schemes included the ponds of Ora, Dhieronas, Arakapas No. 2, Ayii Vavatsinias No. 2 and the boreholes of Oras, Dhymes, Zoopiya, Ayious Vavatsinias, Phterikoudhi, Dhieronas, Sykopetras and Agros.

DETAILED STUDIES

Detailed studies, include the detail design and preparation of construction drawings and tender documents. Such studies, excluding those for the Pitsilia Integrated Rural Development Project, were prepared for the following schemes:

Pano Phlasou Pond

This is one of the off-stream ponds to be constructed within the framework of the Solea Valley Project. The pond site is located adjacent to the main road which joins Evrykhou and Pano Phlasou and is approximately 0.6 km south east of Pano Phlasou village. The storage capacity of the pond will be 250,000 m³.

Water into the pond will be diverted from Kayiotis river through a diversion pipeline. The pond will be constructed by excavating and filling, the total volume of earthworks (excavation and filling) is estimated at 220,000 m³. The pond will be rendered watertight using pvc membrane lining. The pond will have a depth of 10.0 m and a water surface area at top water level of about 38,000 m².

Geologically the site is located in the igneous rocks which are composed of diabase dykes and lavas. The rocks are weathered and over most of the site they are covered with soft superficial deposits.

The estimated cost of the pond is £276,000 excluding the cost of the diversion works and distribution network.

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.

Although in principle the activities of the Design Division are within the above mentioned frame of works, it is however, 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 Branches 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, reproduction and photo-process lab work.

During 1983 the following qualified personnel were working with the Design Division.

One Senior Water Engineer, Head of the Division

Two Executive Engineers Class I

Two Executive Engineers Class II

One Technician Class A, qualified Civil Engineer carrying out duties of Executive Engineer.

The personnel of the Drawing and Records Branch is given in the respective section of this chapter.

Offices

Efforts to set up a permanent or temporary offices for the Project at Polis have not been successful by the end of the year.

Staff

For the implementation of the Project the following staff were appointed towards the end of year 1983. (a) The Project Manager, (b) the Deputy Project Manager (Engineering) (c) the Deputy Project Manager (Agriculture). *More personnel* were expected to be engaged for the Project early in 1984.

IV/2 KHRYSOKHOU IRRIGATION PROJECT

General

1983 was a critical year for the implementation of the first Phase of the Project. The feasibility study for the Project was concluded in 1982. The Project was split in three phases. a) The first phase involves the construction of Evretou dam, part of the lowlands Main Conveyor and an irrigation network covering 2000 ha. b) The second phase involves the continuation of the Conveyor up to Pomos, the diversion of three other rivers to Evretou dam and the irrigation of 1100 ha of land along the coast from Argaka to Pomos. c) The third phase involves the construction of Ezusa dam, the uplands Main Conveyor, and the irrigation of 1200 ha. Priority was given to the first phase. Final designs and tender documents and cost estimates were produced in 1982 for the Evretou dam, the lowland Main Conveyor, and 800 ha of the Irrigation Network. Based on the above work a World Bank has undertaken with a mission in January 1983 to evaluate the first phase with the purpose of financing its construction. The mission examined the first phase as an independent part of the Project and found it to be technically and economically viable, but has asked for the diversion of the upper Khrysochou river to be included in the first phase.

Negotiations were carried out between the Government of Cyprus and the World Bank and in May 1983 a Loan Agreement was signed for the amount of \$ 16,000,000.

Evretou Dam

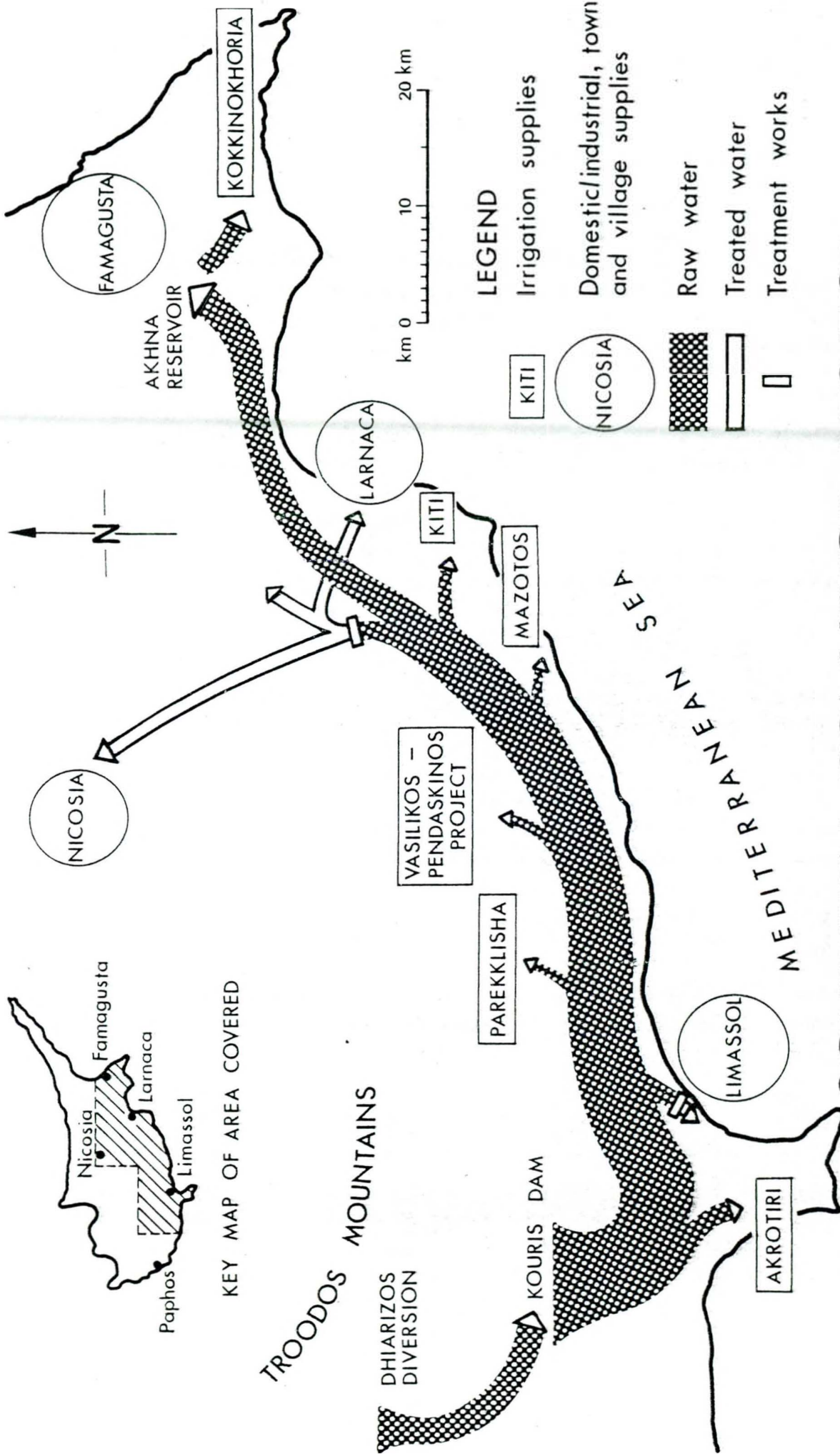
With financing available, Evretou Dam was the first component of the scheme *on the construction schedule*. Prequalification tenders were called in February 1983, and the selected firms were invited to submit tenders for the construction of the dam in April 1983. The lowest tender received was from the Joint Venture of Shephard Hill - Zachariades for the sum of C£ 8,366,588 and the contract was finally awarded to them in December 1983.

Irrigation Network and Main Conveyor

Orthophoto maps were ordered late in 1983 from U.K. to complete the designs of the Irrigation Network, as it was done for the first 800 ha.

Meanwhile the boundaries of the Project irrigated areas were reconsidered under the light of the extension of the areas designated for urban development around Polis, Prodromi and Latchi which were finally excluded from irrigation and replaced with suitable land of about 150 ha in the valley of Saramas upstream of Evretou reservoir.

This and some other technical considerations have led to some serious changes in the layout and designs of the lowlands Main Conveyor and associated ponds and tanks. However, due to the unavailability of adequate number of engineering staff for this project limited progress on design work was made by the end of the year 1983.



SOUTHERN CONVEYOR PROJECT

Diagrammatic Representation of Water Distribution

1st and 2nd Phase

IV/I SOUTHERN CONVEYOR PROJECT

After the completion of the Feasibility Study for the Southern Conveyor Project a World Bank Mission has visited Cyprus for its appraisal. The appraisal has shown that this Project is necessary to be executed and that it is economically viable. Based on this conclusion the World Bank has decided to finance part of this Project.

During the meetings with the World Bank it was decided to complete this Project in two phases. The first Phase (1984-1989) will include.

- Kouris Dam
- Main Conveyor
- Akhna Dam
- Kokkinokhoria Irrigation Network

The second phase (1988-1992) will include

- Dhiarizos Diversion
- Irrigation systems
- Limassol Water Treatment Works
- Domestic Water Supply Schemes

In April 1983 the WDD issued documents to tenderers for the supply of some of the pipes for the Main Conveyor. These pipes were to be laid at certain points where the Main Conveyor crosses the future Limassol by-pass or interferes with the EAC works at Ayia Phyla. This contract has been awarded to the French Firm Pont-a-Mousson, and the delivery of pipes started at the end of 1983.

In the first six months of 1983 the final design study for the Kouris Dam has been completed by SOGREAH the appointed Consultants. Also by the end of 1983 the final design studies for the Main Conveyor, Akhna Dam and the Kokkinokhoria Irrigation Network were completed by the appointed Consultants (Sir William Halcrow and Partners) and the WDD. In both cases the studies were completed within the agreed time schedules.

In July 1983 the WDD advertised for prequalifications of Contractors for the construction of the Kouris Dam. Sixty three applications were submitted, but finally only twenty six were prequalified.

- Contour Survey and cross sections for sediment measurements in the reservoir of Kalopanayiotis, Yermasoyia, Arakapas, Lefkara, Kiti, Lymbia and Agros dams
- Anaphotia Recharge Scheme. Reservoir Survey
- Moulos dam (Pedhieos R.). Contour Survey
- Malounda dam. Contour Survey
- Ayii Trimithias Pond. Contour Survey
- Kophinou Site and Pipeline. Contour Survey and profile levelling
- Kouris R. Recharge Scheme. Contour Survey
- Phrenaros Pipeline. Setting out and profile levelling

Khrysokhou Irrigation Project

Evretou Dam

- Setting out by levelling the Top Water Level for land acquisition purpose.

Vizakia Scheme

Vizakia Dam

- 2 No. Damsite and reservoir surveys - Cross Sections

Vizakia Weir and Pipeline

- site survey and profile levelling

Karyotis Project

Ayios Theodoros Dam

- Damsite and reservoir contour survey

Kakopetria diversion weirs

- 2 No. Contour Survey

Main Conveyor

- Establishing and levelling of Master Bench Marks and Temporary Bench Marks

Solea Valley

- Ezzo Galata Weir and Pipeline. Contour survey and profile levelling
- Kaliana Weir and Pipeline. Contour Survey and profile levelling
- Evrykhon Pond. Contour Survey
- Korakou Pond. " "
- Korakou Dam. " "
- Phlasou Pond. " "

Other Routine Works

- Measurements on settlement markers for Kalopanayiotis, Lefkara, Xyliatos and Asprokremmos dams and Khirokitia Treatment Plant.

TABLE IV-4

Surveying Work conducted in 1983
Southern Conveyor Project

Kouris Dam

- Cross Sections at the Shaft Area
- Access Road, Setting out, longitudinal and cross sections

Main Conveyor

- Setting out of new route in the VPP area (Zyyi-Ayios Theodoros) and profile levelling
- Setting out of new route (minor changes) in the areas of Kato Polemidhia, Ayios Athanasios, Moni R., Tersephanou, Dhekelia and Akhna, profile levelling and cross sections.
- Setting out of most of the route of the Main Conveyor and Structures too for land acquisition purpose.

Break Pressure Tanks

- 3 No. Site Surveying and setting out

Vasilikos Balancing Reservoir and Pipeline

- Site Surveying, setting out and profile levelling

Kouris and Zygos rivers

- Weir sites. Contour survey

Kokkinokhoria Irrigation Scheme

- Site Surveys

Akhna Dam

- Relocation of Khirokitia-Famagusta Pipeline. Setting out and profile levelling

Vasilikos Pendaskinos Project

- Dhyptomamos Dam. Reservoir survey
- Kalavastos Dam. Reservoir Survey
- Kalavastos Irrigation Network
- Setting out of pipeline routes and profile levelling

The work of the concrete and field laboratories is presented in the same way in Table IV-3.

Personnel

On the 31st of December 1983 the total number of personnel employed with the section, was 34. The number is shown below:

Title	Supervision	Function	
		Laboratory	Drillers
Executive Engineer I	1	-	-
Executive Engineer II	1	-	-
Technician I	1	1	-
Technician II	1	1	-
Laboratory Technician II	-	5	-
Assistant Laboratory Technician	-	11	2
Assistant Chief Foreman	1	-	-
Driller Foreman	-	-	4
Casual labour	-	2	4

Machinery and Equipment

During 1983 the main laboratory acquired the following additional equipment: one Jaw-crusher, one Los-Angeles, Abrasion machine, one moisture balance and 2 ovens.

TOPOGRAPHY BRANCH

The Topography Branch which operates within the Planning Division, is staffed with 1 Technical Superintendent, 5 Technicians I, 10 Technicians II, 12 Chainmen, 5 Motorcar Drivers and 10 Labourers and is assigned to conduct all the surveying work of the Department of Water Development. The staff receives training within the Branch on the methods and procedures employed during the surveying operations in the field and office-work, using all types of modern surveying instruments and equipment.

The surveys conducted are of the engineering type and consist of: Profile-levelling, cross-sectioning, topographic surveys, setting-out of work outlines, observations for movement, settlement or deformation, etc.

The activities of the Branch during the year under review were mainly concentrated on the major projects of the Department such as the Southern Conveyor, Vasilikos-Pendaskinos, Khrysokhou irrigation and routine surveys for minor schemes and other studies. A detail list of these surveying assignments is given below:

TABLE IV-3 CONCRETE AND FIELD LABORATORY TESTS DURING 1983

Type of Test	PROJECT						Total
	Evretou Dam	Kalavassos Dam	Dhypotamos Dam	Kouris Dam	Tenders for Concrete Aggregate	Miscellaneous	
Mix design	3	12	22	2	-	-	39
Sieve analyses	6	1	19	5	58	17	106
Silt content	-	-	-	-	18	-	18
Sand equivalent	-	-	-	-	-	4	4
Organic impurities	-	-	-	-	18	-	18
Specific gravity	5	6	13	2	-	10	36
Water absorbtion	5	5	14	2	2	5	33
Moisture content	-	-	110	-	2	-	112
Cube crushing	12	1713	814	8	-	137	2684
Slump	3	510	893	2	-	510	1418
Core crushing	4	-	-	7	-	20	31
Soundness	1	-	-	-	-	-	1
Los Angeles	13	-	-	-	-	-	13
Alkali reactivity	-	1	1	-	-	-	2
Total	52	2248	1386	28	98	703	4515

TABLE IV-2 SOILS LABORATORY TESTS DURING 1983

TYPE OF TEST	VASILIKOS PENDASKINOS		SOUTHERN CONVEYOR PROJECT		PITSILIA RURAL						Total of each test							
	Dhypotamos Dam	Kalavasos Dam	Kouris Dam	Akhna Dam	Tersephanou-Ormi-dhia-Pendaskinos	Vizakia Dam	Ora Pond	Arakapas Pond 2	Dhlerona Pond	Pharmakas Pond 1		Ayii Vavatsinias Pond 2	Lagoudhera Pond	Khirokitia Pond	Malounda Dam	Siphilos Dam	Xeropoulos Dam	Private Farms	Miscellaneous
Sieve analysis (Wet/Dry)	21	217	-	-	28	-	5	27	12	15	2	9	2	7	11	17	373	
Hydrometer analysis	1	26	2	37	12	-	2	14	6	1	-	7	6	10	4	13	145	
Atterberg Limits	9	33	-	38	-	-	-	1	-	-	-	1	7	10	3	-	109	
Specific gravity	1	26	2	37	12	-	2	14	6	1	-	-	-	10	4	13	128	
Moisture content	396	782	-	25	-	-	10	55	15	5	15	30	2	-	-	20	1355	
Compaction	160	388	-	5	-	2	12	11	3	5	3	6	-	-	4	-	589	
Field density	240	334	-	-	-	-	-	-	50	52	45	-	-	-	-	-	721	
Permeability	3	38	-	6	-	6	-	1	1	-	1	-	3	-	2	-	65	
Undrained Triaxial	139	259	-	2	-	-	-	-	-	-	-	-	1	-	2	-	403	
Drained Triaxial	-	-	-	5	-	2	-	-	-	-	-	1	-	-	3	-	11	
Pinhole	-	4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	5	
Large Shearbox	-	6	-	-	-	-	-	-	-	-	-	-	-	-	1	-	7	
Consolidation	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	3	
Suspended sediment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	184	
Relative density	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Total	970	2115	4	158	52	10	21	123	93	79	66	54	22	30	46	30	227	4100

TABLE IV-1 Cont .

Ser. No.	Project	Aim of Investigation	Fieldwork as Carried out	Machinery Used	Expenditure £
3.	Vasilikos-Pendaskinos Project Kalavassos Dam (cont. from 1982 to 31.12.83)	Subsurface geological and material investigations To establish foundation conditions and permeability	Drilling of 12 No. boreholes total depth 486 meters	- Core drill - Flush pumps	12 456
	Dhyptomamos Dam (cont. from 1982 to 31.12.83)	Subsurface geological and material investigations To establish foundation conditions and permeability	Excavation of pits Blasting after drilling	- Overburden drill - Core drill - Diggers	4 728
	Kalavassos Balancing Reservoir (28.9.83-14.10.83)	Site investigations	Drilling of 3 No. boreholes total depth 51 meters	- Auger drill	655
4.	Akaki-Malounda Dam (14.3.83-9.9.83)	Subsurface geological and material investigations To establish foundation conditions and permeability	Drilling of 7 No. boreholes total depth 279 meters with core drill Drilling of 14 No. boreholes total depth 188 meters with overburden drill Excavation of 20 No. pits	- Overburden drill - Core drill - Digger	18 434
5.	Moulos Dam (14.9.83-31.12.83)	Site investigations To establish foundation conditions and permeability	Drilling of 7 No. boreholes Total depth 109 meters with overburden drill Drilling of 4 No. boreholes total depth 105 meters with coredrill	- Overburden drill - Core drill	4 324
6.	Khirokitia Pond (1.8.83-23.8.83)	Site investigations	Drilling of 3 No. boreholes total depth 42 meters	- Core drill	1 101

TABLE IV-1 SITE/MATERIAL INVESTIGATIONS AND GROUTING

Ser. No.	Project	Aim of Investigation	Fieldwork as Carried out	Machinery Used	Expenditure £
1.	<p>A. DEPARTMENTAL PROJECTS</p> <p>Khrysoxhou Irrigation Project Evretou Dam (cont. from 1982 to 30.12.83)</p>	<p>Subsurface geological and material investigations To establish foundation conditions and permeability</p>	<p>Drilling of 1 No. boreholes total depth 950 meters Grouting of 8 No. holes total depth 300 meters total takes 172000 kgs. Test grouting, Water pressure testing, Excavation of pits</p>	<p>- Overburden drill - Core drill - Digger - Traxcavator - Grout pumps - Compressors - Mixers</p>	40 789
2.	<p>Southern Conveyor Project Kouris Dam (cont. from 1982 to 20.1.83)</p>	<p>Subsurface geological and material investigations To establish foundation conditions and permeability</p>	<p>Drilling of 8 No. boreholes total depth 146 meters with associated water pressure testing</p>	<p>- Overburden drill - Core drill - Flush pumps - Traxcavator - Digger</p>	5 320
	<p>Main Conveyor (7.1.83-7.4.83)</p> <p>Akhna Reservoir (16.2.83-29.4.83)</p>	<p>Site investigations to establish foundation/excavation conditions</p> <p>Subsurface geological and material investigations To establish foundation conditions and permeability</p>	<p>Drilling of 51 No. boreholes total depth 250 meters Excavation of pits Augering Excavation of trenches</p> <p>Drilling of 10 No. boreholes total depth 125 meters Augering of 11 No. boreholes total depth 120 meters Excavation of pits</p>	<p>- Auger drill - Diggers - Traxcavators</p> <p>- Core drill - Auger drill - Digger</p>	20 250 5 100

Site investigation work performed was mainly involved with sub-surface geological, foundation and construction materials investigations at the reconnaissance, feasibility and design study stages - in the case of Evretou Dam extensive test grouting was also undertaken at the left abutment of the proposed damsite.

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

- . Khrysokhou Irrigation Project: Evretou Dam, Pelathousa Pond
- . Southern Conveyor Project: Kouris Dam, Main Conveyor, Akhna Reservoir
- . Vasilikos-Pendaskinos Project: Kalavastos Dam, Dhypotamos Dam, Kalavastos Balancing Reservoir
- . Akaki/Malounda Dam
- . Moulos Dam
- . Khirokitia Pond

Site investigation or drilling work undertaken for other Government and private organizations was of a diverse nature and included:

- . Drilling for the Limassol Water Board for establishing new groundwater sources in the Akrotiri area.
- . Foundation investigation for the proposed new MMAD Headquarters
- . Foundation investigations for the central slaughter-house installations at Kofinou, at the request of the Nicosia Municipality
- . Concrete sampling and testing undertaken for the Auditor General
- . Foundation investigations for various private organizations
- . Cavity grouting for Monte Napa developments

The work of the Soils and Concrete Laboratories may be distinguished into that performed by the main and that by the field laboratories. In the main laboratory in Nicosia tests were undertaken in connection with foundation investigations and to establish the suitability of fill materials for use in the construction of various projects of the Department. Tests were also performed at the request of other Government and semi-Government Departments and private organizations.

Site/Materials Investigations and Grouting Works

Table IV -1 gives relevant details of all site/fill material investigations and grouting works performed during the year giving also duration of work and approximate cost for each project.

Laboratories

The work performed in the Soils Laboratory is analysed in Table IV -2 with relevant details as to the type and number of tests performed for each project.

from the Joint Venture of Shephard Hill - Zachariades for the sum of C£8,366,588 and the contract was finally awarded to them in December 1983.

Irrigation Network and Main Conveyor

Orthophoto maps were ordered late in 1983 from U.K. to complete the designs of the Irrigation Network, as it was done for the first 800 ha.

Meanwhile the boundaries of the Project irrigated areas were reconsidered under the light of the extension of the areas designated for urban development around Polis, Prodhromi and Latchi which were finally excluded from irrigation and replaced with suitable land of about 150 ha in the valley of Saramas upstream of Evretou reservoir.

This and some other technical considerations have led to some serious changes in the layout and designs of the lowlands Main Conveyor and associated ponds and tanks. However, due to the unavailability of adequate number of engineering staff for this Project limited progress on design work was made by the end of the year 1983.

Offices

Efforts to set up permanent or temporary offices for the Project at Polis have not been successful by the end of the year.

Staff

For the implementation of the Project the following staff were appointed towards the end of year 1983. (a) the Project Manager, (b) the Deputy Project Manager (Engineering) (c) the Deputy Project Manager (Agriculture). More personnel is expected to be engaged for the Project early in 1984.

GEOTECHNICAL INVESTIGATIONS AND LABORATORY

General

During 1983 the Site Investigation, Laboratories and Grouting Section of the Division of Planning was involved in a number of major and some minor projects of the Department. Furthermore this Branch offered its services to other Government Departments, private organizations and technical offices.

The increased volume of work noted in previous years persisted in 1983 and even more so as major projects like Vasilikos-Pendaskinos, Southern Conveyor and Khrysokhou Irrigation were under investigation. This led to the full utilization of available equipment and personnel throughout the year.

By the middle of 1983 the final design of the Kouris dam, which was undertaken by the French Consulting Firm SOGREAH was substantially completed. Also by the end of the year the final designs of the Main Conveyor, the Akhna dam and the Kokkinokhoria Irrigation Distribution Network were completed by the British Consultants Sir William Halcrow and Partners in cooperation with the Department. In both cases the studies were completed within the specified time limits.

In April 1983 the Department invited tenders for the supply of some of the pipes of the Main Conveyor. These pipes were to be embeded at certain sections, where the Main Conveyor crosses the future Limassol by-pass or interferes with the EAC works at Ayia Phyla. The contract was awarded to the French Firm Pont-a-Mousson and the delivery of the pipes began by the end of 1983.

In July 1983 the process for prequalification of suitable contractors for the construction fo the Kouris Dam began, which was completed by the end of the year. Out of 63 applications 26 firms were prequalified and will submit tenders early in 1984.

KHRYSOKHOU IRRIGATION PROJECT

General

The year under concern was a critical one for the implementation of the first phase of the Project. The feasibility study for the Project was concluded in 1982. The Project was separated in three phases.

- (a) The first phase involves the construction of Evretou dam, part of the lowlands Main Conveyor and an irrigation network covering 2000 ha.
- (b) The second phase provides for the continuation of the Main Conveyor up to Pomos, the diversion of three other rivers to Evretou dam and the irrigation of 1100 ha of land along the coast from Argaka to Pomos.
- (c) The third phase includes the construction of Ezousas dam, the uplands Main Conveyor and the irrigation of 1200 ha. Priority of course was given to the first phase. Final designs and tender documents and cost estimates were produced in 1982 for the Evretou dam, the lowland Main Conveyor, and 800 ha of the Irrigation Network. Based on the above work a World Bank mission undertook in January 1983 to evaluate the first phase with the purpose of financing its construction. The mission examined the first phase as an independent part of the Project and found it to be technically and economically viable, but has asked for the diversion of the upper Khrysokhou river to be included in the first phase.

Negotiations were carried out between the Government of Cyprus and the World Bank and in May 1983 a Loan Agreement was signed for the amount of \$16,000,000.

Evretou Dam

With financing available, Evretou Dam was the first component of the scheme to be constructed. Prequalification tenders were called in February 1983, and the selected firms were invited to submit tenders for the construction of the dam in April 1983. The lowest tender received was

IV DIVISION OF PLANNING

by

Chr Marcoullis
Senior Water Engineer
Head of Division

Introduction

The Planning Division of the Water Development Department consists of the following three branches:

- . Reconnaissance and Feasibility Studies
- . Geotechnical Investigations and Laboratory
- . Topography

The latter Branch was transferred from the Design division as of this year, due to its direct relationship with the Planning Division.

RECONNAISSANCE AND FEASIBILITY STUDIES

SOUTHERN CONVEYOR PROJECT

Although the feasibility studies for the above Project were in fact completed in 1982, some additional studies were carried out, on a request by the World Bank, in an effort to determine the most advantageous phasing of the various components of the Project.

The studies were followed by a reappraisal of the project by a mission of the World Bank, which finally reached the conclusion to propose the implementation of the project, as originally envisaged, in two phases.

The first phase (1984-1989) will include the following components:

- . Kouris Dam
- . Main Conveyor
- . Akhna Dam
- . Kokkinokhoria Irrigation Distribution Network

The second phase (1988-1992) will include the following components:

- . Dhiazizos Diversion Works
- . The remainder distribution networks
- . Water Treatment Plants
- . Domestic Water Supply Schemes

YERMASOYIA RIVERBED AQUIFER
HYDROGRAPH OF BH No. 27 (134/59)
(Elevation 17.58m)

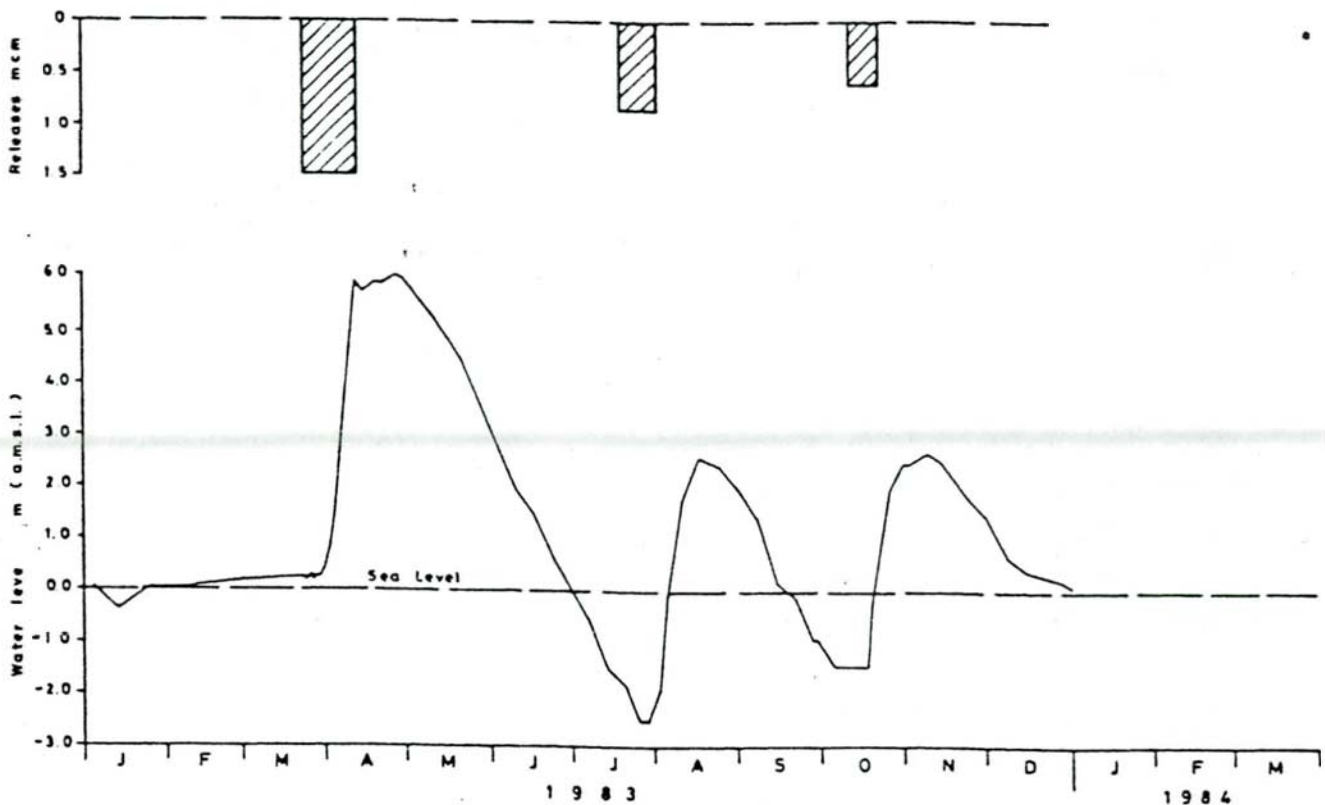
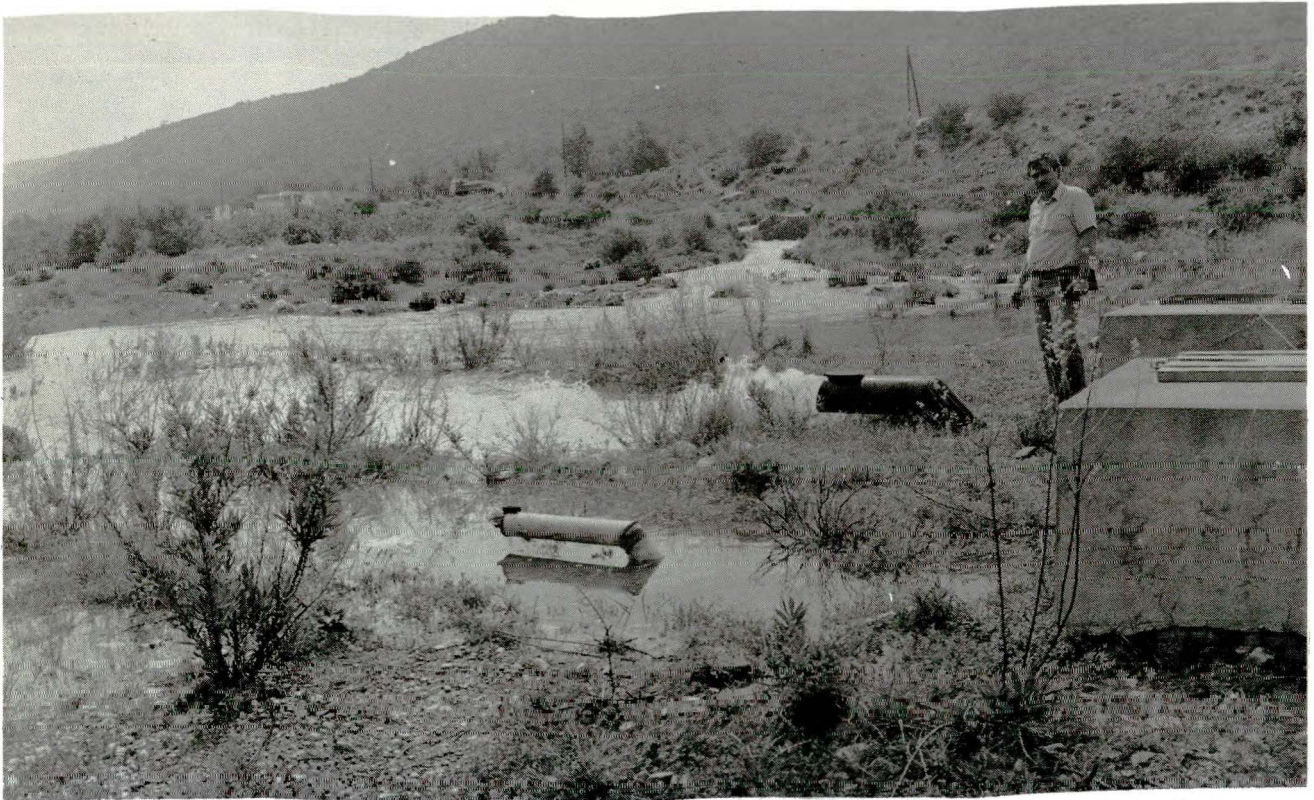


Fig-3- Hydrograph of borehole No.27 as a function of releases

The total extraction during 1983 was 4.6 MCM for the water supply of Limassol , Amathus Improvement Board and other communities and a small part for irrigation purposes.

On March 1983 the water level in the aquifer was at its lowest permissible level. For this reason controlled releases from the dam were made for recharge and natural water treatment purposes.

In total three such releases were made between the 23rd of March to 12th April, the 20th of July and 2nd of August and the 12th to 24th of October. The total quantity of water released was 3 MCM (see fig.3) concurrently with these release-recharge schemes a dense observation network was established regarding infiltration rates, water level recovery quality etc and a study was began for the preparation and calibration of a hydrogeological model for optimizing the management of the aquifer in the future.



Release of water from the Yermasoyia reservoir washout (in the front) and outlet (in the back) for recharge purposes. WDD Photo D49-6, 4.4.83.



Measurement of flow in Yermasoyia river 2 km downstream the reservoir to determine infiltration rates. WDD Photo D46-7, 4.4.83.

Table III-2 - New boreholes drilled in the Garyllis - Omonia wellfields and results from the pumping tests

Area Borehole	Garyllis West		Garyllis East		Omonia	
	30/83	44/83	35/83	48/83	53/83	58/83
Depth (m)	62.5	61.0	62.5	61.0	61.3	61.0
Diameter Ø(in)	10	10	10	10	10	10
Pumping method	SD*	SD	CD*	SD	SD	SD
Durathon(h)	25	28	24	26	23	25
Transmissivity (m ² /d)	1460	5747	3330	4310	1770	1910
Specific Yield(%)	-	2	-	0.6	7-10	3
Recommended Yield(m ³ /h)	150	110	200	200	80	120
Recommended Pump suction(m)	54	51	54	55	53	53

Note: Drilling and testing by GSD; siting and well design and test interpretation by WDD

* step drawdown

** constant discharge rate

The Garyllis and Omonia aquifers were studied and the safe yield of them was assessed to be of the order of 5 to 6 MCM per year.

Artificial recharge of Yermasoyia Riverbed aquifer by release of water from the dam

The extraction, from the Yermasoyia Riverbed aquifer downstream the dam depends almost entirely on the replenishment of it through spills or controlled releases of water from the Yermasoyia reservoir

Table III-1 - New boreholes drilled in the Kouris Delta and results from the pumping tests.

BH	153/83*	170/83	185/83
Depth (m)	79.3	67	59.5
Final \emptyset (in)	0-47.6 m - 10 47.6-79.3 m - 8	0-47.6 m - 10 47.6-67 m - 8	10
Method of pumping test	step drawdown	step drawdown	step drawdown
Duration(h)	24	24	24
Transmissi- vity (m^2/d)	-	2000	-
Specific yield (%)	-	10	-
Well losses ($S=BQ+CQ^P$)	B=0.0755 C= 3.0648×10^{-5} P=2.036	B=0.616 C=0.0143 P=1.311	B=0.1169 C= 6.38×10^{-5} P=2.369
Recommended Yield(m^3/h)	120	140	110
Recommended Pump suction (m)	45	45	50

* The boreholes were drilled by the GSD; siting and well design was prepared by WDD. The test-pumpings were carried out by WDD.



New sinkholes developed after the construction of the protection wall in the Maroni River. WDD Photo E4-11, 4.1.84.



A weir established upstream the sinkhole area near Maroni village to record the inflow into the aquifer through the sinkholes. WDD Photo E4-9, 4.1.84.

A new sinkhole developed in the Vasilikos River at the same altitude as that of the Maroni sinkhole

Water Resources Management and Operation Branch

This Branch cooperates very closely with the two other branches of the division in carrying out its tasks. The main ones during 1983 were the following:

Kouris Delta Emergency Irrigation Scheme

The water content in the Yermasoyia and Polemidhia Dams in early 1983 was not considered sufficient to meet the irrigation demand. For this reason the existing 9 Government boreholes in the Kouris Delta were included in an "emergency Scheme" for meeting the demand in replacement of an equal quantity from the above two dams. In addition three (3) new boreholes were drilled in the area.

Pumping tests on six(6) of the boreholes that were finally commissioned were carried out and yields of 80 to 135 m³/hr were confirmed(see table III-1).

The capacity of the Kouris Delta was assessed by using the existing Akrotiri groundwater mathematical model which resulted to a quantity of 3 MCM which could be pumped without any effect on the area. In the first 4 months of the operation of the wellfield a quantity of 1.235 MCM was pumped and which met the immediate irrigation needs of the area.

The performance of the aquifer in the area was monitored throughout the year and water levels, quality changes and progressive yield records were maintained. This operation of the aquifer will be evaluated for the possibility of increased extraction in the future.

Limassol Water Supply Emergency Scheme

For the same reason as above and in view of the low water content in the Yermasoyia Dam a survey was carried out on the Limassol Water Demand and sites for new boreholes were located in the Omonia and Garyllis existing wellfield areas. A total of six (6) new boreholes were drilled for which after pumping tests a yield of 80 to 200 m³/hr was confirmed. These boreholes were drilled near the existing main conveyors for easy connection and at sites relatively as far as possible from houses. The quality of the groundwater although better in general than that from the existing boreholes in the area still the proximity to housing complexes causes concern(see Table III-2).

in the Kokkinokhoria the drop was of the order of 2 meters with the result of further reduction in the yields of the boreholes. The sea-intrusion in the area is still propagating inland at a steady pace. The indications are that the forecast on the water resources conditions in the area by 1990 as presented in the feasibility study are valid (see fig.2).

Use of environmental radioisotopes in the study for the source of recharge of Akrotiri Aquifer

During 1983 a survey in the Kouris Delta area was made at three different periods. The survey involved the sampling of surface and groundwater for Tritium and the Stable Isotopes of water for evaluating the proportion of recharge in the area due to infiltration of Kouris river water and that due to local rainfall.

This subject is of paramount importance in view of the future reduction of the Kouris River flow by the construction of the Kouris Dam.

The first results suggest that some 70% of the recharge of the Delta area is due to Kouris River and the remainder due to local rainfall. This research is made under the Regular Technical Assistance Program of the International Atomic Energy Agency (IAEA). All the samples are being analyzed at the IAEA Headquarters in Vienna, Austria.

Other major studies

The Maroni Gypsum aquifer was under close observation during the early and late part of 1983. The groundwater levels in the gypsum aquifer (artesian) declined. This decline together with the flows in the Maroni River caused a reactivation of the Sinkhole area near the Maroni village with new and enlargement of old sinkholes being observed which cause concern about the safety of the near road and houses. Two weirs upstream and downstream the sinkhole area were established for evaluating the recharge and the development in the area was continuously monitored. Some 10 boreholes were equipped with pressure gauges for monitoring the artesian pressure.

Southern Conveyor Project

Concurrently with the work of the Engineering Hydrology Branch, when the alternative of Diverting water from the Kouris River was being examined instead of the construction of the Kouris Dam, this Branch evaluated the effect of such diversions on the recharge of the Akrotiri Aquifer by using the Ground-water Mathematical Model of the area.

The contemplated diversion of 21 MCM was about 40 per cent of the annual total flow of the river. The study concluded that if spreading grounds were established on the Kouris Delta area and 10 MCM/yr were induced into the aquifer, diverting of 21 MCM/yr from Kouris River would not affect the downstream water resources detrimentally.

In the late 1983, a comprehensive plan for the groundwater pumpage for the Southern Conveyor Project-Kokkinophoria Irrigation Areas was prepared. The proposed plan was based on the knowledge and understanding of the developing groundwater conditions in the Kokkinophoria area and the Irrigation design framework put forward by the SCP Design Team. The proposed plan consisted of the following:

- A map showing the SCP Irrigation Areas with the groundwater contribution per square kilometer. The total annual groundwater contribution to the SCP is 1.33 MCM/yr whilst the total groundwater deemed to be available by 1990 is about 9 MCM/yr.
- A map summarizing the available groundwater in the SCP area only.
- A set of forms presenting details of the boreholes required to meet the peak and total demand for each irrigation block. These boreholes were plotted on LRO maps subdivided per irrigation block.

A total of 264 existing and 11 new boreholes were deemed as needed. This large number is attributed to the present and anticipated low yields and the requirement to meet the demand within two months of the irrigation season.

The division continued during 1983 to monitor and evaluate the water balance conditions of the main aquifers which fall under the Southern Conveyor Project. To this effect, the established monthly water level networks in Akrotiri, Parekklisha Kiti and Kokkinophoria areas were observed and monthly groundwater contours were prepared. In general the Akrotiri aquifer conditions are steady although increased extraction from the Kouris Delta was effected for the drought emergency scheme of 1983. The Parekklisha and Kiti aquifer water levels dropped in response to the relatively dry conditions, whilst

In addition the Division cooperated with the World Bank in assessing the hydrological data and, amongst other items, 20 sequences of 40 years period were computed for the inflow to Kouris Dam for testing the reliability of flows and the confidence in meeting the prescribed demands. The annual synthetic flows of Kouris River at the damsite were generated by the use of the computer and the Monte-Carlo techniques and an autoregressive equation.

These sequences of flow had an overall mean flow of 37.4 MCM and a standard deviation of 19.3 MCM. The sequences of flow were tested and found to be of normal distribution. The sample used for this stochastic approach was the 1965 to 1982 observed record of mean flow of 44.6 MCM

Aspects of Surface Hydrology-runoff and flood studies - were discussed with the World Bank Mission and various minor studies and data were produced to assist in these discussions.

Other projects and studies of the Department

All the necessary input information concerning rainfall and hydrometry were collated and processed for the following rivers for use, together with the rainfall runoff model, in evaluating the available runoff at each selected site for development schemes.

- Pedhieos river
- Akaki river
- Peristerona river
- Elea river
- Atsas river
- Karyotis river

The hydrology was completed at five sites on Atsas and Elea river for the period of 1916 to 1982. The hydrologic model was calibrated using the observed data of 5 years and was validated with the available data of the last 10 years

The divertible quantities to the proposed Vyzakia dam were assessed.

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:

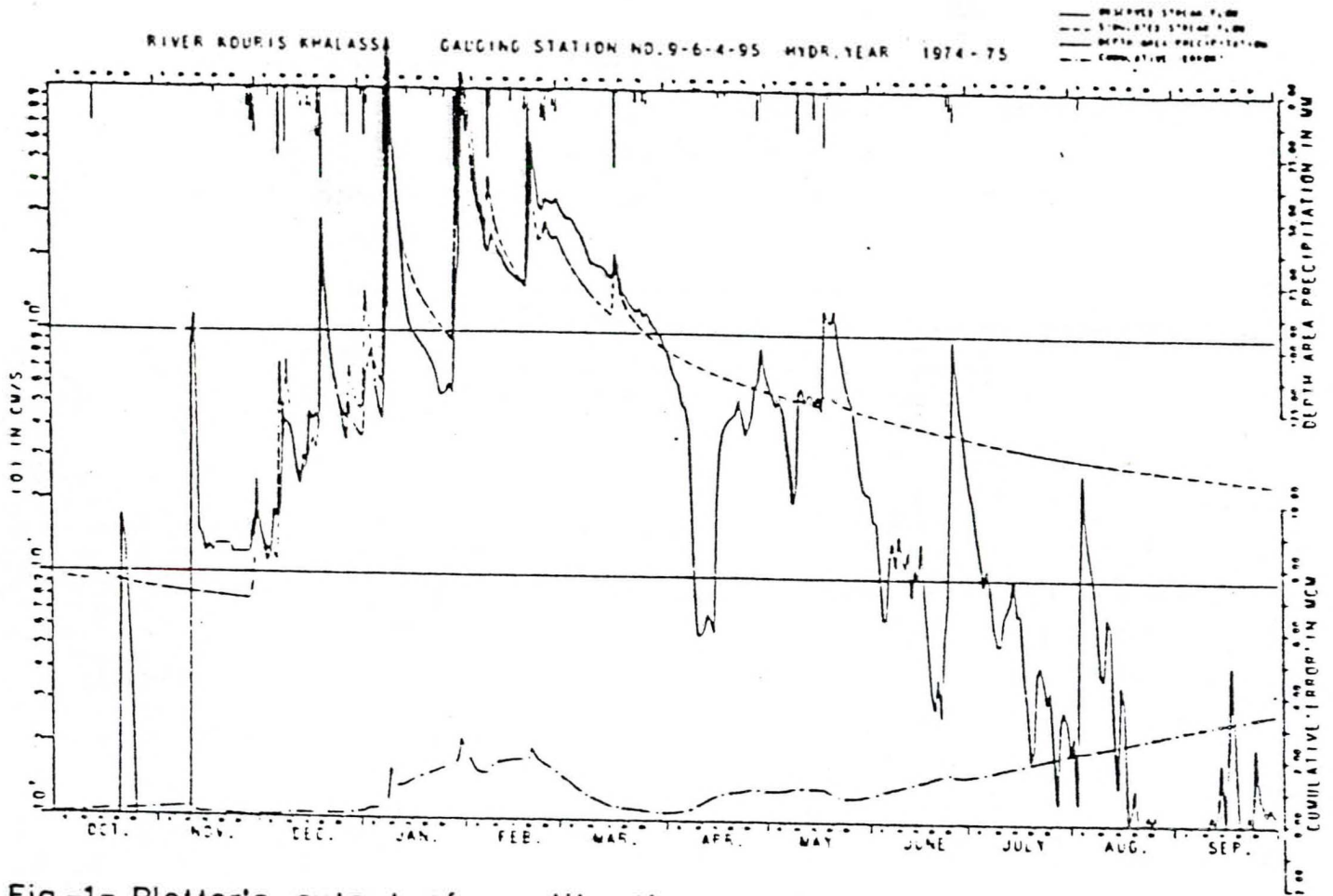


Fig.-1- Plotter's output of a calibration run for the Kouris River flow.

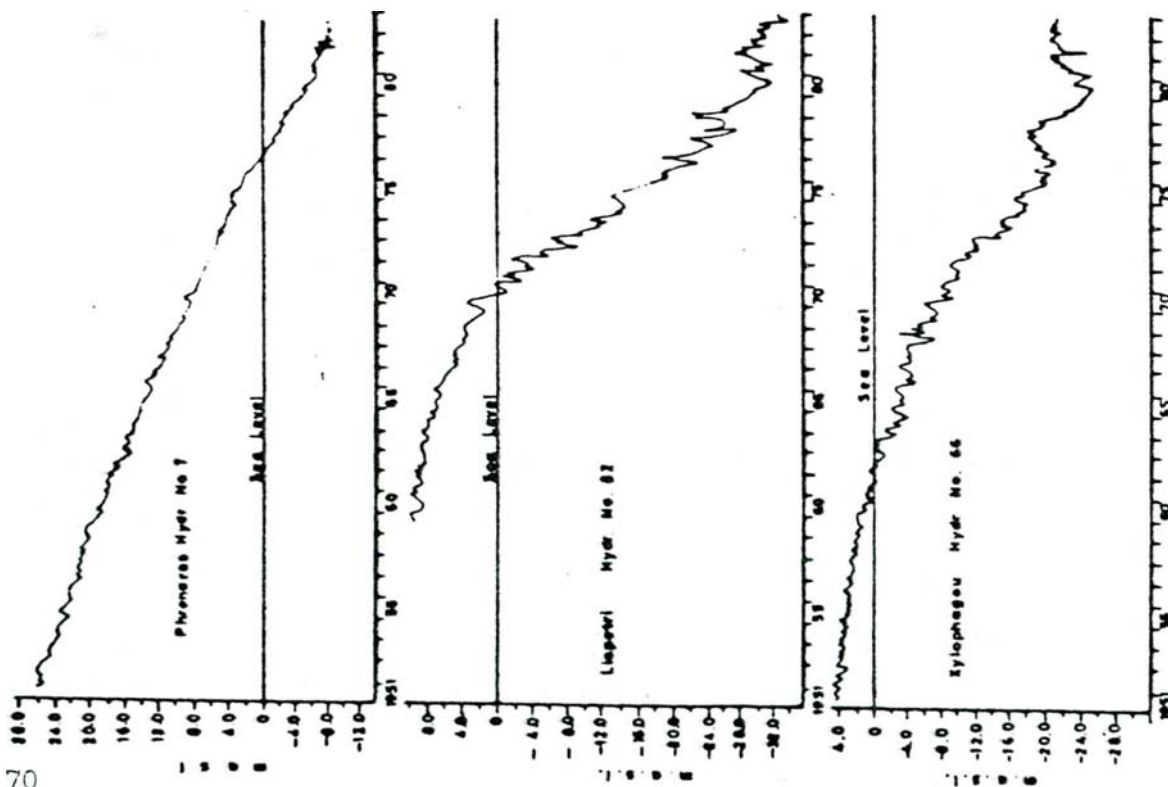


Fig.-2- Long duration hydrographs for three observation boreholes in the Kokkinakhorra area

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 1983 the Division consisted of the following staff

- 1 Senior Hydrogeologist - Head
- 1 Geologist I - Ast. Head
- 1 Hydrologist I
- 1 Executive Engineer I
- 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

In early 1983, the divertible water from Kouris and Zyghos Rivers was simulated as an alternative implementation strategy for the Southern Conveyor Project in lieu of the proposed Kouris Dam (see Fig.1)

From the analysis made the three Kouris River tributaries could provide the divertible water required to satisfy the selected conveyor capacity of 2 m³/s. The average annual divertible quantity for the wet period (November to April) and its standard deviation was estimated to be:

Kouris river tributary	:	11.6 ± 2.6 MCM
Zyghos river tributary	:	<u>9.5 ± 2.5 MCM</u>
Total		21.1 ± 5.1 MCM

III DIVISION OF HYDROLOGY
AND WATER RESOURCES MANAGEMENT

by

I.St. Iacovides
Senior Hydrogeologist
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 (streamed 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.

TABLE II-9
 APPLICATIONS EXAMINED AND LOANS ISSUED FOR THE REACTIVATION OF TURKISH CYPRIOT
 WELLS ABANDONED BY THEIR OWNERS

Particulars	Nicosia	Limassol	Larnaca	Paphos	Total
Applications approved (Number).....	-	-	-	8	8
Wells/boreholes allocated (Number).....	-	-	-	8	8
Farmers benefited (number).....	-	-	-	-	18
Area to be irrigated (donums).....	-	-	-	141	141
Loans granted (Number).....	-	-	-	8	8
Loans granted (Pounds £).....	-	-	-	7790	7790
Loans issued (Pounds £).....	-	-	-	7790	7790
T/C pumping plant allowed to be used (Number).....	-	-	-	-	-
Estimated Value of T/C pumping plants (Pounds £).....	-	-	-	-	-
Amortization rate (Pounds £/Year).....	-	-	-	-	-

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 of 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 examined by the District Officer and the district Agriculture 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 kind of equipment to be installed, the amount of water to be pumped, 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 repaid only the 1/3 of the amount the remaining 2/3 is given ex gratis.

From its establishment the Central Committee for the issue of loans and the reactivation of Turkish Cypriot owned wells/boreholes had 56 meetings during which it approved 438 applications from 1251 displaced farmers for the irrigation of 12205 donums of land. The amount of loans granted by the end of this year was £372704 and the pumping plants of Turkish Cypriot ownership to £42,190.-

During the year under examination, the Committee had one meeting during which it approved 8 applications from 18 farmers for the irrigation of 141 donums of land. The amount of loans granted is £7,790.

Details are given in the following table II-9.

During 1983 this Department issued 5 Drillers licences and renewed 57 others. The number of private drilling rigs which drilled for water during 1983, was 86 and this Department has been notified about the drilling or cleaning of 211 boreholes. Information from private drillers have been received by this Department for 194 boreholes.

During 1983, 17 private Drillers were reported to the District Officers for illegal drilling.

WATER QUALITY

Chemical Analyses

During the year, 688 samples of water were sent to the Government Analyst and 1144 to the WDD Laboratory for chemical analyses. Out of these, 797 samples were taken from springs, wells or boreholes, which are used or proposed as water supply sources. The remaining 1035 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 53 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 222 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

TABLE II - 8

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-Akna), 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. 3.82	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 without metering the water pumped from each boreholes 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 1983 there were 388 water meters installed of which 264 are in continuous operation. The total volume of water recorded is 14.68 MCM.

Private Drillers (Wells Law, Section 36)

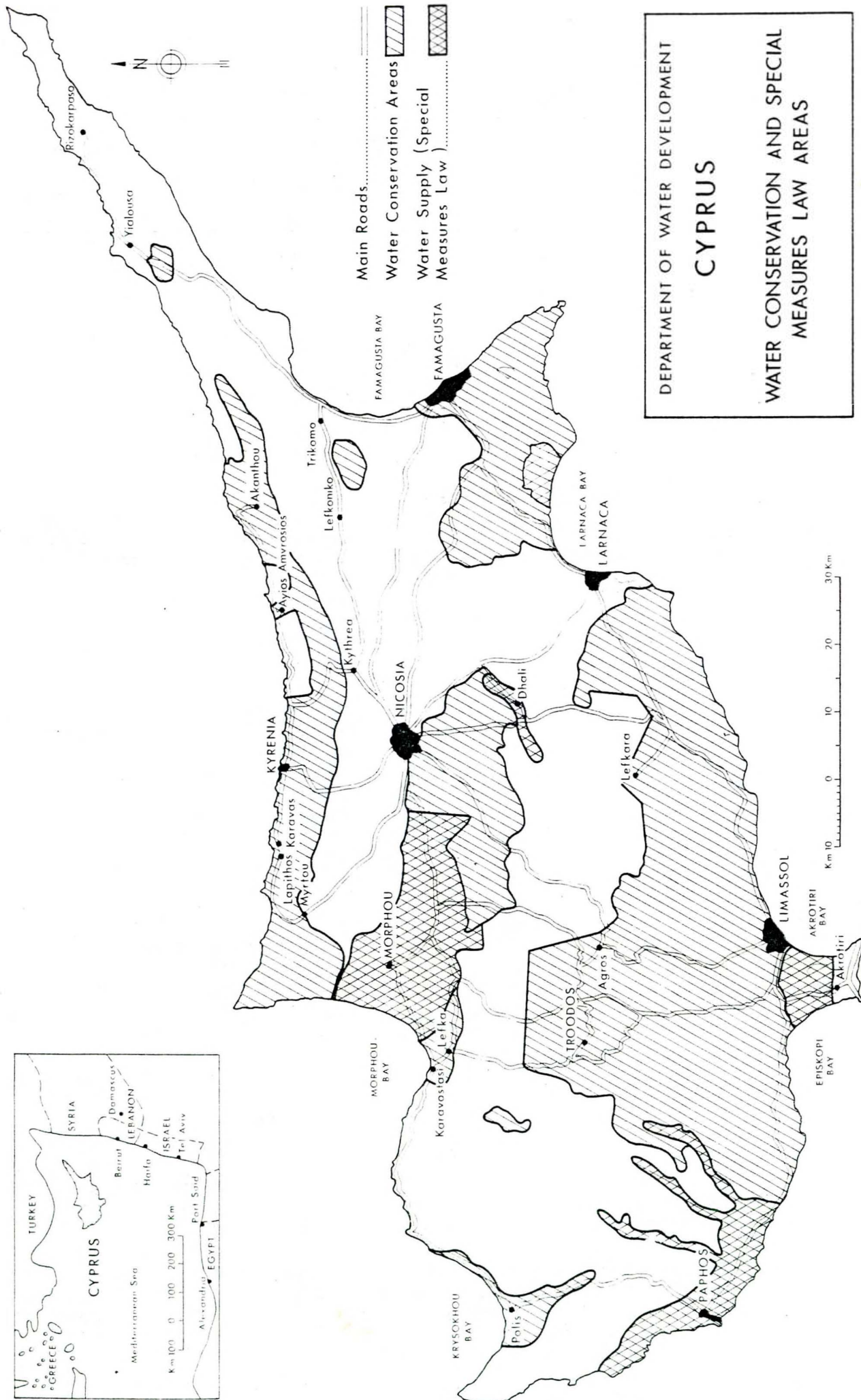
According to the above law, no one is allowed to operate a drilling rig without a Driller's licence. Such a licence is issued by the Director of the Water Development Department, after the interested person to become a Driller applies for it and when the Director of the Department is satisfied that the 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 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.

TABLE II -7

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, Kouklia, 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	Vasilias, 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	Kouklia, 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
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



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 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 Legal Advisor of this Department, Ch Kyriakides and the District Engineer of the district where applications were to be examined, participated.

The committee performed during 1983, 35 meetings and examined 4799 applications sent to the Director, WDD by the District Officers, as follows:-

Water Supply (Special Measures) Law areas	813
Water Conservation areas	3327
Non Water Conservation areas.....	659

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 62 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 Table II-7.

Application 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 are shown on map page 62 and particulars given in the table II-8.

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.

60 TABLE II-6
SELECTED OBSERVATION BOREHOLES

Serial No	Hydr. No.	Village	Water level increase (+) or decrease (-)					
			March 1982	November 1982	March 1983	November 1983	March 1982 - 83	November 1982 - 83
56/56	192	Liopetri	+0.38	+0.46	+0.48	+0.37	+0.10	-0.09
20/63	1516	Paralimni	+19.22	+18.77	+19.20	Blocked	-0.02	-
22/63	1518	"	+5.73	+5.53	+5.74	+5.53	+0.01	0.00
51/51	774	Phrenaros	+1.61	+1.06	+0.93	+0.52	-0.68	-0.54
79/56	975	"	+8.23	+8.43	+8.28	+8.39	+0.05	-0.04
88/54	24	Kolossi	+3.50	-0.30	+2.60	-0.60	-0.90	-0.30
51/63	813	Limassol	+2.03	+1.03	+1.53	+0.63	-0.50	-0.40
45/63	811	Zakaki	+1.28	+0.48	+1.13	+0.03	-0.15	-0.45
107/61	17	Yermasoyia	+2.08	-0.30	+0.36	+3.78	-1.72	+4.08
108/59	8	"	+16.55	+13.08	+14.26	+17.08	-2.29	+4.00
7/60	22	"	+1.21	-0.68	-0.02	+1.18	-1.23	+1.86
134/59	27	"	+1.28	-0.72	+0.39	+2.50	-0.89	+3.22
161/50	180	K. Trimithia	+187.68	+187.13	+187.03	+184.71	-0.65	-2.42
90/50	105	"	+191.78	+191.32	+191.20	+191.02	-0.58	-0.30
125/60	15	Episkopi	+24.06	+18.06	+24.31	+17.88	+0.25	-0.18
FB94/70	1236	Akrotiri	+1.86	+0.34	+1.44	-0.79	-0.42	-0.45
P.B. 12	2671	Kouklia	+1.26	-0.60	+1.40	+0.75	+0.14	+1.35
P.B. 17	2673	Akhelia	+6.97	+5.37	+6.92	+5.62	-0.05	+0.25

As regards groundwater situation, due to this year's low rainfall and poor groundwater recharge a general drop of the water table in all important aquifers was noted and in some of them considerably. Details may be seen in the table of selected observation boreholes.

It must be noted that the increase of the water levels in Yermasoyia valley were due to releases from Yermasoyia reservoir to recharge the aquifer where Limassol and other water supply boreholes are situated. Releases were made in April (1.5 MCM) August (0.83 MCM) and October (0.67 MCM).

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 1982-83, 2500 spring and minor stream discharges were taken on 155 springs and minor streams; 960 discharges were taken on 80 springs which are under regular monthly observations and 1540 discharges were taken on 75 springs and minor streams for a certain period at various intervals.

As the rainfall during the hydrological year under review was below normal most of the springs had 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 Observations. 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 2929km² (see map on page 52). The springs wells/ boreholes which were on register at the end of 1983 were 25967.

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 borehole monitored twice during 1983 is 1373 and, every month or fortnight 502.

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 1983 11667 wells/boreholes and springs were in use 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 1983 the number of groundwater samples from observation boreholes analysed for Cl was 1465.

TABLE II-5

VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1983 (Cont.)

Ser. No.	Dam	Capacity $10^3 \times m^3$	Inflow commen- cing date (1983)	Maximum Volume accumu- lated $10^3 \times m^3$	Date of maximum accumu- lation (1983)	Minimum volume accumu- lated $10^3 \times m^3$	Date of minimum accumu- lation (1983)	Remarks
43	Pyrgos	283	January	283	21. 2.83	Empty	17. 9.83	Overflowed 21. 3.84
44	Trimiklini	340	"	340	22. 5.83	210	6.10.83	Opened 29.10.82, Closed 5.5.83 Overflowed 22.5.83
45	Xyliatos	1220	"	1220	16. 3.83	1057	2.11.83	Overflowed 16.3.83
46	Yermasoyia	13600	"	8799	13. 5.83	2896	1. 1.83	

VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1983

Ser. No.	Dam	Capacity $10^3 \times m^3$	Inflow commen- cing date (1983)	Maximum Volume accumu- lated $10^3 \times m^3$	Date of maximum accumu- lation (1983)	Minimum volume accumu- lated $10^3 \times m^3$	Date of minimum accumu- lation (1983)	Remarks
23	Lefka Marathasa	368	January	368	Jan. 83	159	29.10.83	Overflowed 22.12.82
24	Lefka Kafizes	113	"	113	18. 1.83	68	24.10.83	" 18. 1.83
25	Lefkara	13850	March	1205	19. 4.83	225	9.12.83	
26	Liopetri	325	-	-	-	-	-	No inflow in 1983
27	Lymbia	220	January	220	12.11.83	25	30. 9.83	Overflowed 12.11.83
28	Lythrodondas Upper	32	March	29	22. 4.83	Empty	16. 7.83	Gate opened 10.7.82, Gate closed 4.3.83
29	Lythrodondas Lower	32	January	32	5. 3.83	2	6.10.83	Overflowed 5.3.83
30	Melini	59	"	59	1. 3.83	26	5.11.83	Overflowed 1.3.83
31	Mayrokolymbos	2180	"	679	27. 4.83	110	17.10.83	
32	Ormidhia (Vathys)	100	-	-	-	-	-	No inflow in 1983
33	Pakhyammos	43	January	43	10. 3.83	Empty	14. 7.83	Overflowed 10.3.83
34	Palekchori (Kambj)	620	"	620	2. 3.83	16	7.11.83	" 2.3.83
35	Paralimni Lake	1365	January	Total	quantity passed		through 4500M ³	Constantly open
36	Pelendri	123	"	123	7. 4.83	29	25.10.83	Overflowed 7.4.83
37	Pera Pedhi	55	January	55	Jan. 83	3	6.10.83	" 10.11.82
38	Petra Upper	10	"	10	24. 1.83	Empty	28. 8.83	" 24. 1.83
39	Petra Lower	25	"	25	8. 2.83	"	1.10.83	" 8. 2.83
40	Pomos	860	"	860	28. 2.83	61	27.10.83	" 28. 2.83
41	Polemidthia	3400	"	1626	21. 4.83	225	10.11.83	
42	Prodromos	110	"	110	10. 4.83	11	12. 1.83	Overflowed 10.4.83

VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1983

TABLE II-5

Ser. No.	Dam	Capacity $10^3 \times m^3$	Inflow commen- cing date (1983)	Maximum Volume accumu- lated $10^3 \times m^3$	Date of maximum accumu- lation (1983)	Minimum volume accumu- lated $10^3 \times m^3$	Date of minimum accumu- lation (1983)	Remarks
1	Agridhia	59	March	30	30. 6.83	26	12. 8.83	Closed 7.3.83
2	Agros	72	January	47	2. 6.83	4	10.11.83	
3	Akrounda	22	January	22	Jan. 83	5	7. 9.83	Overflowed 13.12.82
4	Akapnou - Eftagonia	132	"	132	26. 2.83	30	11.11.83	" 26. 2.83
5	Arakapas	128	"	128	21. 1.83	23	21.10.83	Closed 17.1.83-Overflowed 21.1.83
6	Arakapas No. 1	192	"	192	24. 3.83	63	17. 1.83	Overflowed 24.3.83
7	Argaka	990	"	990	3. 3.83	16	29.10.83	" 3.3.83
8	Asprokremmos	51000	"	20034	9. 6.83	2133	1. 1.83	
9	Athalassa	790	November	29	11.11.83	Empty	1. 1.83	
10	Ayia Marina	298	January	261	3. 5.83	27	1. 1.83	
11	Ayii Vavatsinias Dam	53	"	53	24. 1.83	Empty	20.12.83	Overflowed 24.1.83
12	Ayii Vavatsinias No. 1	55	"	55	24. 1.83	20	8.11.83	" 24.1.83
13	Eftagonia I	92	"	42	25. 4.83	1	17. 1.83	
14	Eftagonia II	127	"	98	3. 6.83	4	17. 1.83	
15	Eftagonia III	65	February	24	22.12.83	Empty	27. 1.83	
16	Kalo Kherio	32	January	32	5. 1.83	3	25.10.83	Overflowed 5.1.83
17	Kalopanayiotis	363	"	363	18. 1.83	93	2.10.83	" 18.1.83
18	Kandou	38	"	32	22. 4.83	4	30. 8.83	
19	Kato Mylos	104	"	104	16. 1.83	26	10.11.83	Overflowed 16.1.83
20	Khandria	70	"	70	7. 3.83	20	25.10.83	Overflowed 7.3.83
21	Kiti	1625	-	-	-	-	-	No inflow in 1983
22	Kyperounda	50	January	50	5. 3.83	5	25.10.83	Overflowed 5.3.83

Inflow of Water in Dams

During 1983 out of 63 most important Dams and ponds in Cyprus which were under regular observations in the past, only 46 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 46 dams under regular observations was very low because of the low precipitation during the hydrological year under review; The maximum volume accumulated was 40 MCM or 42% of the total capacity of these dams, which is 96 MCM. Out of these dams 26 overflowed, most of them in January, and March. analytically the situation is shown on table II-5.

New flow gauging stations

During the year under review three new flow gauging stations were constructed.

Vasilikos River near Layia (upstream of Kalavassos Dam). Construction of a "V" shaped structure 5m wide, slope 1:10.

Maroni River near Maroni village. Construction of two "V" shaped structures, one upstream and one downstream of Maroni 4m wide, slope 1:10.

Repairs and improvements to existing flow gauging stations

During the year major improvements were carried out on the following flow gauging stations for better operation:

Karyotis River near Evrykhou. Alterations to the invert of the weir by the construction of a "V" shaped structure 4.5m wide, slope 1:10 and a float well.

Yermasoyia River near Phinikaria. Alterations to the invert of the weir by the construction of a "V" shaped structure, 15m wide, slope 1:10.

Akrounda River upstream of Yermasoyia Dam. Alterations to the invert of the weir by the construction of a "V" shaped structure 4m wide, slope 1:10, and a float well.

Ezuza River near Kannaviou. Alterations to the invert of the weir by the construction of a "V" shaped structure 13.7m wide, slope 1:10.

Flood Discharges

As the rainfall during the hydrological year was below normal, we had no remarkable floods. The most noteworthy flood, however, were recorded on the following flow gauging stations:

* Xeros River near Phinikas about 29m³/s on the 1st March 1983. Its catchment area is 205 km².

* Tremithios River near Ayia Anna about 24 m³/s on 10th June 1983. Its catchment area is 94 km².

* Tremithios River near Klavdhia about 19m³/s on 10th June 1983. Its catchment area is 135km².

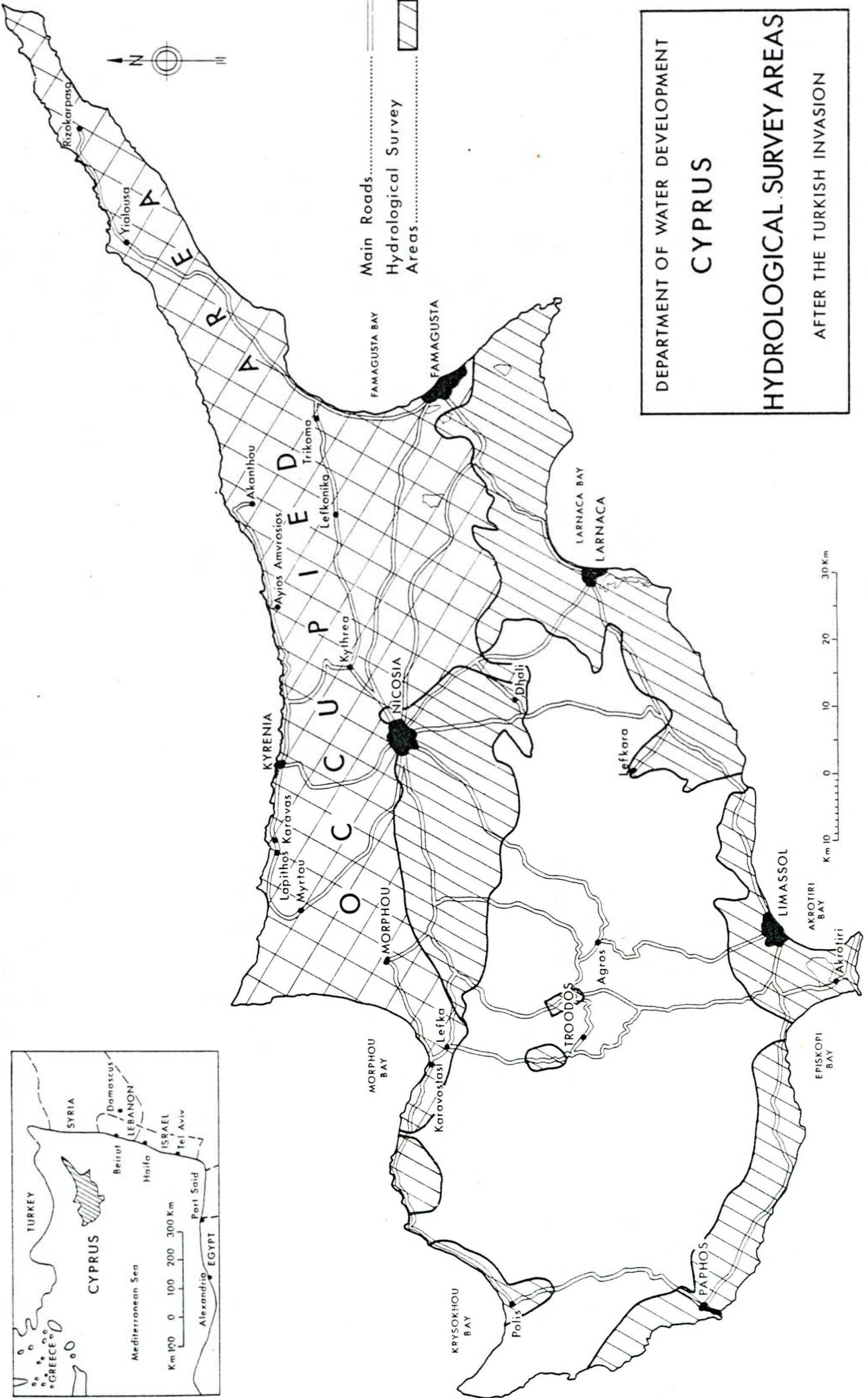
* Peristerona River near Panayia Bridge F.S. about 22m³/s on 17th January 1983. Its catchment area is 77 km².

* Dhiarizos River near Philousa about 14m³/s on 1st March 1983. Its catchment area is 125 km².

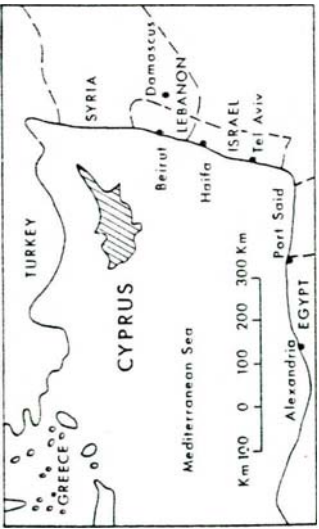
* Dhiarizos River near Kouklia about 13 m³/s on 1st March 1983. Its catchment area is 260 km².

* Yermasoyia River near Phinikaria about 11 m³/s on 17th January 1983. Its catchment area is 110 km².

* Pedhieos near Kambia about 10m³/s on 17th January 1983. Its catchment area is 29 km².



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



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 measurement 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 ninth year now.

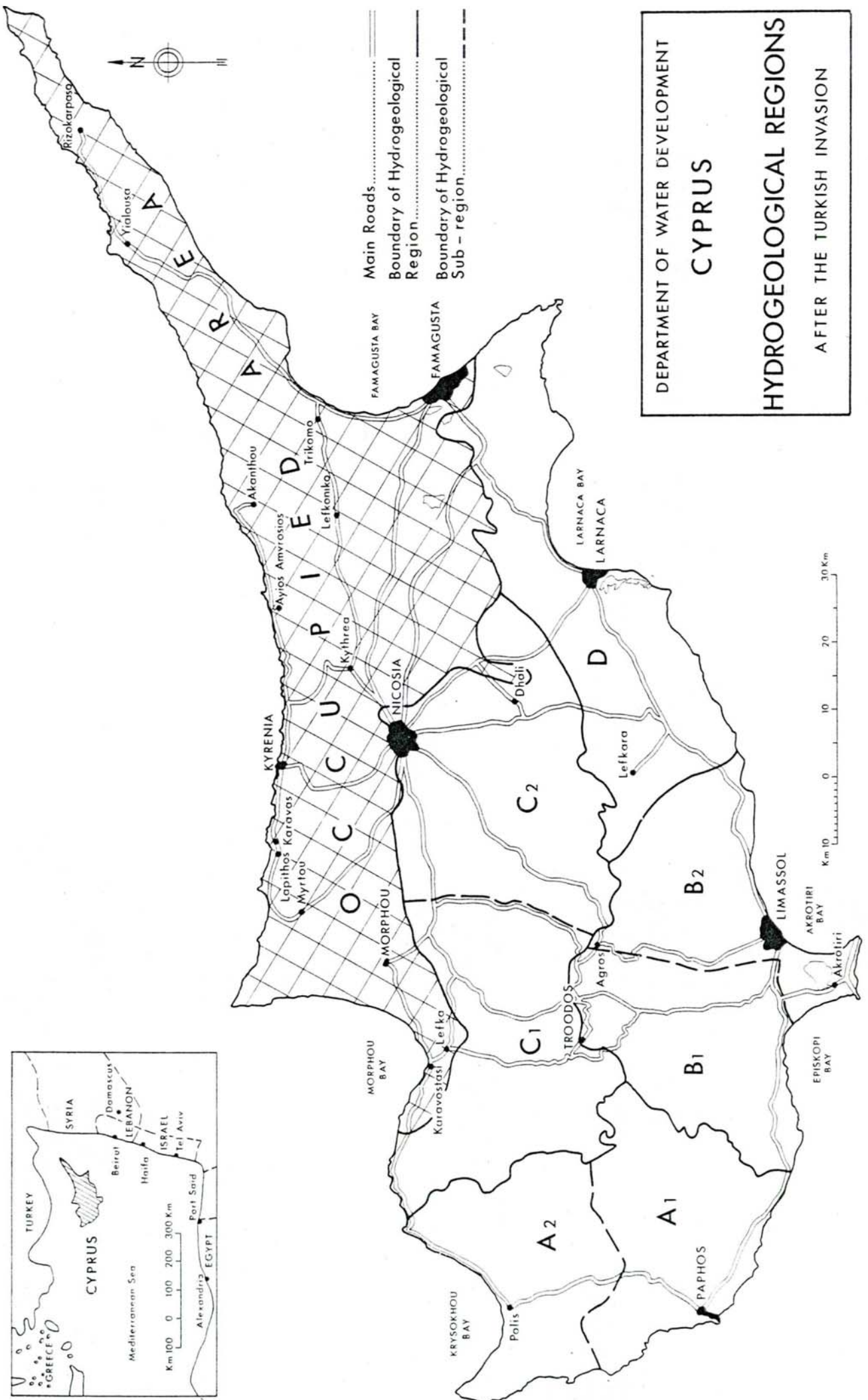
The general conclusion obtained from the study of this years records of the above flow gauging stations, is that the flow of most of them was below normal because of the low precipitation of December, January and March.

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

TABLE II-4

DISCHARGE OF SELECTED STREAMS AS CALCULATED AT SELECTED FLOW GAUGING STATIONS FOR THE YEAR 1982-83

Ser. No.	Station	Stream	Location	Annual flow 10 ⁶ m ³
1	2-8-3-10	Limnitis	Saw Mill	11.7
2	3-3-1-70	Ay. Nikolaos	Kakopetria	10.0
3	3-3-3-95	Karyotis	Evrykhou	10.8
4	3-5-4-40	Elea	Vizakia	1.7
5	3-7-1-50	Peristerona	Panayia Br.	10.4
6	3-7-3-90	Akaki	Malounda	6.0
7	6-1-1-80	Ay. Onoufrios	Kambia	1.0
8	6-1-1-85	Pedhieos	Kambia	2.4
9	6-5-3-15	Yialias	Nisou	0.2
10	8-4-5-30	Tremithios	Klavdhia	0.05
11	8-9-7-50	Vasilikos	Kalavasos	2.2



DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
HYDROGEOLOGICAL REGIONS
 AFTER THE TURKISH INVASION

TABLE II-2 INCIDENCE OF MAXIMUM AND MINIMUM TEMPERATURES

Station	Extreme maximum temperature and date	Extreme minimum temperature and date
	C	C
Nicosia	41.0; 5th August	-2.2; 7th January
Limassol	37.6; 26th July	1.5; 2nd January
Larnaca Airport	37.0; 26th July	-1.0; 6th March
Paphos*	34.3; 21st July	2.5; 27th January
Panayia Bridge	38.2; 5th August	-5.0; 2nd January
Saittas	37.6; 5th August	-4.5; 27th January
Amiandos	31.0; 5th August	-7.0; 6th March
Prodhromos	30.6; 5th August	-8.2; 6th March
Stavros	37.2; 5th August	-3.4; 20th February
Kornos	38.4; 26th July	-1.8; 27th January 20th February 7th March
Platania	33.5; 5th August	-6.2; 6th March
Phassouri	36.5; 11th July	-2.5; 27th January

*: R.A.F. Station

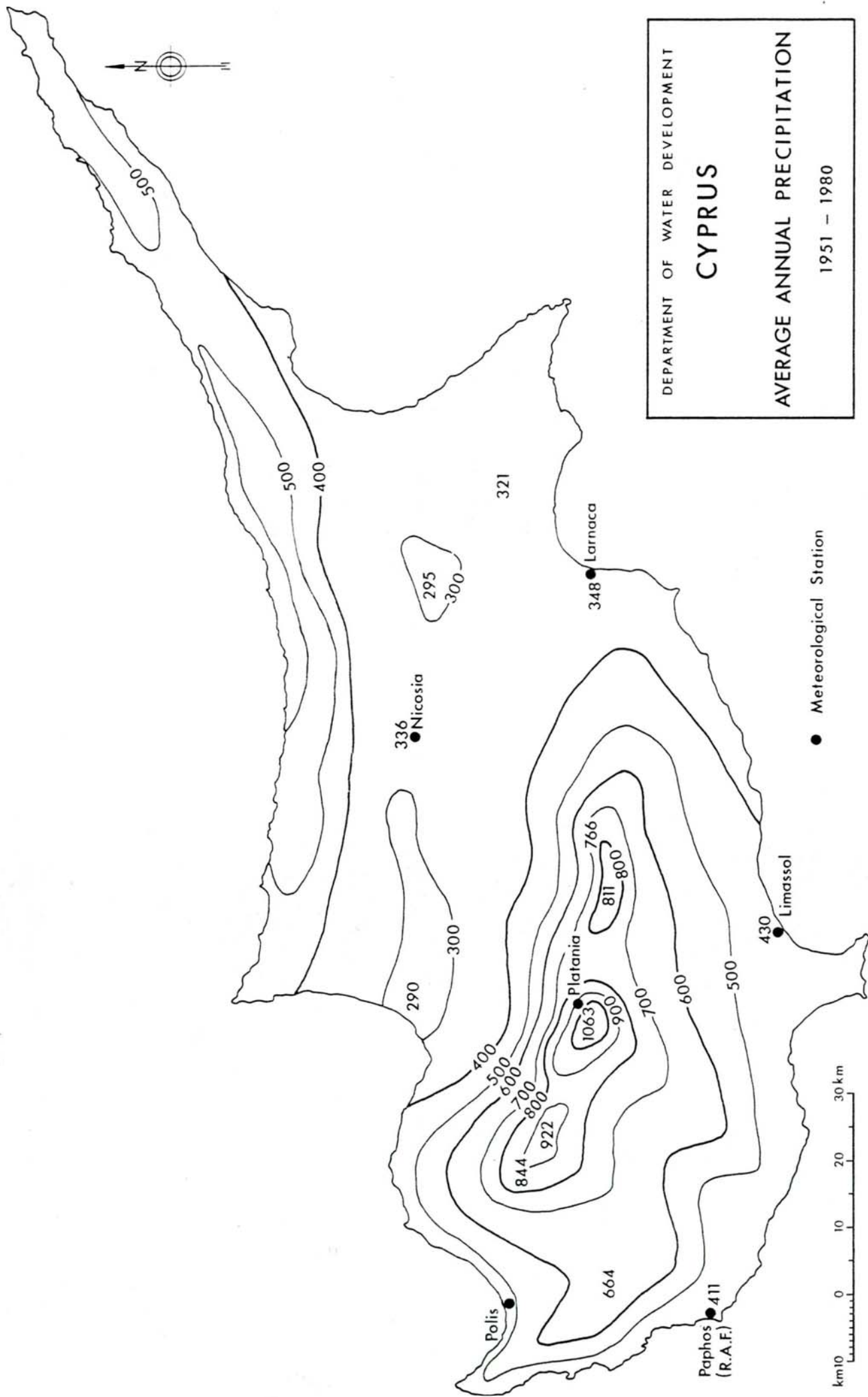
3. Evaporation

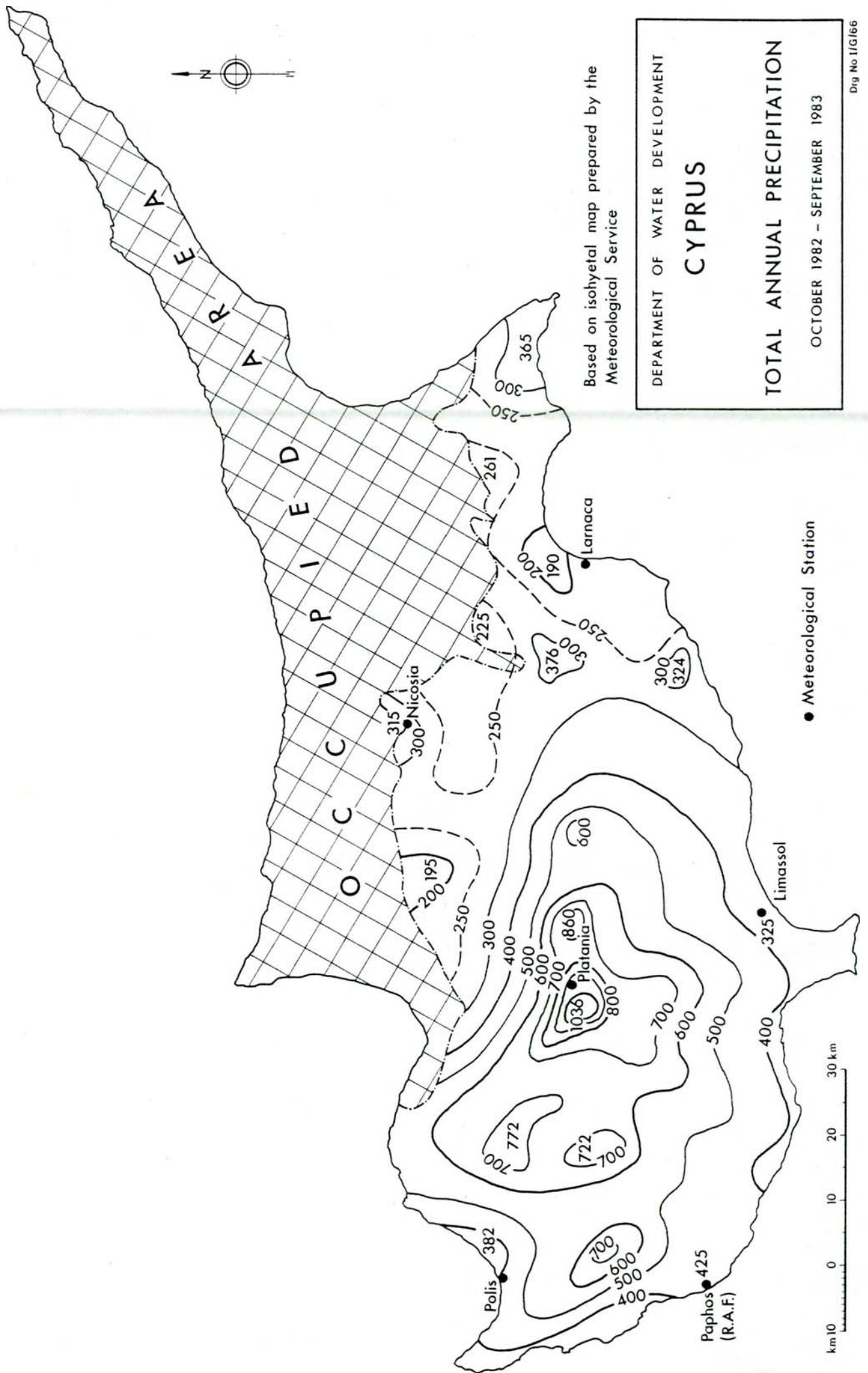
Monthly total evaporation (in mm) measured from United States Weather Bureau (U.S.W.B.) class "A" pan during the hydrometeorological year 1982-1983 at selected stations is given below:

TABLE II-3 TOTAL MONTHLY EVAPORATION

Station	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Total
Nicosia	130	80	43	41	47	84	129	186	242	288	275	201	1746
Limassol	155	92	52	45	49	82	130	217	255	303	294	210	1884
Larnaca Airport	185	127	87	86	83	124	150	210	289	307	283	244	2175
Saittas	125	75	44	52	57	74	105	180	222	241	238	185	1598
Akhelia	146	115	71	70	68	85	117	167	205	230	206	181	1661
Yermasoyia	136	93	51	57	59	77	109	178	240	255	240	187	1682
Polemidhia	149	94	79	67	64	89	121	181	237	246	247	199	1773
Prodhromos	89	*	*	*	*	*	99	164	177	214	195	159	

*: No records





Based on isohyetal map prepared by the
 Meteorological Service

DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
 TOTAL ANNUAL PRECIPITATION
 OCTOBER 1982 - SEPTEMBER 1983

● Meteorological Station

km 10 0 10 20 30 km

GRAPHICAL PRESENTATION
OF INCIDENCE OF RAINFALL 1982-1983

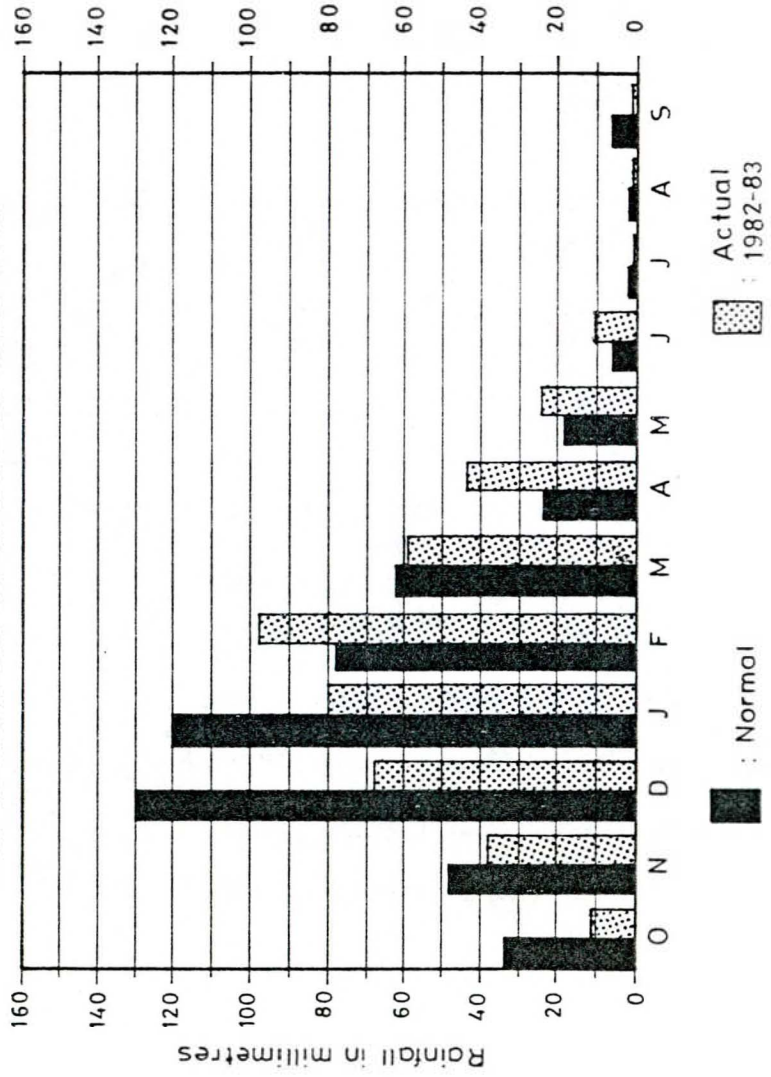


TABLE II-1 INCIDENCE OF RAINFALL DURING THE HYDROMETEOROLOGICAL YEAR,
1982-1983

Months	Rainfall (in mm)	Rainfall (in inches)	Percentage of yearly total	Percentage of monthly normal
October	11.7	0.46	2.7	34
November	38.3	1.51	8.8	78
December	68.0	2.68	15.6	52
January	80.0	3.15	18.4	67
February	98.0	3.86	22.5	125
March	59.0	2.32	13.5	94
April	44.0	1.73	10.1	186
May	24.0	0.95	5.5	128
June	10.6	0.41	2.4	180
July	0.4	0.02	0.1	23
August	0.6	0.02	0.1	43
September	1.4	0.06	0.3	21
Totals	436.0	17.17	100.0	-

Note: Yearly total on percentage of yearly normal:82%

The maximum amount of rainfall in a 24-hour period during the hydrometeorological year was 108.5mm, reported by Alona village rainfall station on 22nd May 1983.

The first snowfall occurred on mount Olympus on the 8th November 1982, which is nearly a month earlier than the median date for the first snowfall in Cyprus. Subsequent snowfalls occurred during the ensuing months till April. The last one occurred on the 17th April, 1983, which is one week beyond the median date for the last snowfall in Cyprus.

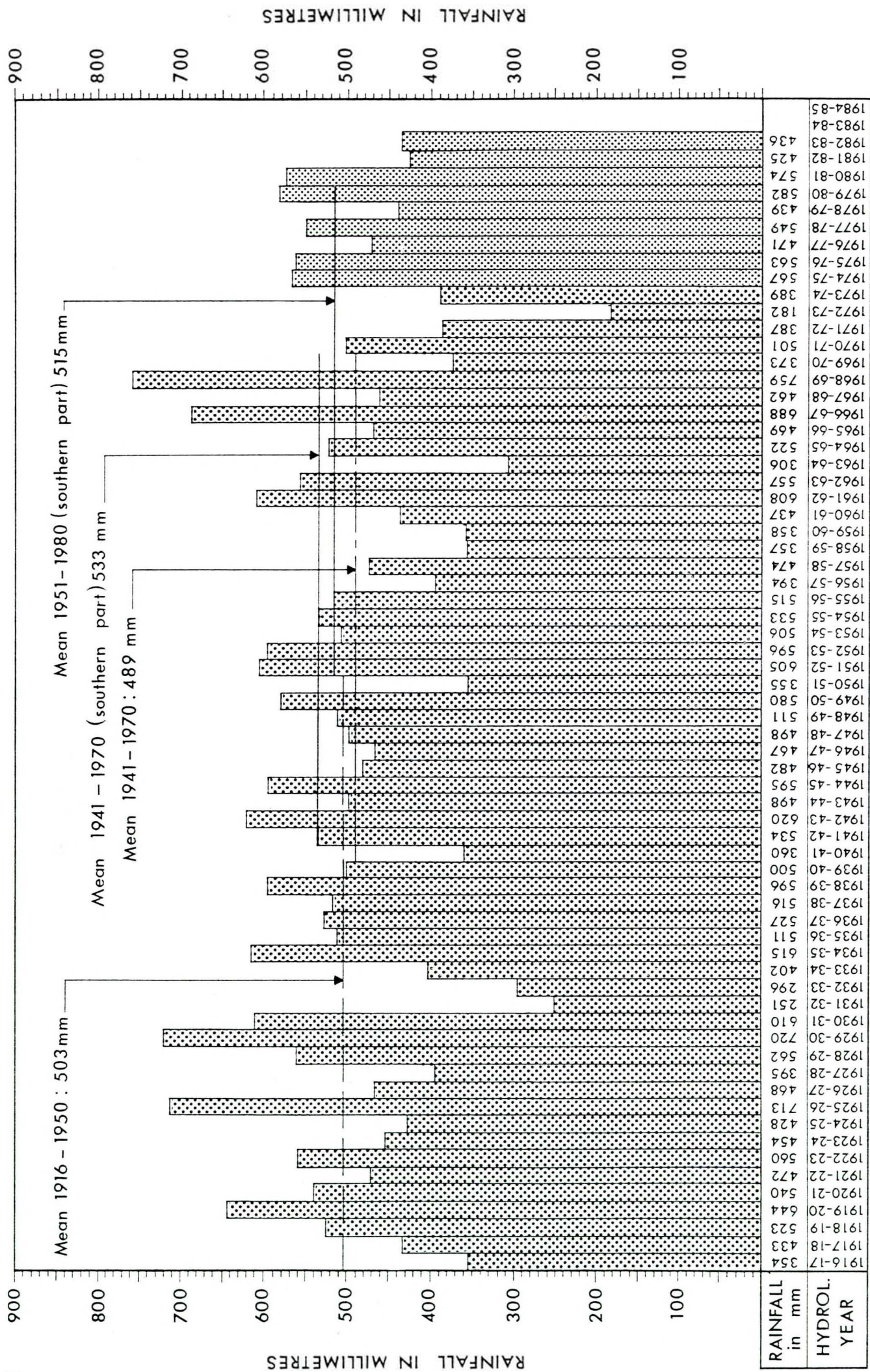
Hail occurred in all months except November 1982 and September 1983.

2. Temperature

During the hydrometeorological year 1982-1983 the air temperature as a whole was slightly below normal. In particular, monthly mean temperatures were below normal in November, December, January, February, March June, July and August; they were above normal in October and around normal in April, May and September.

The extreme maximum and extreme minimum temperatures recorded during the hydrometeorological year under review were as shown on table II-2.

ANNUAL AVERAGE RAINFALL OF CYPRUS 1916 - 1983



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

- Removing 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 1983, 59 test pumpings were carried out as follows:-

- 4 for division of land with total hours pumped	104
- 49 for building permits with total hours pumped.....	208
- 2 for irrigation divisions with total hours pumped.....	51
- 4 for town and village water supplies with total hours pumped.....	51

METEOROLOGICAL SUMMARY

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 1982-1983.

1. Precipitation

The yearly total precipitation averaged over the southern part of the island during the hydrometeorological year October 1982 - September 1983 was 436mm which is 82% of normal. (Normal is considered the average rainfall over the southern part of the island during the period 1941-1970).

The total precipitation amounts during the period ranged mainly between 75% and 95% of normal, except for part of the eastern Troodos slopes and the area of Larnaca where they ranged between 60% and 70% of normal.

As regards the monthly distribution of precipitation, it was below normal in October, November, December, January, March, July, August and September and above normal in February, April, May and June.

The table II-1 giving the incidence of rainfall during the hydrometeorological year 1982-1983 illustrates the situation.

II DIVISION OF WATER RESOURCES

by
D C Kypris
Senior Hydrogeologist
Head of Division

General

During 1983 we had no possibility again to collect hydrological data in the part of Cyprus still occupied for the ninth year by the Turkish troops amounting to 40% of the Cyprus land. So the behaviour of both surface runoff and ground-water bodies could not be followed or recorded in the Northern part of the country during the year under examination.

The new areas brought under hydrological observation during the year have an extent of about 80 square kilometers. A number of 190 wells/boreholes and springs were plotted or replotted in this area with their relative information recorded. A supplementary plotting was also carried out in the areas already covered for 931 new wells/boreholes.

INTRODUCTION

The main tasks assigned to the Division of Water Resources are the collection and interpretation of Hydrological and Hydrogeological data, regarding both ground and surface water, to deal with engineering geology problems as connected with the planning and execution of water works projects, to carry out auxiliary drilling operations and to control groundwater extraction and use.

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 2.

During 1983, D C Kypris, Senior Hydrogeologist, acted as the Head of 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. Mr Chr. Ioannou, Hydrologist class I, was the Head of Hydrometry Branch.

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 17 existing boreholes.
- Drilling of ten boreholes, one for domestic water supply and two for the creation of livestock areas.

Savvas Theodosiou, Mechanical Engineer I, visited Glasgow, Scotland between 19.11.83 - 25.11.83 to witness the tests of the pumps for Vasilikos-Pendaskinos Project.

Dr Chr Christodoulou, Principal Water Engineer visited Paris between 10.12.83 - 14.12.83 to discuss the possibilities of financing the Southern Conveyor Project by prospective financiers.

Study Leave

Ioanna Nicolaou, Technician 2nd Grade who has been granted one year's study leave without pay to obtain a BSc degree in Civil Engineering to the Catholic University of Armerica completed her studies and resumed her duties on 13.6.83.

Scholarships

Shophoclis Aletraris, Topographer Irrigation Engineer I, who has been granted a Fulbright scholarship in USA to obtain a MSc degree in Irrigation Engineering completed his studies and resumed his duties on 13.6.83.

Soteris Paschalides, Executive Engineer I, who has been granted one year scholarship by the Netherlands Government in Hydraulic Engineering completed his studies and resumed his duties on 12.9.83.

Nicodemos Nicodemou, Executive Engineer I, has been granted 15 months scholarship by the UK Government under its technical co-operation training programme in Construction Management at the University of Longhborough.

Joseph Nakouzi, Senior Clerical Officer GCS was transferred to this Department from the Printing Office with effect from 16.11.83.

George Tandas, Clerical Officer GCS was transferred to this Department from District Wellfare Office with effect from 15.11.83.

George HjiSoteriou, Supervisor of Accounts was transferred to this Department from the Agricultural Department with effect from 12.12.83.

Lambidona Nikiforou, Clerk 2nd Grade on a casual basis was transferred to this Department (SCP) from the Aliens Department as from 5.12.83.

Conferences and Duty Abroad

K C Hassabis, Assistant Director visited the Syrian Arab Republic as a member of an Official Delegation of the Ministry of Agriculture and Natural Resources from 31.1.83 - 5.2.83.

Dr Chr Christodoulou, Principal Water Engineer and Maria Archimandritou Agricultural Officer visited Washington USA between 28.3.83 - 11.4.83 to discuss with the World Bank the matter of phasing of the Southern Conveyor Project and other issues as well as carry out loan negotiations for the Khrysokhou Irrigation Project.

C St Lytras, Director and Dr Chr Christodoulou, visited FAO Headquarters in Rome between 27.3.83 - 31.3.83 and 12.4.83 - 16.4.83 to be briefed in general on the work of FAO as well as discuss in detail the development of water resources in the Khrysokhou area.

Dedalos Kypris, Senior Hydrogeologist participated in the meeting for International Colloquim on technical co-operation among developing countries in ground water resources development organised by the United Nations and the Yugoslavia Government between 23.5.83 - 28.5.83 in Zagreb Yugoslavia.

C St Lytras, Director, visited France between 29.6.83 - 2.7.83 to attend the General Assembly meeting of the Mediterranean Water Institute at Marceilles.

Adonis Georghiou, Geologist I and Paraskevoulla Maratheftou T I (BSc Eng.) participated in the International Course in Water Resources Engineering held in Belgrade, Yugoslavia between 20.6.83 - 16.9.83.

Dr Stephanos Papatryphonos, Hydrologist I, attended the postgraduate training course on Groundwater Tracing Techniques between 29.8.83 - 30.9.83 held in Graz, Austria.

Andreas Georghiades, Senior Water Engineer attended a seminar on International Constructions Claims - Avoiding and Resolving Disputes held in Hilton Athens between 21 - 22 September 1983.

Dr Chr Christodoulou, Principal Water Engineer attended a seminar on Contract law, Conditions of Contract and Arbitration held at the University of Bristol between 2.10.83 - 7.10.83.

C St Lytras, Director, visited Tunisia between 31.10.83 - 3.11.83 to attend the meeting of the Orientation and Administration committee of the Mediterranean Water Institute.

Sophoclis Aletraris: To the permanent (Dev.) post of Topographer Irrigation Engineer I, with effect from 15.10.83.

Andreas Aristides: To the permanent (Ord.) post of Clerical Officer GCS with effect from 15.12.83.

Deaths

With deep sorrow we record here the death of our highly esteemed colleague Michael D Olympios, Assistant Chief Foreman who died on 23.1.83 one year after his elder daughter, a doctor, fell accidentally to her death in Athens.

Retirements

Charalambos Themistocleous, Foreman retired from the Government Service with effect from 1.5.83.

Nicos Chrysostomou, Senior Clerical Officer retired on medical grounds from the Government Service with effect from 1.6.83.

Andreas Riris and Michael Petrides, Foremen, retired from the Government Service with effect from the 1.10.83.

Panayiotis Andreou, Assistant Chief Foreman retired from the Government Service with effect from 1.11.83.

Phidias HjiXenophontos, Foreman, retired from the Government Service with effect from the 1.11.83.

Transfers

Andreas Loizias, Accounting Officer 1st Grade was transferred to this Dept. from the Accountant's General Office with effect from 23.2.83.

Kyriacos HjiAntoni, Accounting Officer 1st Grade was transferred from this Dept. to the Psychiatric Institution Athalassa with effect from 2.5.83.

Polydoros Neocleous, Messenger on casual basis to this Dept. (PIP) was transferred to the District Office Paphos with effect from 2.5.83.

Kyriaki Christodoulou, Administrative Officer was transferred to this Dept. (PIP) from the District Office Paphos with effect from 18.6.83.

Andreas Thodosiou, Administrative Officer was transferred from this Dept. (PIP) to the District Office Paphos with effect from 18.6.83.

Paraskevi Thrasyvoulou, Clerk 2nd Grade GCS was transferred from this Department to the Ministry of Labour and Social Insurance with effect from 24.6.83.

Eleni HjiKyriakou, Technician 1st Grade was transferred to Nicosia from District Office Paphos with effect from 1.8.83.

Christodoulos C Artemis, Senior Water Engineer was transferred from this Department to the Ministry of Agriculture and Natural Resources with effect from 26.9.83.

The following were promoted to the permanent (Ord.) post of Technician 1st Grade with effect from 15.9.83.

- Eleni I Nicolaou
- Elpida Antoniadou
- Maria Yiangou
- Eleni L Adamidou
- Iacovos Ch Iacovou
- Christodoulos Loizides
- Eleni Chr Nicolaou
- Charalambos Anastasiou
- Charalambos Kountoureshis
- Ioannis Antoniou
- George Frangoullides
- Leandros Markides
- Petros Papageorghiou
- Panayiotis Georghiou
- Nicos Charilaou
- Thrasyvoulos Kallasides
- Anastasios Aristotelous
- Andreas I Papasavvas
- Christos Constantinides
- Yiannakis Achilleos
- Loizos Nicolaou
- Nearchos Onisiphorou
- Fereniki Michaelidou
- Charilaos Akritas

The following were promoted to the permanent (Dev.) post of Technician 1st Grade, with effect from 15.9.83.

- Droso Papageorghiou
- Anastasia Papageorghiou
- Irene Kyriakou
- Yiannoulla HjiProcopi

Panayiotis Skordis: To the permanent (Dev.) post of Executive Engineer I with effect from 15.10.83.

Demosthenis Antoniou: To the permanent (Ord.) post of Executive Engineer I with effect from 15.10.83.

The following were promoted to the posts appearing opposite their name.

- Nicos Philippides)	
- Andreas Phylaktou	)	To the permanent (Ord.) post of Technician 1st
- George Zachariou	)	Grade with effect from 15.6.83.
- Droso Papageorghiou)	
- Eleni I Nicolaou)	
- Anastasiou Papageorghiou)	
- Yiannoulla HjiProcopi)	
- Irene Kyriakou)	
- Eleni Chr Nicolaou)	
- Elpida Antoniadou)	
- Ioannis Antoniou)	
- Panayiotis Georghiou)	
- Nicos Charilaou	)	To the temporary (Dev.) post of Technician
- Leadros Markides	)	1st Grade with effect from 15.6.83.
- Loizos Nicolaou)	
- Nearchos Onisiphorou)	
- Yiannakis Achilleos)	
- Anastasis Aristotelous)	
- Charalambos Kountoureshis)	
- Fereniki Michaelidou)	
- Charalambos Anastasiou)	
- Georghios Frangoullides)	
- Petros Papageorghiou)	
- Andreas Papasavvas)	
- Christos Constantinides)	
- Christodoulos H Loizides)	
- Iacovos H Iacovou)	
- Thrasyvoulos Kallasides)	

Vlasis Partasides: To the permanent (Dev.) post of Executive Engineer I, on probation, with effect from 15.8.83.

Dr Stephanos Papatryphonos: To the permanent (Dev.) post of Hydrologist I with effect from 5.8.83.

Michalakis Chr Ioannou and Sotiris Paschalides: To the permanent (Ord.) post of Executive Engineer I, with effect from 15.8.83.

Petros Neophytides: To the permanent (Dev.) post of Topographer Irrigation Engineer with effect from 15.8.83.

The following Technicians 2nd Grade temporary (Dev.) were appointed to the permanent (Dev.) post of Technician 2nd Grade as from 15.9.83.

- Omiros Georghiou
- Charalambos Constantinou
- Michael A Michaelides
- Christos Theodorou
- Ioannis G Koulas
- Polyxeni Georghiou
- Andreas Demetriades
- Adamos Neophytou
- Ioanna Nicolaou
- Athinoulla Andreou

The following Clerks 2nd Grade were appointed on a casual basis for the Vasilikos-Pendaskinos Project.

- Thelma Frangeskou as from 5.1.83
- Kalliopi Loutsiou as from 1.2.83
- Tasoulla Joseph as from 14.3.83

Miss Eleni Georgoudhi was appointed as Clerk 2nd Grade on a casual basis for the Southern Conveyor Project as from 19.12.83.

Emplacements

The following Clerks 2nd Grade, GCS, were emplaced on probation to the permanent (Ord.) post of Clerk 2nd Grade, GCS with effect from 1.7.83.

- Demetra Patsalidou
- Maroulla Theodorou

Promotions

The following were promoted as follows:-

Costas Georghiou and Stavros Pitsillides: To the permanent (Ord.) post of Senior Technical Superintendent with effect from 1.1.83.

Vrahimis Ioannou, Symeon Georghiou, Michael Antoniadis: To the permanent (Ord.) post Technical Superintendent with effect from 1.1.83.

Savvas Katsianis, Tefkros Tsangarides, Phaedon Stavrou, Andreas Theodorou, Sophoclis Nicolaou, Christodoulos Kyriakou: To the permanent (Ord.) post of Senior Technician with effect from 1.1.83.

Nicos Chrisostomou: To the permanent (Ord.) post of Senior Clerical Officer with effect from 1.2.83.

- George Petrocostas
- Spyros Stephanou
- Vassos Chr Socratous

Sophoclis Aletraris, Topographer Irrigation Engineer II temporary (Dev.) was appointed to the permanent (Dev.) post with effect from 15.8.83.

The following Executive Engineers II on Secondment to the temporary (Dev.) post were appointed to the permanent (Dev.) post of Executive Engineer II with effect from 15.8.83.

- Socratis Kountouris
- Andreas Chr Tjiakouris

Kyros Savvides, Chemist II temporary (Dev.) was appointed to the permanent (Dev.) post of Chemist II as from 15.8.83.

Demosthenis Antoniou, Executive Engineer II on unestablished basis was appointed to the permanent (Ord.) post of Executive Engineer II as from 15.8.83.

Photios Photiou, Topographer/Irrig. Engineer II temporary (Dev.) was appointed on probation to the permanent (Dev.) post of Topographer/Irrig. Engineer II as from 15.8.83.

The following Foremen who were holding the temporary (Dev.) post, were appointed to the permanent (Ord.) post of Foreman with effect from 15.9.83.

- Nicolas Louca Christou
- Sophoclis Christou

The following Foremen who were holding the temporary (Dev.) post, have been appointed to the permanent (Dev.) post of Foreman with effect from 15.9.83.

- Chrysanthos Commatos
- Savvas Papapanteli
- Georghios Socratous
- Stelios Eracleous
- Kyriacos Markou
- Iacovos Constantinou
- Pambos Diplaros
- Savvas Nicolaou

The following Executive Engineers II temporary (Dev.) were appointed on probation to the permanent (Ord.) post of Executive Engineer II as from 15.9.83.

- Fros o Germanou Louca
- Ermioni Kouzouli
- Stavros Aletras

- Andriana Sevastidou
- Margarita Malekkou
- Maria Ermolaou
- Panayiota HjiLoizou
- Charalambos Ioannides
- Ioannis Kousettis
- Myrianthi Michaelidou
- Maria Karaoli
- Theonitsa Constantinou
- Polyxeni Michaelidou
- Andreas Constantinou
- Kyriaki Arminiotou
- Constantia HjiDemetriou
- Ivi M Constantinidou
- Maria Ioannou

Georgoulla Chrysostomou was appointed to the temporary (Dev.) post of Executive Engineer II, with effect from 22.7.83.

The following were appointed on probation to the permanent (Dev.) post of Technician 2nd Grade with effect from 22.7.83.

- Takis Hepis
- Nicolaos Stratis
- Kyriaki Ph Panayiotou
- Diamanto Theophanous
- Georghios Constantinou
- Panayiotis Christodoulides
- Yiannakis Markou
- Georghios Neophytou
- Neophytos A Neophytou

Charalambos Kyriakides was appointed to the permanent (Ord.) post of Counsel of the Republic in the Law Office with effect from 15.8.83.

Pantelis Eliades, Executive Engineer II, temporary (Dev.) was appointed to the permanent (Dev.) post of Executive Engineer II with effect from 15.8.83.

Constantinos Hadjisavva, Mechanical Engineer II temporary (Dev.) post was appointed to the permanent (Dev.) post of Mechanical Engineer II on probation with effect from 15.8.83.

The following Executive Engineers II temporary (Dev.) were appointed on probation to the permanent (Dev.) post of Executive Engineer II with effect from 15.8.83.

TABLE I-5

STATEMENT OF REVENUE COLLECTED

DURING THE YEAR 1983

Description	£
Drilling charges	31
Nicosia water supply	1 117 280
Paphos Irrigation Project.....	204 390
Central WS system -	
Nicosia - Larnaca - Famagusta	483 503
Village water supplies	32 045
Khrysokhou Irrigation Project.....	8 453
Other fees	89 240
Xyliatios Irrigation scheme	766
Total	<u>£1 935 708</u>

For construction works budget-expenditure tables see under chapter VI CONSTRUCTION DIVISION.

STAFF MATTERS

Appointments

The following Foremen who were holding the temporary (Dev.) post, have now been appointed to the permanent (Dev.) post of Foreman with effect from 1.1.83.

- Costas Avlonitis
- Andreas Eleftheriou
- Aristotelis Constantinou
- Andreas Riris
- Georghios Mamantos
- Michael Petrides
- Andreas Koutsoullis
- Christodoulos Stephanou
- Yiannis Papadopoulos

Christophoros Georghiades was appointed to the permanent (Ord.) post of Administrative Officer, general administrative staff with effect from 1.2.83.

Andreas I. Theodosiou was appointed to the permanent (Ord.) post of Administrative Officer, general administrative staff with effect from 1.6.83.

The following Clerks 2nd grade were appointed to the permanent (Ord.) post of Clerk 2nd Grade, GCS with effect from 1.7.83.

Summary

	£	%
Amount approved	3 351 476	100
Less actual expenditure	2 569 992	76.68
Balance	<u>£781 484</u>	<u>23.32</u>

TABLE I-4

WDD DEVELOPMENT BUDGET
STATEMENT OF MONTHLY
EXPENDITURE FOR THE YEAR 1983
(Not including village loans)
Head 2D Water Development

	£
1983 Approved	8 480 018
Add Special Warrants	3 985 565
Total	<u>£12 465 583</u>

Month	Monthly expenditure £	Cumulative expenditure £	%
January	228 188	228 188	1.83
February	1 279 889	1 508 077	12.09
March	555 123	2 063 200	16.55
April	797 940	2 861 140	22.95
May	421 527	3 282 667	26.33
June	836 600	4 119 267	33.04
July	688 728	4 807 995	38.57
August	524 771	5 332 766	42.77
September	573 753	5 906 519	47.39
October	1 205 374	7 111 893	57.05
November	828 281	7 940 174	63.69
December	2 743 840	10 684 014	85.70

Summary

	£	%
Amount approved	12 465 583	100
Less actual expenditure	10 684 014	85.70
Balance	<u>£1 781 569</u>	<u>14.30</u>

(ii) Breakdown of Irrigation, Drainage and Dams

	Government £	Village £	Total £
1 Minor irrigation works	208 148	98 906	307 054
2 Consultants fees	14 212	-	14 212
3 Paphos Irrigation Project	1 294 193	-	1 294 193
4 Vasilikos - Pendaskinos Project	5 003 438	-	5 003 438
5 Southern Conveyor Project	874 299	-	874 299
6 Khrysokhou Irrigation Project	824 982	-	824 982
7 Other major waterworks	223 759	93 007	316 766
8 M'ce of dams & distribution system	424 053	-	424 053
Total	<u>£8 867 084</u>	<u>£191 913</u>	<u>£9 058 997</u>

TABLE I-3

WDD ORDINARY BUDGET

STATEMENT OF MONTHLY

EXPENDITURE FOR THE YEAR 1983

Head 20A Water Development

	£
1983 Approved	3 326 689
Add Special Warrants	24 787
Total	<u>£3 351 476</u>

Month	Monthly expenditure £	Cumulative expenditure £	%
January.....	106 066	106 066	3.16
February	122 501	228 567	6.82
March	156 630	385 197	11.49
April	160 732	545 929	16.29
May	192 921	738 850	22.04
June	197 624	936 474	27.94
July	199 912	1 136 386	33.90
August	176 820	1 313 206	39.18
September	273 586	1 586 792	47.34
October	210 774	1 797 566	53.63
November.....	276 753	2 074 319	61.89
December	495 673	2 569 992	76.68

Ser No.	Details	E x p e n d i t u r e			Total £
		Government Ordinary £	Development £	Village (Loans) £	
9	Hydrology	-	171 408	-	171 408
10	Surveys & investigations ..		149 928	-	149 928
11	Purchase of machinery and equipment	-	14 102	-	14 102
12	Stores	9 854	-	-	9 854
13	Others	-	5 042	-	5 042
14	Save water campaign	-	23 190	-	23 190
	Total	£2 569 992	£10 684 013	£513 243	13 767 248

B Non-budgeted Votes

1	Pitsilia Project				1 824 185
2	Refugee housing estates				379 302
3	Works for other Government Departments				238 932
4	Works for private developers				165 620
5	Works through village deposits				61 372
	Total				£2 669 411
	Grand total				£16 436 659

(i) Breakdown of Administration

	Ordinary £	Development £	Total £
1 Personal emoluments	887 486	614 414	1 501 900
2 Gasual technical assistance ...	-	132 604	132 604
3 Travelling	6 913	60 993	67 906
4 M'ce & operation of motor transport	9 108	-	9 108
5a Office expenses	8 251	5 919)	17 605
5b Purchase of drawing materials .	-	3 435)	
6 Government water supply	10 146	-	10 146
Total	£921 904	£817 365	£1 739 269

The level of construction works carried out during 1983 was again at all time record expenditure amounting to £12,654,747 from WDD and other votes. See table VI-1 under CONSTRUCTION DIVISION.

The largest single item of expenditure was Vasilikos-Pendaskinos Project at £5,003,438.

Loan Proceeds

The situation regarding loans is as follows:

Description of loans	Amount with- drawn during 1983 £
- Loan No. 1658/5 CY (IBRD) US\$11,000,000 for VPP	798 575
- Loan No. 158 KUWAIT FUND KD2,500,000 for VPP	1 131 535
- Loan No. 1.1572.00 EUROPEAN INVEST. BANK ECU's9,000,000 for VPP	827 584
- Loan No. 76.65.045 KREDITANSTALT FUR WIEDERAUFBAU DM10,000,000 for Rural Project	90 559

Revenue

A sum of £1,935 708 was collected during the year 1983 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 1983

Ser No.	Details	E x p e n d i t u r e			Total £
		Government Ordinary £	Development £	Village (Loans) £	
A	WDD Votes				
1	Administration	921 904	817 365	-	1 739 269
2	Greater Nicosia WS scheme running expenses	665 155	-	-	665 155
3	Nicosia-Larnaca-Famagusta, Central WS system (formerly styled Famagusta WS scheme)	478 503	-	-	478 503
4	Regional village WS schemes running expenses	60 461	-	-	60 461
5	Irrigation, drainage and dams	424 053	8 443 031	191 913	9 058 997
6	Town water supplies	-	561 245	-	561 245
7	Village water supplies	-	498 702	321 330	820 032
8	Drilling and prospecting ..	10 062	-	-	10 062

was established. During 1983 the National Committee was composed of the following:

Chairman

C St Lytras, Director, WDD

Secretary

E Kambourides, Executive Engineer I, WDD

Members, Ex-officio

The Representative of the Ministry of Interior. The Managers, Nicosia, Limassol, Famagusta and Larnaca Water Boards.

The Cyprus National Committee of the IWSA exchanged regular correspondence with the Head Office of the Association relative to its activities.

MEETINGS OF THE DIRECTOR WITH THE STAFF

Several meetings were held during the year under the chairmanship of the Director 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 and the District Administration were also held during the year.

FINANCE EXPENDITURE AND REVENUE

During the year 1983 the total actual expenditure by the Department from WDD budgeted and other non-budgeted votes amounted to £16,436,660 out of a total budget of £20,206,632.

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 1983

Description	Budget £	Expenditure £
WDD Development Estimates		
including loans		
Govt.: £12,465,583		10 684 014
Loans: 593,158	13 058 741	<u>513 243</u>
		11 197 257
WDD Ordinary Estimates	3 351 476	2 569 992
Non-budgeted votes for Pitsilia Project, refugee housing estates, works for other Government Departments, private developers and village deposits	<u>3 796 415</u>	<u>2 669 411</u>
Total	£ 20 206 632	£ 16 436 660

The thirty fourth (34) International Executive Council Meeting combined with a meeting of the Working Team, with a total of one hundred and fifty seven delegates from twenty nine countries and thirty eight delegates representing FAO and the World Bank took place in Melbourne's Hilton International Hotel and the Dallas Brooks Centre, Melbourne, Australia from the 25th September-1st October 1983.

Following the Working Team's meetings and the Executive Council Meetings the delegates had the choice of one of two study tours between the 2nd of October to 6th October 1983. The working team's meeting lasted for three days and one day was spent on the Special Technical Session, papers being delivered among other on the following topic:

- Landscape features, soil and climates of Irrigated Regions in South-Eastern Australia
- Salinity Mitigation strategies at the regional level
- Micro-Irrigation in Australia
- Micro-Irrigation Management
- Micro-Irrigation Design

The Executive Council meeting were on the following:

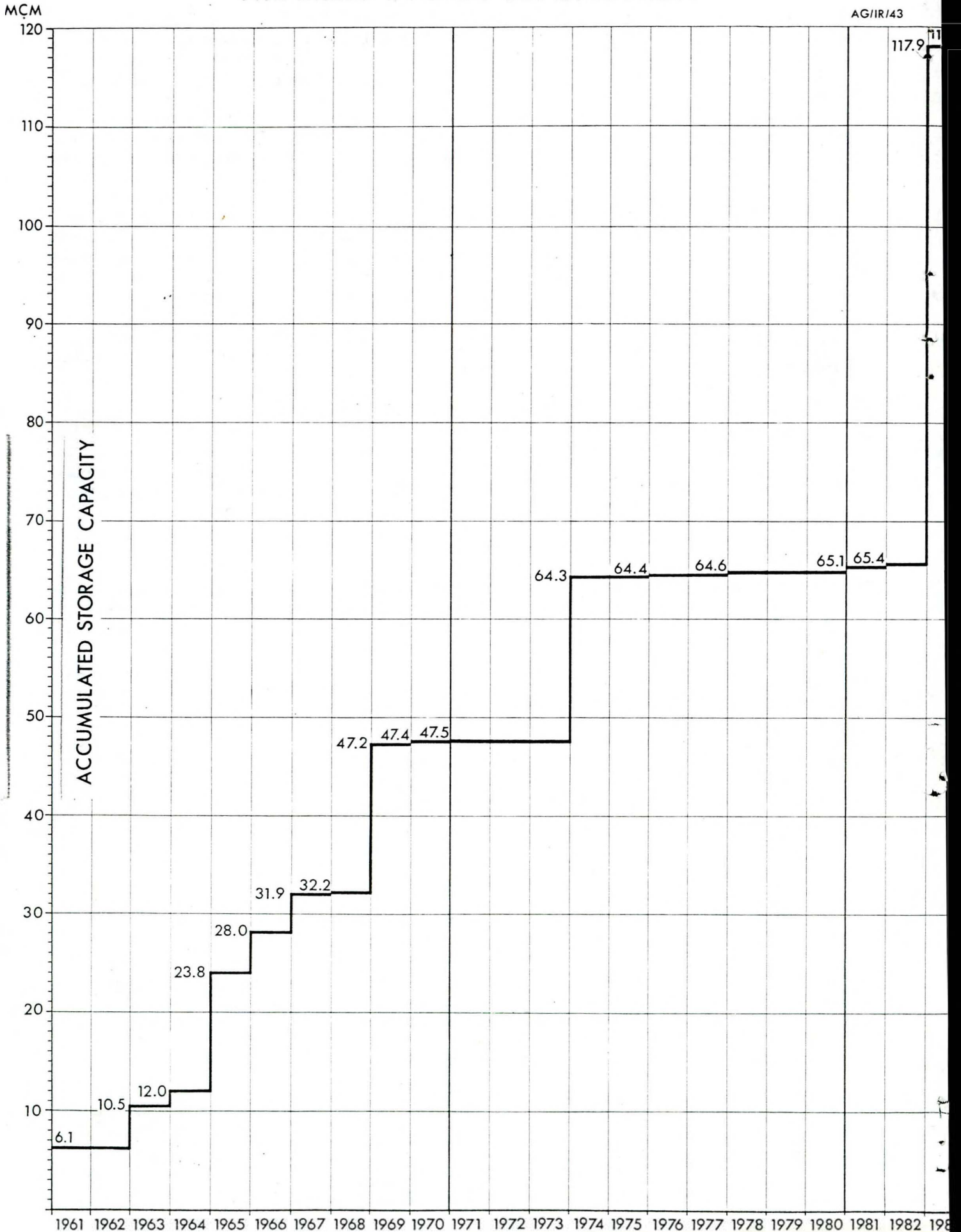
- (i) Passing the condolences resolution on the sad passing away of President Honoraire R Darves - Borno on 28 December 1982 and Mr Helmut Schleifer, Chairman Australia National committee.
- (ii) Admittance as participating Countries of the People Republic of China and Madagascar.
- (iii) Adopted an amendment to the constitution and the By-Laws
- (iv) Passed the statement of the accounts for the calendar year 1982 and approved the budget for 1983.
- (v) Accepted the invitation of the Australia National Committee to the fifth-Afro-Asian Regional Conference in Australia.
- (vi) Elected three vice presidents.
- (vii) Agreed to organize as ICID's contribution to the "International Year of Peace 1986" a special session on "Water for Food and Peace" in 1986 at the Executive Council meeting in Pakistan.
- (viii) The thirteen congress of ICID to be held in Morocco in 1987 will have its central theme "Improving Water Management in Developing Countries".

Unfortunately Cyprus did not participate in the activities mentioned above and its contribution and participation was limited to the interchange of information.

International Water Supply Association

The Department of Water Development was an associate member of the International Water Supply Association (IWSA) until 1969. Late in 1969 a National Committee

PROGRESS IN DAM CONSTRUCTION



AG/IR/43

Chr Marcoullis, Senior Water Engineer, Head, Design Division, WDD A Papadopoulos, Representative of the Association of Civil Engineers and Architects.

The post of the Representative of the Association of Building Contractors remained vacant.

The 51st Executive Meeting of ICOLD was held in London, England between 31st August and 3rd September 1983. Unfortunately the Cyprus National Committee was not represented at this meeting.

No committee meetings were held during the year but the secretary continued the exchange of correspondence with the Central Office of ICOLD in Paris and its technical committees and has both received and supplied technical information on dams and related subjects. The Departmental Technical Library has been enriched by the addition of several recent ICOLD publications.

The 52nd Executive Meeting will be held in Tokyo, Japan between 29 May and 1st June 1984. The Meeting will be preceded by a Study Tour in Korea and will be followed by study tours to various dams in Japan.

International Commission on Irrigation and Drainage

The International Commission on Irrigation and Drainage is a non-profit organization whose objectives are to stimulate and promote the development and application of the science and techniques on irrigation, drainage, flood control and river training in the engineering, economic and social aspects. The ICID was set up in 1950 with Central Office in New Delhi, India.

Membership to the ICID totals now 80 National Committees with the admission of the National Committees of the China's People Republic and Madagascar. Cyprus is a member country of the ICID since 1954 and the Cyprus National Committee in its present form was established in 1964. The Cyprus National Committee is now composed of the following:

Chairman

C St Lytras, Director, WDD

Secretary

N Tsiourtis, Senior Water Engineer, WDD

Members, Ex-officio

Director, Department of Forests

Director, Department of Agriculture

Director, Agriculture Research Institute

During the year 1983 the Cyprus National Committee continued the exchange of information with the central office of ICID and other National committees. All publications such as six-monthly bulletins, annual reports and other documents which were received from the Central Office of the ICID or elsewhere were distributed to all members of the CNCID.

In the year under review the following activities of the ICID took place:

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	FOUN-DATION	HEIGHT ABOVE LOWEST POINT OF CREST (m)	LENGTH OF DAM (m)	VOLUME OF DAM CONTENT (10 ³ /m ³)	GROSS CAPACITY OF RESERVOIR AREA (10 ³ /m ²)	P U R T O S E	MAXIMUM DIS-CHARGE CAPACITY OF SPILL-WAYS (m ³ /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	I	65	L	Government & Palekhorri Irr. Div.	W D D	J & P Cyprus	26	
27	ARAKAPAS	1975	Limassol	Limassol	Limassol	PG	R	23	97	10	129	I	I	205	L	Arakapas Irr. Div.	W D D	W D D	27	
28	AYI VAVATSIINIAS No1	1980	Larnaca	Larnaca	Larnaca	TE	S	17	125	32	55	I	I			Palambella-Mosphi mouth Irr. Div.	W D D	Iacovou Bros, Cyprus	28	
29	EPHTAGONIA No1	1980	Limassol	Limassol	Limassol	TE	S	16	390	46	92	I	I			Kokkinoyia Irr. Div.	W D D	Iacovou Bros, Cyprus	29	
30	KHANDRIA	1980	Limassol	Limassol	Limassol	TE	S	35	82	41	70	I	I			Kambos tou Paphiti Irr. Div.	W D D	CYBARCO Ltd.	30	
31	MELINI	1980	Limassol	Limassol	Larnaca	TE	S	22	116	32	59	I	I			Melini Irr. Div.	W D D	Iacovou Bros, Cyprus	31	
32	PELENDRIA	1980	Limassol	Limassol	Limassol	TE	S	18	229	59	123	I	I			Amnos Irr. Div.	W D D	FYSCO, Cyprus	32	
33	AKAPNOU-EPTHAGONIA	1981	Limassol	Limassol	Limassol	TE	S	18	280	67	132	I	I			Akapnou - Epthagonia Irr. Div.	W D D	Iacovou Bros, Cyprus	33	
34	AYI VAVATSIINIAS	1981	Larnaca	Larnaca	Larnaca	VA	R	19	58	2	53	I	I			Palambella-Mosphi mouth Irr. Div.	W D D	W D D	34	
35	KATO MYLOS	1981	Limassol	Limassol	Limassol	TE	S	23	240	41	104	I	I			Valera Irr. Div.	W D D	Phoenix Constructions, Cyprus	35	
36	AGRIDHIA	1982	Limassol	Limassol	Limassol	TE	S	18	119	25	59	I	I			Klados Irr. Div.	W D D	Iacovou Bros, Cyprus	36	
37	ASPROKREMMOS	1982	Paphos	Paphos	Paphos	TE	R/S	56	700	2097	51000	I	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	273	I	I			Phterika Irr. Div.	W D D	Iacovou Bros, Cyprus	38	
39	XYLIATOS	1982	Nicosia	Nicosia	Nicosia	ER	R	42	155	240	1250	I	I	100	L	Government	W D D	General Construction Co Cyprus	39	
40	LAGOUDHERA	C(1983)	Nicosia	Nicosia	Nicosia	TE	S	36	123	63	96	I	I			Axousa Irr. Div.	W D D	Joint Venture Phoenix Constr. & KYKON, Cyprus	40	
41	AYI VAVATSIINIAS No2	C(1983)	Larnaca	Larnaca	Larnaca	TE	S	25	130	30	43	I	I			Petalia - Palovato Irr. Div.	W D D		41	
42	DHERONA	C(1983)	Limassol	Limassol	Larnaca	TE	S	24	167	59	159	I	I			Dhiastera Irr. Div.	W D D		42	
43	KHIROKITIA	C(1983)	Larnaca	Larnaca	Larnaca	TE	S	16	460	95	205	I	I			Irr. Div. to be set up	W D D		43	
44	DHYPOTAMOS	C(1985)	Larnaca	Larnaca	Larnaca	ER	R	49	390	1090	15000	S/I	I	1130	L	Government	Rofe, Kennard & Lapworth & W Evans & Partners, U K		44	
45	KALAVASOS	C(1985)	Larnaca	Larnaca	Larnaca	ER	R	57	482	1700	17000	I/S	I	1268	L	Government	Rofe, Kennard & Lapworth & W Evans & Partners, U K		45	
46											875									46
47																				47
48																				48
49																				49
50																				50

FOOTNOTES: *3 Concrete cut-off wall 29m deep below lowest foundation
W D D : Water Development Department

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 SEALING ELEMENT	POSITION AND NATURE OF SEALING ELEMENT	HEIGHT ABOVE LOWEST FOUNDATION (m)	LENGTH OF CREST (m)	VOLUME CONTENT OF DAM (10 ³ /m ³)	GROSS CAPACITY OF RESERVOIR AREA (10 ³ /m ²)	P U R P O S E	MAXIMUM DISCHARGE CAPACITY OF SPILLWAYS (m ³ /s)	TYPE OF SPILLWAYS	OWNER	ENGINEERING BY	CONSTRUCTION BY	S E R No
			RIVER	NEAREST CITY	STATE PROVINCE OR COUNTRY													
1	KAFIZES	1953	Xeros/Morpi	Nicosia	Nicosia	PG	R	23	27	4	113	I	54	L	Lefka Irr. Div.	W D D	W D D	1
2	KANDOU	1956	Kouris	Limassol	Limassol	PG	R	15	53	2	20	I	59	L	Kandou Irr. Div.	W D D	W D D	2
3	PERAPEDI	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	Katouris	Nicosia	Nicosia	PG	R	22	66	5	285	I	125	L	Pyrgos Irr. Div.	W D D	W D D	4
5	TRIMIKLINI	1958	Kouris	Limassol	Limassol	PG	R	33	76	6	30	I	59	L	Trimiklini Irr. Div.	W D D	W D D	5
6	ATHALASSA	1962	Pedhieos	Nicosia	Nicosia	TE	R/S	18	447	103	791	I	48	L	Government	W D D	W D D	6
7	GEUNYELI	1962	Pedhieos	Nicosia	Nicosia	TE	R/S	15	254	50	230	I	173	L	Geunyeli Irr. Div.	W D D	W D D	7
8	LEFKA	1962	Marathasa	Nicosia	Nicosia	PG	R	35	149	11	276	I	246	L	Lefka 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	PRODHROMOS	1962	off stream	Limassol	Limassol	TE	R/S	10	756	73	480	I	—	L	Prodhromos Irr. Div.	W D D	W D D	10
11	KANLI KEUY	1963	Pedhieos	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	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	14
15	LIOPETRI	1964	Potamos	Famagusta	Famagusta	TE	S	18	579	50	360	R	150	L	Liopetri Irr. Div.	W D D	W D D	15
16	MIA MILEA	1964	Pedhieos	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	Xeros	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	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	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	20
21	MAVROKOLYMBOS	1966	Mavroko-lymbos	Paphos	Paphos	TE	R/S	45	528	267	2180	I	340	L	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	21
22	POMOS	1966	Livadhi	Paphos	Paphos	ER	R	38	302	153	175	I	300	L	Pomos Irr. Div.	Energoprojekt of Yugoslavia	Med. Constr. Greece - G P Zachariades Cyprus	22
23	YERMASOYIA	1968	Yermasoyia	Limassol	Limassol	TE	R	49	409	539	83	I	850	V	Government	Energoprojekt of Yugoslavia	CYBARCO of Cyprus	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	24
25	MASARI	1973	Serrakhis	Nicosia	Nicosia	TE	S	15	929	245	650	I	622	V	Government	W D D	W D D	25

FOOTNOTES W D D : Water Development Department
 Irr. Div. : Irrigation Division

rural and town domestic water supply and water resources to deal with issues arising from our involvement with the IDWSSD and as a focal point for the Decade activities. The committee consists of the following WDD officials.

Chairman

C St Lytras, Director

Secretary

E Kambourides, Executive Engineer I, WDD

Members

Dr Christodoulou, Principal Water Engineer, WDD

D Kypris, Senior Hydrogeologist, WDD

C Andreou, Senior Water Engineer, WDD

C C Artemis, Senior Water Engineer, WDD

The IDWSSD was launched in 1981 with the main theme of "clean water and adequate sanitation for all by 1990". In launching the decade the Member States of the United Nations recognized that drinking-water and sanitation services are essential for the full development of man as an individual and as an integral part of society and that all people, whatever their stage of development or socioeconomic conditions are, have right of access to those services in the quantity and quality required for their basic needs.

A main activity of the Decade is the Project and Programme Information System which aims to offer Government an option for increased external support for the Decade.

International Commission on Large Dams

The International Commission on Large Dams (ICOLD) is a non-profit seeking organization with 70 member countries. As set out in its constitution: "The objects of the Commission are to encourage improvement in the design, construction, maintenance and operation of large dams by bringing together information thereon and by studying questions relating thereto".

The Cyprus National Committee on Large Dams (CYNOLD) was elected to full membership of ICOLD in 1969. During 1983 the National Committee was composed of the following:

Chairman

C St Lytras, Director, WDD

Secretary

C C Artermis, Senior Water Engineer, WDD

Members

Dr C A Christodoulou, Principal Water Engineer, Head, Planning Division, WDD

DAMS CONSTRUCTED UP TO 1960

No	DAM	TYPE	HT	1000m ³	YEAR
1	Kouklia	Earth	6	4,545	1900
2	Lymbia	Gravity	5	18	1945
3	Lythrodhonda	Gravity	11	32	1945
4	Kalokhorio (K)	Gravity	9	82	1947
5	Akrounda	Gravity	7	23	1947
6	Golimi	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	455	1955
12	Gypsos	Earth	3	100	1955
13	Kandou	Gravity	15	34	1956
14	Perapethi	Gravity	22	285	1957
15	Pyrgos	Gravity	22	285	1957
16	Trimikliti	Gravity	33	340	1958

Total Storage Capacity 6,174 m³ x 10⁶

MINOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m ³	YEAR
47	Sotira	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	1964
55	Avgorou (7)	Earth	3	68	1966
56	Kandea (2)	Earth	5	82	1966
57	Xylaphaghou (4)	Earth	7	86	1966
58	Sotira (4)	Earth	5	32	1966
59	Lysi	Earth	7	77	1967
60	Ay. Yeoryios (9)	Earth	3	68	1967
61	Ay. Epikitos (6)	Earth	6	34	1968
62	Akanthou (6)	Earth	6	45	1968
63	Akhna (3)	Earth	4	40	1968
64	Xylotymbou (5)	Earth	5	50	1969

Total Storage Capacity 1,075 m³ x 10⁶

MAJOR DAM PROJECTS FROM 1981-90

No	DAM	TYPE	HT	1000m ³	YEAR
76	Ephragonia No.3	Earth	10	65	1981
77	Akapnou-Ephragonia	Earth	9	132	1981
78	Kato Mylos	Earth	10	104	1981
79	Ephragonia No.2	Earth	8	127	1982
80	Arakapas	Earth	10	192	1982
81	Asprokremmos	Earth	53	51,000	1982
82	Xyltiatos	Rockfill	42	1,250	1982
83	Agriidhia	Earth	10	59	1983
84	Kyperounda	Earth	10	270	1983
85	Lagouthera	Earth	10	71	1983
86	Ora	Earth	10	62	1983

Total Storage Capacity 53,332 m³ x 10⁶

MAJOR DAM PROJECTS FROM 1960-70

No	DAM	TYPE	HT	1000m ³	YEAR
17	Prodhromos	Earth	10	122	1962
18	Morphou	Earth	13	1,879	1962
19	Lefka	Gravity	35	368	1962
20	Geunyeli	Earth	15	1,045	1962
21	Athalassa	Earth	18	791	1962
22	Karali Keuy	Earth	19	1,113	1963
23	Argaka	Rockfill	41	1,150	1964
24	Mia Mitha	Earth	22	355	1964
25	Ovgos	Earth	16	845	1964
26	Kiti	Earth	22	1,614	1964
27	Agros	Earth	26	99	1964
28	Liapetri	Earth	18	340	1964
29	Polemithia	Earth	45	3,864	1965
30	Ayia Marina	Rockfill	33	311	1965
31	Kalopanayiotis	Earth	40	391	1966
32	Mavrokolymbos	Earth	45	2,180	1966
33	Pomos	Rockfill	38	859	1966
34	Yermasoyia	Earth	49	13,600	1968
35	Syngrossis	Earth	7	1,115	1968

Total Storage Capacity 32,041 m³ x 10⁶

MAJOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m ³	YEAR
36	Ayios Yeoryios	Earth	6	90	1962
37	F. sta Antiflood	Earth	8	16.5	1963
38	Ayios Nikolaos	Earth	2	1,365	1964
39	Paralimni Lake	Earth	1	1,365	1964
40	Fresh Water Lake	Earth	3	4,545	1964
41	Makrasyka	Earth	8	195	1966
42	Akhna (Mesonia)	Earth	4	90	1967
43	Morphou spreeding grounds	Earth	5	130	1968
44	Ormidhia	Earth	5	100	1968
45	Vrysoulas	Earth	7	140	1969
46	Protapas	Earth	6	90	1970

Total Storage Capacity 8,275 m³ x 10⁶

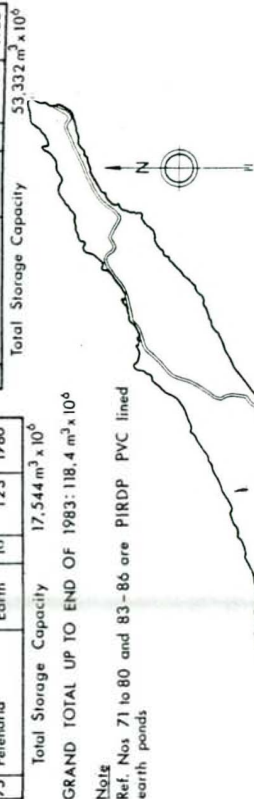
MAJOR DAM PROJECTS FROM 1971-80

No	DAM	TYPE	HT	1000m ³	YEAR
65	Lefkara	Rockfill	71	13,850	1973
66	Massari Recharge Dam	Earth	15	2,273	1973
67	Polekhorio-Kambi	Gravity	33	620	1973
68	Arakapas	Gravity	23	129	1973
69	New Lymbia	Gravity	12	220	1977
70	Ayji Vavatsinias	Arch	14	53	1980
71	Ayji Vavatsinias	Earth	10	55	1980
72	Ephragonia No.1	Earth	10	92	1980
73	Khandria	Earth	10	70	1980
74	Melini	Earth	10	59	1980
75	Pelenidria	Earth	10	123	1980

Total Storage Capacity 17,544 m³ x 10⁶

GRAND TOTAL UP TO END OF 1983: 118,4 m³ x 10⁶

Note: Ref. Nos 71 to 80 and 83-86 are PIRDP PVC lined earth ponds



DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
DAM PROJECTS
 DECEMBER 1983 DRG. No AG/IR/27

*Inundated by New Lymbia Dam See ref. No 69
 HT refers to height in meters from foundation
 YEAR is the year of completion
 Phrenaros (6) means six small dams in Phrenaros area

Chairman

C St Lytras, Director WDD

Secretary

I St Iacovides, Senior Hydrogeologist WDD

Members

The Director of :

Agricultural Research Institute

Department of Agriculture

Department of Forests

Geological Survey Department

Meteorological Service

During the year a number of questionnaires and data were completed and supplied to the IHP Secretariat at UNESCO Headquarters regarding on going activities of the programme.

Technical Assistance Research Programme of the International Atomic Energy Agency (IAEA)

The study that was initiated in 1982 with the title "Isotopes in Hydrology Kouris Delta" with I St Iacovides Senior Hydrologist as the chief investigator continued throughout 1983.

The objective of the study was to identify the part of the recharge due to the Kouris River as compared to that of the local rainfall, by using the variations in the stable isotopes of water, oxygen-18 and deuterium, in the groundwater of the Akrotiri Aquifer.

As part of the study and for evaluating the results, a tracer model was developed with the results being very compatible with those derived by the Akrotiri aquifer mathematical model.

This development led to the proposal for extending the project study so as to cover the whole Akrotiri Aquifer area in 1984 and 1985. The provision of a computing facility (microcomputer) for the needs of developing further both the tracer and groundwater models is being considered by IAEA.

In 1983 a down-the-borehole conductivity and temperature meter has been provided by IAEA for in situ monitoring of sea-intrusion in the coastal wells and boreholes worth about £3,500.

The National Action Committee for the International Drinking Water Supply and Sanitation Decade (IDWSSD)

The Cyprus National Action Committee for the IDWSSD was established within the Department in 1981 consisting of officers dealing with aspects of planning,

the sale of water amounted to £520,441. The total operation, maintenance and energy cost amounted to £611,946 and the subsidy of water on the O&M cost amounted to £91,505. The O&M expenses breakdown is as follows: Operation, £264,039 Maintenance £100,069 and energy cost £247,838.

Water available for utilization from contributory schemes was 3.75 MCM out of which 2.86 MCM was for the irrigation of 4,034 donums.

Recharge works in the Government controlled areas represent only 13.1% of the total recharge capacity available in Cyprus. In the year under review no water was collected in the recharge dams.

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 minor projects.

Legal Adviser

The Department of Water Development, of the Ministry of Agriculture and Natural Resources has been a pioneer in engaging on full time basis the services of a legal adviser. The appointment of legal advisers now in the Government machine is so widespread, that one may safely say that this has become an institution.

The duties of the legal adviser of the Department of Water Development vary and inter-alia consist of providing legal advice on numerous questions which arise from the day to day running on the Department in particular and the Ministry of Agriculture and Natural Resources in general.

The said legal advice may be oral or written and they may involve interpretation of contracts, laws, regulations circulars etc.

The legal adviser has been appointed as counsel of the Republic and he carries out all duties of the counsel of the Republic as he did in the past. That is to say he appears before the various Courts of the Republic of Cyprus and handles all kinds of actions and recourses in favour of and/or against the Republic including arbitration procedures.

Apart from these purely legal duties the legal adviser attends various meetings held in the Department or elsewhere and takes part in the proceedings or makes written contribution to such meetings. He drafts orders, regulations and amendments of laws, if necessary.

CYPRUS NATIONAL INTERDEPARTMENTAL COMMITTEES

International Hydrological Programme

The main purpose established for the IHP, which is the major component of UNESCO's Water Resources programme, is to develop a scientific and technological basis for the rational management of water resources, both as regards quantity and quality.

The Cyprus National Committee for the IHP consists of the following:

Khirokitia, Alethriko, Skarinou, Tokhni, Klavdhia and Menoyia areas and the Lefkara-Khirokitia, Khirokitia-Famagusta and Khirokitia-Nicosia conveyors.

The scheme 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 5.458 MCM. The quantity of water drawn from Yermasoyia and Lefkara Dams was 1.957 and 1.429 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 £430,068 and the revenue generated £801,440 (including outstanding accounts).

The town of Larnaca received 2,111,287m³ of water from the Central Water Supply System and the production of its own and leased sources was 502,100m³ totalling the water at its disposal to 2.613 MCM. This quantity could not meet the increased demand of the town and the Water Board of Larnaca had to impose restriction on the supply throughout the year under review.

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. The total production of water during 1983 was 7,902 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 99,457 m³.

The total quantity of water available to the town during the year was 1,293,881m³ which could not meet the increased demand and restrictions on the supply had to be introduced during the summer months.

Operation and Maintenance of Projects - Irrigation Works

The management of major irrigation works is done either by the WDD or by the Government Water Works 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 view the total available in all dams in Cyprus, in the Government controlled areas, amounted to 41.193 MCM. From this quantity 24.777 MCM were used for the irrigation of 49,712 donums, 3.831 MCM were used for domestic water supplies, 2.999 MCM were used for recharge, 0.823 MCM seeped through or below the dams and 3.524 MCM were lost as evaporation. The remaining 5.189 MCM were retained in the dams as over annual storage.

Water available for utilization from Government Projects reached the figure of 37.44 MCM. Out of this only 28.64 MCM was utilized, 21.81 MCM for irrigation 3.83 MCM for domestic water supply and 2.99 MCM for recharge. Irrigation water was utilized on 45,678 donums of land planted with citrus, bananas vines, deciduous, vegetables, potatoes, cereals and olives. The gross income from

Other significant works executed were for rural domestic water supply schemes (£820,833), water supply and sewage disposal for refugee estates (329,302), schemes undertaken for other government departments (£323,973), minor irrigation schemes (£307,054), water supply distribution networks for private developers of plots of land (£165,620) and other irrigation works (£316,764).

For the Southern Conveyor Project £874,298 was expended during 1983 mainly on pipes and fittings; for the Khrysohou Irrigation Project £824,982 including £800,000 advance payment to Evretou Dam Contractors.

The Division of Operation and Maintenance of Projects - Town Water Supplies 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.

Work on the second phase of the emergency schemes, which commenced in 1982, continued during 1983. By August 1983 the majority of the boreholes included in the emergency scheme were connected to the conveyors of the Nicosia and Central Water Supply System and put into operation. The total expenditure on emergency schemes during 1983 was £83,785 and the total quantity of water produced by all boreholes of the 1982/83 emergency schemes was 2289 MCM of water.

The total quantity of water produced in 1983 was 9129 MCM out of which 7460 MCM came from Government Sources and 1669 was purchased from private sources. Of the total production, the quantity of water delivered to the Nicosia service reservoirs was 8553 MCM. The remaining 0.576 MCM was partly consumed en-route by a number of villages, camps and industries connected to the system and partly unaccounted for.

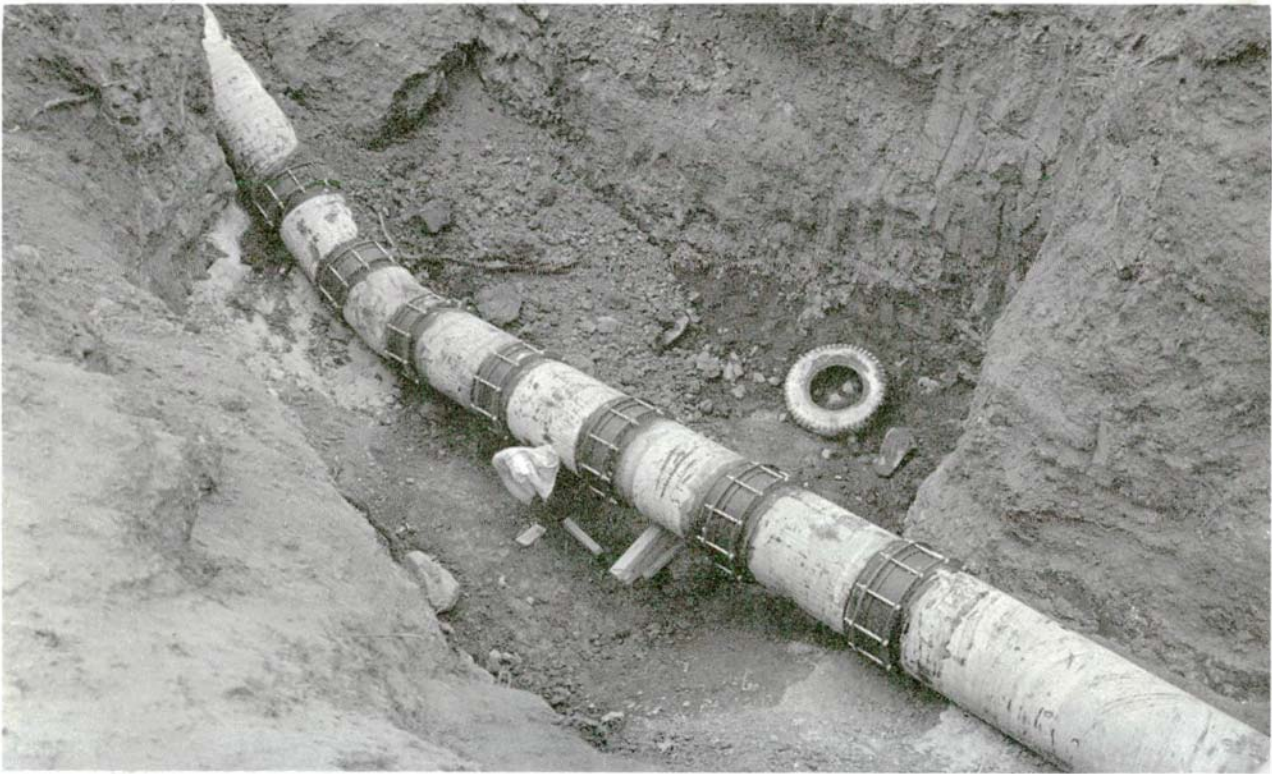
A further quantity of 0.453 MCM was produced from the sources of the Nicosia Water Commission.

The total quantity of water delivered to the Nicosia Water Board service reservoirs was 9.006 MCM and compared to the unrestricted demand of the town which is estimated, for 1983, at 13.13 MCM per annum there was a shortage of 4.13 MCM per annum, and restrictions on the hours of supply to Nicosia town were in force throughout the year.

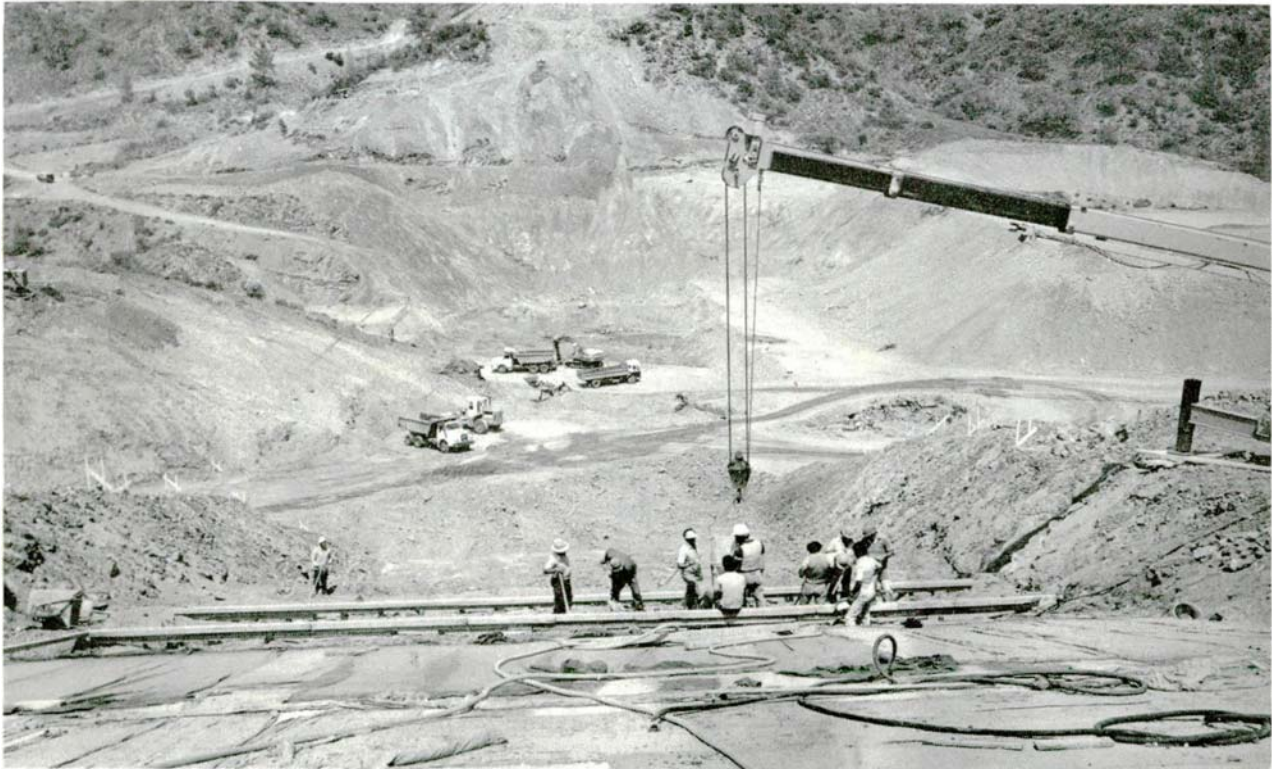
The total expenditure during 1983 for the operation and maintenance of all sources and conveyance systems supplying Nicosia town was £713,861 and the revenue generated from the sale of water was £1,042,973, including outstanding accounts.

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 and Yermasoyia Dam - which was connected to the system in 1983, as its main sources of water, Vasilikos Subsurface Dam and a number of boreholes at Psematismenos,



Relocation of Lefkara-Khirokitia pipeline at Dhyptomamos.
WDD Photo D54-5 (19.4.83)



Dypotamos dam. View of left abutment and concreting
grout cap at right abutment in foreground.

WDD Photo D66-12 (6.7.83)

have been completed. The joint venture J & P - MEDCON completed the last item of Asprokremmos dam (Power Station). G P Zachariades completed the installation of the western area irrigation network. Minor construction works out of contract were executed by the Water Development Department and are expected to be completed gradually up to the end of 1985.

1983 was the first year during which the whole Paphos Project was put in to operation by the WDD covering all project areas between Kouklia and Ayios Yeorios as well as supplies to the irrigation areas of Mavrokolymbos Dam. The last portion of the western area was handed over by the contractor to the Department and put into operation in June 1983. For the irrigation of 7,950 donums of permanent plantations and about 13,650 donums of seasonal crops 8,680,000 cubic meters of water from the project boreholes and river flow from Dhiarizos and Ezousa and 745,000 CM from Mavrokolymbos dam was utilised. The diverted flows were fed into the main canal.

Pitsilia Integrated Rural Development Project (PIRDP) entered its fifth full year of construction in 1983. It features second in construction expenditure in 1983 reaching £1,824,185 as compared with £1,759,881 in 1982. So far the total expenditure on water development works in the Pitsilia Project has reached the figure of £6,563,410.

1983 has been a year of intensive activity in the sector of water development in the Pitsilia area. This sector of development has absorbed the vast majority of funds allocated for the Pitsilia Integrated Rural Development Project, which is financed by the International Bank for Reconstruction and Development (IBRD).

During the year the activities were continued on the construction of ponds, distribution systems, boreholes schemes, rehabilitation schemes and domestic water supply schemes.

In addition work was continued on the Xyliatos dam distribution system, which will cover an area of 2,300 donums, and is expected to be completed early in 1984.

The Pitsilia Integrated Rural Development Project is expected to be completed by mid 1984 and as it has already been mentioned it will cover 49 villages. It is expected that the original target in the sector of water development as laid down at the commencement of the project will be overwhelmingly covered.

The construction programme for 1983 included 108 schemes of various types for the Pitsilia project. Thirtyeight of these schemes were ponds and their distribution systems, 3 schemes were for the Xyliatos dam and its distribution systems, 16 were boreholes schemes, 19 were village water supply schemes, 29 were rehabilitation schemes and 3 were sundry works.

Town water supplies expenditure during 1983 was £550,533 spent on Nicosia borehole emergency schemes, the Kouris Delta, scheme for Limassol water supply and the Yermasoyia-Vasilikos pipeline to the central water supply system feeding Nicosia, Larnaca, Famagusta and numerous villages.

Vasilikos-Pendaskinos Project features first on the construction expenditure for 1983 with £5,003,438 out of which a sum of £1,203,368 was for Dhypotamos dam, £2,314,036 was spent for Kalavastos dam, £228,833 for Kornos Treatment Plant and £156,267 for consultant's fees.

Indicative results suggest that 70 per cent of the recharge is due to the Kouris flows and the remainder from local rainfall.

The Maroni gypsum aquifer was under close observation due to the enlargement of the sinkholes affecting the safety of part of the village. The declining water levels and the flow of the Maroni river during the year resulted to the reactivation of the sinkhole area. Measures have been taken to evaluate the recharge and divert the river elsewhere without affecting the water-balance of the aquifer.

Due to the reduced content of the Yermasoyia and Polemidhia dams in early 1983, 9 existing boreholes in the Kouris Delta plus 3 newly drilled were incorporated in the scheme for irrigation after the potential of the area was assessed and the effect of such pumping was simulated by using the Akrotiri groundwater model. The performance of the aquifer was monitored throughout the year.

For the same reason, a total of 6 new boreholes were sited, drilled and pump-tested in the areas of Omonia and Garyllis wellfields for the needs of the Limassol Water Supply.

The Yermasoyia wellfield was replenished through, fully controlled and monitored, releases from the Yermasoyia dam. During 1983 some 4.6 MCM were pumped for the needs of the Limassol Water Supply whilst some 3 MCM were released from the dam. The natural treatment of surface water through the gravel aquifer is fully utilized.

Hydrological information obtained through these releases are being used together with hydrogeological data for formulating a groundwater model of the aquifer.

Planning and Design of Projects

During the year under review planning and design was concentrated on the Southern Conveyor Project, the Khrysokhou Irrigation Project and the Pitsilia Integrated Rural Development Project.

A team of WDD staff worked with consultants Sir William Halcrow and Partners on the detailed design of the 120km long main conveyor of the Southern Conveyor Project, the Akhna Dam where water will be conveyed from Kouris Dam and the Kokkinokhoria distribution network design. By the first half of the year SOGREA had finished the design of Kouris Dam.

A loan agreement was signed in May 1983 with the World Bank for the construction of the first phase of the Khrysokhou Irrigation Project. The award for the construction of Evretou Dam, the main water source for the Khrysokhou Project was decided at the end of the year.

The Division of Design continued with the planning and design of irrigation schemes for the Pitsilia Project as well as schemes for Solea valley and the design for dams at Vizakia and Akaki-Malounda.

Construction of Projects

Construction expenditure of the Department during 1983 reached £12,654,747 as against £9,863,081 in 1982. (See table VI-I under DIVISION OF CONSTRUCTION).

During the year 1983 all works under contract on the Paphos Irrigation Project

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 1982 - 1983 averaged 436mm which 82% of normal. The total precipitation amount during the period ranged mainly between 75% and 95% of normal except for part of the eastern Troodos slopes and the area of Larnaca where they ranged between 60% and 70% of normal.

The maximum amount of rainfall in a 24-hour period was 108.5mm reported by Alona village rainfall station of 22nd May 1983.

The first snowfall occurred on Mount Olympus, the highest peak of Troodos mountain range, on the 8th November 1982 and the last snowfall on the 17th April, 1983.

The air temperature was slightly below normal. The extreme maximum temperature was 41.0°C reported by Nicosia town climatological station on the 5th August 1983 and the extreme minimum temperature was -7.0°C reported by Amiandos on 6 March 1983.

As extracted from the available data the maximum annual evaporation measured from a USWB pan was 2175mm reported by Larnaca Airport synoptic station and the minimum annual evaporation was 1598mm reported by Saittas climatological station.

The Division of Hydrology which was established in 1982, continued in 1983 in the formulation of methodology and processing of hydrogeologic data with the aim of providing the Department with 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 water resources. Appraisal of the exploitation and development of water resources and its consequence as to quantity and quality as well as management and conjunctive use of surface and groundwater resources is carried out through mathematical models.

Both the Engineering Hydrology and the Groundwater Hydrology Branches continued to evaluate, update and revise water resources data for the need of the Southern Conveyor Project. The Kouris River flows were updated and the effect of the Kouris Dam on the Akrotiri aquifer was evaluated by use of calibrated mathematical models through the use of computer. The conjunctive use of surface, SCP water and the envisaged available groundwater at Kokkinokhoria area were studied to enable the design of the irrigation distribution system. All the aquifers within the SCP area were continued to be monitored and water-balance studies were carried out.

In respect to other studies, the runoff of the watersheds between Karyotis and Peristerona was processed and evaluated in anticipation of a major feasibility study.

The effect of the construction of a major dam on Kouris and the reduction of recharge on the Akrotiri Aquifer is being studied through the use of radioisotopes through the technical and financial assistance of the International Atomic Energy Agency.

(i) Experts - Paphos Irrigation Project

B Milinusic, FAO Senior Irrigation Engineer continued his services as Project Manager of the Paphos Irrigation Project upto 30.6.83.

(ii) Experts - Vasilikos - Pendaskinos Project

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

BRITISH TECHNICAL ASSISTANCE

Southern Conveyor Project

Dr R J Grimble Argoeconomist, expert from UK Ministry of Overseas Development (ODA) worked with Cypriot staff with the World Bank mission during April - May, for the finance of the project.

CONSULTANTS EMPLOYED BY THE DEPARTMENT

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

SOGREAH, Grenoble, France for the design and supervision of Paphos Irrigation Project distribution and conveyance systems.

Sir M MacDonald and Partners, Cambridge, England for the design and supervision of construction of Asprokremmos Dam, Paphos Irrigation Project.

SOGREAH in association with Hydroconsult, Nicosia for the final design and contract documents of Kouris dam, Southern Conveyor Project.

Sir William Halcrow and Partners, Swindon, England in association with Balfours, London for the design and contract documents 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, Phase II.

Sir William Halcrow and Partners in association with A Prastitis and Associates, Nicosia for the detail design and contract documents of Evretou Dam, KWIP.

SUMMARY OF ACTIVITIES

Water Resources

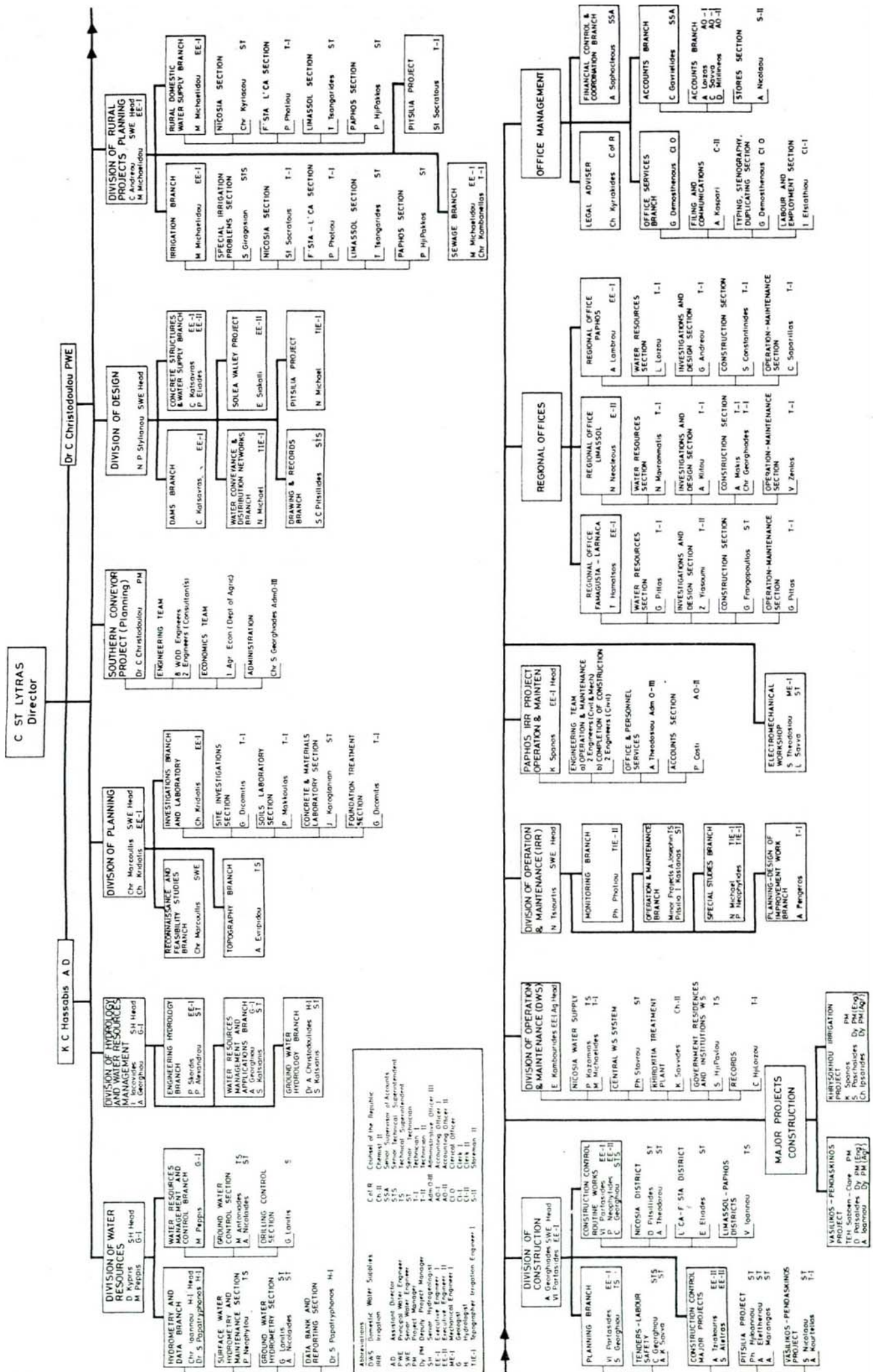
The collection and evaluation of hydrological data continued through 1983 especially with reference to the requirements of the major projects.

The general conclusion obtained from their study of 61 river flow gauging stations is that the flow in most of them was well below normal. The same picture prevailed with regard to groundwater recharge where a general drop of all important aquifers was observed.

TECHNICAL STAFF OF WDD ON 31.12.1983

DRG No BM/G/212

TECHNICAL STAFF		D	AD	PW	SWE	SH	EE	ME	Geo	H	CH	TIE	STS	TS	ST	T	CF	ACF	F	TOTAL	REFERENCE
1	Permanent Ordinary Staff	1	1	1	6	2	15	1	2	2			4	8	22	73	4	9	40	191	D
2	Permanent Development Staff						10	1		2	1	4			3	40	2	9	17	89	AD
3	Temporary Development Staff						5									13				18	PWE
4	Casual Staff						10									49				59	SWE
	TOTAL NUMBERS	1	1	1	6	2	40	2	2	4	1	4	4	8	25	175	6	18	57	357	SH
DISTRIBUTION OF STAFF																					
5	DIRECTORATE	1	1																		
	i Water Resources Management					1		1	2				2	2	17				1	26	H
	ii Hydrology					1	1	1	1				2	2	3					9	CH
	iii Planning									1	1	1	1	1	22			1		30	TIE
	iv Design					1	3	3							20					25	STS
	v Construction					1	4	4					1	2	8	7	3	3	9	38	TS
	vi Rural Projects Planning					1	1	1					1	4	4	1				12	ST
	vii Operation & Maintenance (DWS)						1	1					1	2	2				4	11	T
	viii Operation & Maintenance (Irrig)					1					2	2	1	1	3	1				9	CF
	i Paphos Irrigation Project (PIP)						5	1							12		1			19	ACF
7	Major Projects						7				1				1					10	F
	ii Southern Conveyor Project (SCP)		1																	19	
	iii Vasilikos - Pendaskinos Project (VPP)						6								11	1		1		19	
	i Regional Office, F/st - L/ca						1							1	5			1		8	
8	Regional Offices						1								16		2	13		32	
	ii Regional Office, Limassol						1								21		1	5		28	
	iii Regional Office, Paphos						1								1	2	2	4		10	
9	Services							1													
	i Mechanical and Electrical Services																				
<p>Note: Pitsilia Project staff are listed under construction division which is also involved with VPP</p>																					
10	Various Postings					1*	1*									3*				8	
11	Vacancies						3		1				1	1	3	25		8	19	61	
	TOTAL NUMBERS	1	1	1	6	2	40	2	2	4	1	4	4	8	25	175	6	18	57	357	



WATER DEVELOPMENT DEPARTMENT-ORGANIZATION CHART 31.12.1983

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 computers are widely used in these studies.

The Division of Design which deals with the preparation of detailed designs and contract documents and specification 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.

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

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 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 in particular and the Ministry of Agriculture and Natural Resources in general are being referred to the Legal Adviser of the Department for scrutinization, advice and/or action.

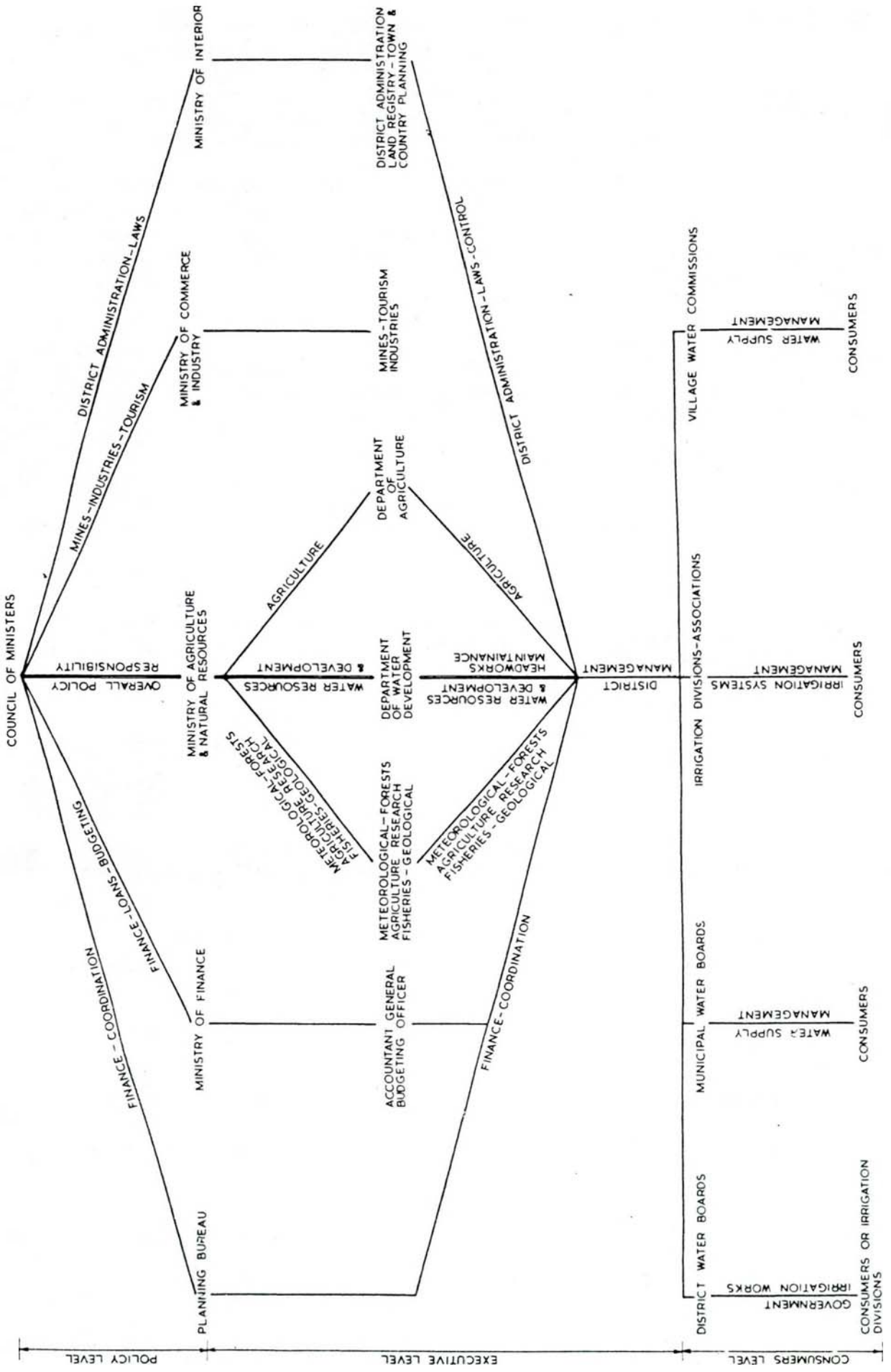
These legal matters are multiform and may involve inter alia, amending laws, handling cases in courts, attending meetings and so on.

FOREIGN TECHNICAL ASSISTANCE

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

United Nations

Technical assistance received from United Nations during 1983 was:



WATER DEVELOPMENT - ORGANIZATION CHART

The second phase includes the extension of the irrigated area from Limni mines to Pomos, adding another 1000ha 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 into Evretou Dam (Magounda, Yialia, Livadhi). No decision has been taken as to the completion of the final designs and implementation of the second or the third phase.

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 Yiolou mainly, to irrigate 1000ha net of land. Another 2000ha 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 undertaken also the design and construction of sewerage and sewage disposal works.

The Government institutional set up for water resources conservation and development and the role of the Department of Water Development is shown on page 8.

A reorganisation of the Department was carried out at the end of 1982 involving mainly two Divisions. The Division of Water Resources which was split into a) the Division of Water Resources management and b) the Division of Hydrology. Similarly the Division of Operation and Maintenance was split into a) the Division of Operation and Maintenance (DWS) and b) the Division of Operation and Maintenance (Irrig).

The Departmental Organisation is shown on page 10 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 new Division of Hydrology which is responsible for the evaluation of the surface and groundwater resources and their present and future management.

Main Conveyor: This 110km long pipeline of diameters ranging from 1400mm down to 800mm will convey the stored water at Akhna reservoir.

Akhna Reservoir: A 16m high earthfill embankment dam 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 area at times of peak irrigation demand to supplement flows in the main conveyor and thus reduce the size of pipeline otherwise required.

Kokkinokhoria Distribution Network: will cover an area of 5125ha.

The construction of the Project will begin in 1984, with the construction of Kouris Dam.

The installation of the main conveyor is expected to commence in 1985. At the end of the year under review the Construction Division of the Department started the laying of a length of 2.5km 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.

The cost of Phase I of the Project is estimated to reach the amount of £100 million.

THE KHRYSOXKHOU 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 4200ha 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 2000ha (net) of land in the Khrysoxhou valley mainly from the dam to the coast, except for an area of 150ha in the Sarama valley where water requires pumping. Elsewhere irrigation will be done by gravity; water will be conveyed through a main conveyor of maximum diameter 900 mm to 4 overnight storage ponds and a break pressure tank, from there 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 the dam will start in January 1984, and will cost about £9 million. It will be completed in 1987 with the first water impoundment expected to start early in 1986. The dam is of earth-rockfill type with clay core.

The final designs of the irrigation networks and conveyor are scheduled to be completed by the end of 1984 and construction is expected to start in 1985 and completed by mid 1987. In some areas the network will be ready for the irrigation season of 1986 to take advantage to the impoundment of the dam.

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

In addition to the 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 ground water scheme that will extract water from the Khrysoxhou river aquifer. The World Bank has financed the 1st phase with a loan of \$16 million.

The land consolidation scheme includes a length of 30km of farm roads. Agriculturists of the 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 for KD2.5 million from the Kuwait Fund for Arab Economic Development and the third from the European Investment Bank of 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) 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 estimated as about 27 million Cyprus Pounds.

Major Projects in the Detailed Design Stage

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.

In aiming to devise a socially and financially acceptable and economically viable scheme the SCP will promote irrigated farming development in the south coastal region between Limassol and Famagusta that would benefit most from the Project. In addition the SCP 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, and also supply the needs of tourists.

Following a pre-appraisal by a World Bank mission in Cyprus and because of the large size of the Project and its high financial cost, it was decided to implement the Project in two phases.

Phase I will cover the irrigation requirements of Kokkinokhoria and domestic water demands until 1993, when Phase 2 is expected to come into operation.

Phase I includes the construction of the Kouris Dam, the main conveyor, the Akhna Dam and the Kokkinokhoria Irrigation System. In 1992 just before the operation of Phase 2 the Project is expected to supply 33 MCM of which 17 MCM for irrigation at Kokkinokhoria and around 16 MCM will satisfy domestic demands. The construction of Phase I is expected to be completed in 5-6 years.

The main works of the Project are as follows:

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 110m high. The 5km long reservoir will have a surface area of 360ha.

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 the Nicosia, Larnaca and Famagusta water supplies.

The main components of the project as it stands now, are:

- Kalavassos 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 Kalavassos Dam comprising, main conveyor, break pressure tank, and pipeline network covering an area of about 765 hectares net (Vasilikos Irrigation Scheme),
- A conveyance and distribution system for irrigation from Kalavassos Dam covering an area of about 215 hectares net in the area of Maroni village,
- A conveyance and distribution system for irrigation from Dhypotamos dam covering an area of 295 hectares net (Pendaskinos Irrigation Scheme),
- A conveyance system comprising main conveyor (common with that from Kalavassos Dam up to the break pressure tank), pumping station at Tokhni and balancing reservoir at Khirokitia to convey water from Kalavassos 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 reservoirs 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 Nissou.

A quantity of 8.95 MCM of water will be allocated per year for the irrigation of a area of 1275 ha, mainly citrus and vegetables, a further quantity of 7.00 MCM per year 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 765 ha of land belonging to Kalavassos, Mari, Zyyi, Tokhni and Psematismenos,
- The Pendaskinos area of 295 ha of land belonging to Ayios Theodoros and Skarinou and
- The Maroni area of 215 ha of land belonging to the homonymous village.

Land consolidation has been carried out in three areas of the project.

- Maroni for an area of 140 ha
- Kalavassos-Tokhni for an area of 243 ha
- Zyyi, Psematismenos-Maroni for an area of 120 ha.

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 Project beneficiaries are 3500 farm families (mostly small owners), 980 landless families (as seasonal labour) and 320 landless families leasing government land.

The permanent plantations which are planned to be developed in the project are citrus (47%), avocado (7%) table grapes (8%) bananas (5%) and deciduous fruit trees (5%). The seasonal crops will be vegetables (21%) and summer garden produce (7%).

The Project is financed by the Government of Cyprus and the World Bank which has financed 77% of the foreign exchange component of the project i.e. \$14 million US dollars, based on the 1973 estimate which was US\$18.2 million.

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT (PIRDP) is a multipurpose project the main component of which is water development but which includes roads, education, health, agricultural extension services and research, loan facilities for agriculture etc.

The main objective of the PIRDP, is the stimulation of the economically depressed until now, mountaineous region of Pitsilia thus raising the standard of living of the 21,000 inhabitants of some 50 villages of the region and checking the population drain to the towns.

The total cost of the PIRDP has exceeded £10 million of which \$10 million represent a loan from the World Bank.

Construction of the water development works started in 1978 and will be completed early in 1984 at a total cost of about £7 million.

The water development component of the project consists of:

- One earth-rockfill dam at Xyliatos of 1.25 MCM water capacity for the irrigation of an area of 308 ha of land.
- One small concrete gravity arch dam at Ayii Vavatsinias of 0.054 MCM capacity belonging to Ayii Vavatsinias irrigation scheme.
- 19 PVC lined off-stream earth ponds of a combined capacity of approx. 2 MCM for the irrigation of 495 ha of land.
- 20 borehole irrigation schemes for the irrigation of an area of 479 ha.
- Rehabilitation of numerous small irrigation schemes involving an area of approx. 250 ha.
- Domestic water supplies for various villages of the region.

The ponds are fed with water from diversion weirs which have been constructed on nearby streams through diversion pipelines laid for this purpose. The ponds are filled during the winter and early spring months so that the water can be used during the dry summer months.

The main crops irrigated are vegetables, deciduous fruit trees, citrus and olives. Land Consolidation has been applied in some of the areas of the project and irrigation distribution networks have been constructed with farm hydrants reaching all farm holdings.

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.

All major components of the Vasilikos-Pendaskinos Project were under construction in 1983 including Kalavastos Dam, Dhypotamos Dam, Tokhni pumping station and Kornos water treatment plant. Expenditure during the year for VPP was just over £5 million.

1983 was the first year during which the Paphos Irrigation Project was put into full operation in the sense that the 5000 ha area of the project from Khapotami to Ayios Yeoryios (Peyia) is served by the project distribution network on an on-demand basis.

For Pitsilia Integrated Rural Development Project 1983 was the third full year of implementation involving the construction of Xyliatos Dam, several ponds and boreholes and their distribution networks and rehabilitation of irrigation and domestic water supply schemes of the region.

More emergency schemes were implemented during 1983 to meet the demand for drinking water for Nicosia, Larnaca and Famagusta, through the connection of new boreholes to the water supply systems of these towns. A greater measure of relief will come with the impoundment of water in the two dams of Vasilikos-Pendaskinos Project, under construction now and in the long term with the realisation of the Southern Conveyor Project.

There was again an all time overall record expenditure by the Department in 1983 rising to £16,436,660 as compared to £13,317,293 in 1982.

BRIEF DESCRIPTION OF PROJECTS

Major Projects Under Construction

THE PAPHOS IRRIGATION PROJECT (PIP) is the largest and most important project constructed by the Water Development Department. Its aim is the irrigation of 5000 ha of net irrigable land in the south western coastal plain of Cyprus on both sides of the town of Paphos. The water requirements for the irrigation of this area are estimated at 36 MCM/year and is provided by the Xeropotamos River flow (22 MCM) regulated at Asprokremos where an earth dam has been constructed, by the alluvial aquifers in the river beds of Dhiarizos, Xeropotamos (lower reaches only) and Ezousas (10 MCM) and the coastal calcarenite aquifer (4 MCM).

Construction of the civil works of the Project commenced in 1976 and the target date for its full completion was the year 1981 while irrigation supplies from the boreholes in the river aquifers were available to the adjacent areas of the Project where distribution networks were completed as early as 1979. The PIP was fully completed in mid 1983 and the total cost of the Project up to the end of 1983 reached the amount of £24,450,000.

The main items of the project are a) Asprokremos Dam with a 51 MCM capacity reservoir b) 24 boreholes c) the 12 km concrete lined trapezoidal canal, max. flow capacity 4.2 m³/s d) 14 pumping stations e) 41 km long main conveyor pipelines and canaletti and f) 540 km long irrigation distribution networks for all sectors of eastern and western areas.

The Land Consolidation Authority has carried out land consolidation of an area of 2350 ha in 8 villages of the region and by mid 1982 approx. 100 km of farm roads were constructed by the same authority. In addition 26 km of farm access roads were built by the PIP.

I GENERAL

Introduction

Significant developments in the activities of the Department during 1983 were:

Negotiations for loans for the implementation of the Southern Conveyor Project and the Khrysokhou Irrigation Project; work on the final designs and contract documents for supply and construction contracts for these two projects; continuation of construction works of the Vasilikos-Pendaskinos Project and the water development component of the Pitsilia Integrated Rural Development Project; last but not least the design and construction of emergency schemes for the augmentation of town water supplies, routine irrigation schemes and rural domestic water supply schemes.

During 1983 and for the ninth year running all activities of the Department were 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 north bar for communication through the good offices of the UN peace keeping force for the unified water supply of Nicosia.

Precipitation was around 80% of normal and flow recorded at most river gauging stations was well below normal due to low rainfall; as a result water accumulated in dam reservoirs was very low. A poor ground water recharge was also observed.

During 1983 it was decided to complete the Southern Conveyor Project in two phases. The first phase will include the construction of Kouris Dam, a 120 km conveyor to Kokkinokhoria, a balancing dam reservoir at Akhna and the distribution network for the Kokkinokhoria irrigation area. The second phase will include diversion of water from Dhiarizos river to Kouris Dam, irrigation networks to additional areas and domestic water supply systems.

With regard to Khrysokhou Irrigation Project, a loan agreement was signed in May 1983 with the World Bank for \$16 million for the construction of part of the project.

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Abbreviations

m	metre
mm	millimetre
MCM	Million Cubic Metres
m ³	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 1983 the value of the Cyprus £ on average (daily basis) was:-

\$.....	1.8993
£ st.	1.2510
DM.....	4.8325
Drachma.....	166.2699

