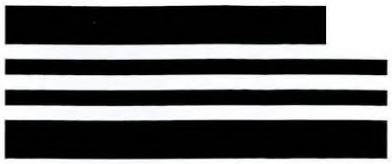

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Generic Process

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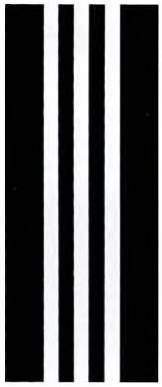

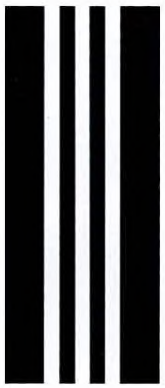

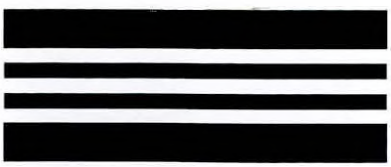

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Republic of Cyprus
Ministry of Agriculture and
Natural Resources

WATER DEVELOPMENT DEPARTMENT

ANNUAL REPORT 1980

Nicosia, November 1981

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ANNUAL REPORT 1980

C St Lytras, M Sc DIC B Sc – Director

Nicosia, November 1981

Published by the PIO
for the
Water Development Department
Ministry of Agriculture and Natural Resources.

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Abbreviations

m	metre
mm	millimetre
MCM	Milion 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

* The Cyprus pound was on par with £ sterling up to July, 1972. In 1980 the value of the Cyprus pound on average (daily basis) was:-

$.....	2.8327
£ st.	1.2172
DM	5.1213
Drachma ...	119.7386

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I GENERAL

Introduction

The year 1980 saw the continuation of intensive effort throughout the spectrum of activities of the Department ranging from day to day routine irrigation and rural domestic water supply schemes to inter-regional multi-million pound projects the full implementation of which, by the end of the century, will have made use of all major water resources of the government controlled areas of Cyprus.

During 1980 and for the sixth year running all activities of the Department were confined to the southern part of the Island due to the continued occupation of northern Cyprus by the invading Turkish troops, which, since the summer of 1974 have created a situation allowing no access or contact by Government Departments with the occupied north so that even unified hydrological studies have been disrupted thus inflicting irrepairable gaps in the hydrometeorological picture of the country.

Regarding the groundwater situation there has been a mixed development in the free areas of Cyprus. Whereas in some areas including Yialias and Akrotiri there has been a marked improvement other areas and especially the Kokkinokhoria area have deteriorated due to continuing over pumping of the aquifers.

Work continued throughout 1980 on the feasibility studies of two major projects namely that of the Southern Conveyor Project in the south and the Khrysokhou Watershed Irrigation Project in the northwestern part of the Island. Preliminary reports were submitted to the Government during the year under review for both projects giving development options for study by the Government. Feasibility studies for the deve-

lopment options selected commenced immediately.

As in the previous year design work by the Design Division of the Department was mostly carried out for the Pitsilia Integrated Rural Development Project (PRDP), a multipurpose project in the mountainous central part of Cyprus. The water development component of the PRDP consists of several earth ponds and their irrigation schemes as well as a dam at Xyliatos.

A record expenditure was again reached this year amounting to £13,106,610 (1979 expenditure was £12,475,202). On construction works alone the expenditure rose to £9,389,027 with Paphos Irrigation Project accounting for nearly £5 million. Other prominent schemes were Nicosia Water Supply, just short of £2 million, Pitsilia Integrated Rural Development Project, a little below £1 million and rural domestic water supply schemes including refugee housing, just over £0.8 million.

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.

The Government institutional set up for water resources conservation and development and the role of the Department of Water Development is shown on page 3.

DEPARTMENT ORGANIZATION

The Departmental Organization is shown on page 4 and is made up of:

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

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, techno-economic 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. In this Division

the drawing and topographic functions of the Department are also incorporated.

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* which assists in the operation and maintenance of the major projects such as dams and town water supplies.

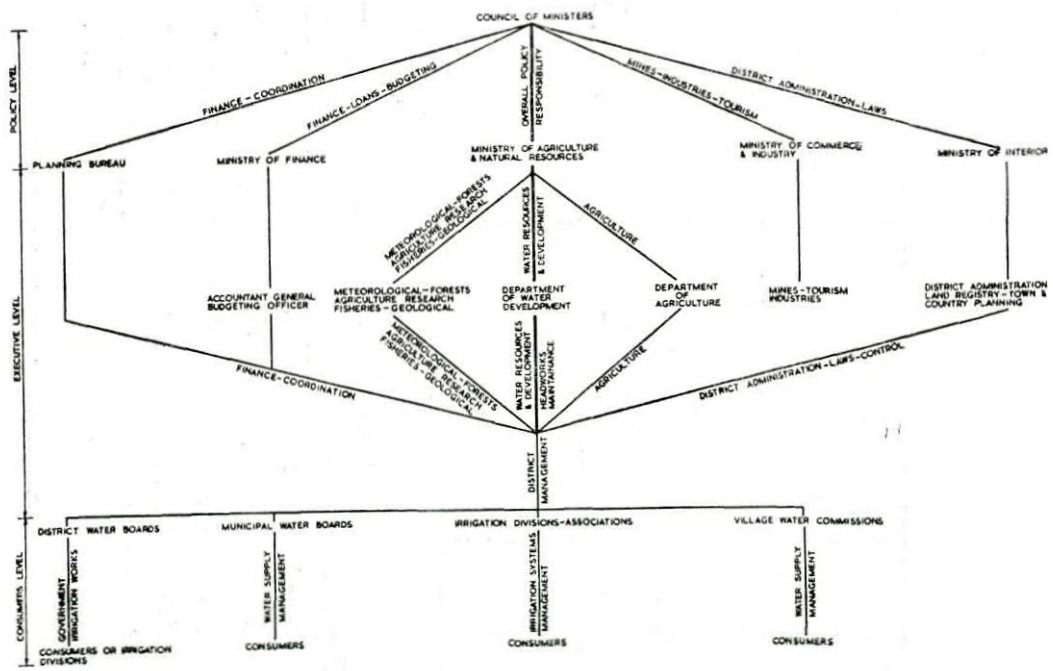
The *Division of Small Projects Planning* deals with the planning and designing of small irrigation and domestic water supply projects which are of a rather routine nature and do not need elaborate planning and design procedure.

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

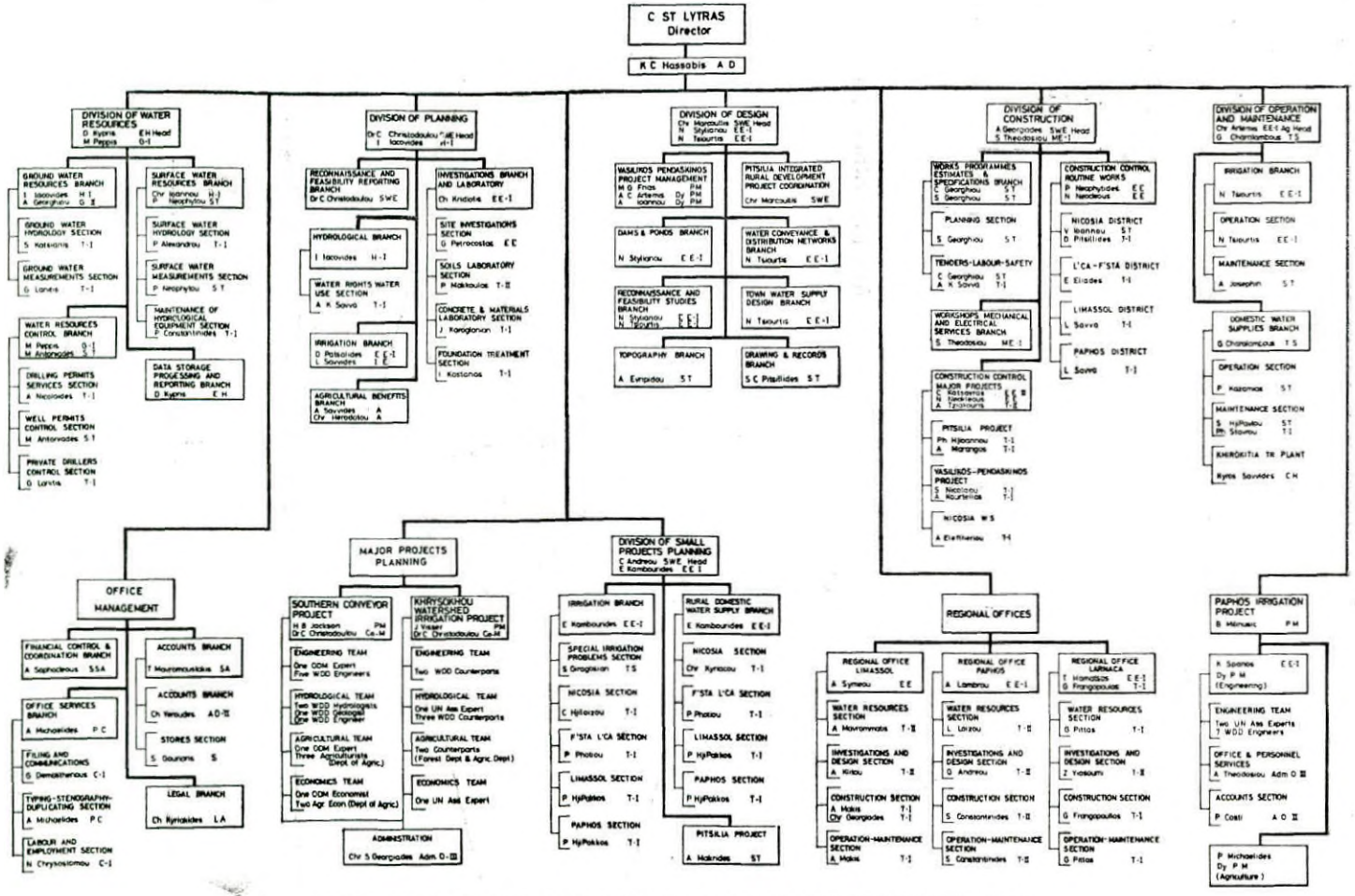
In these Regional Offices the main works carried out are:

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.



WATER DEVELOPMENT - ORGANIZATION CHART



WATER DEVELOPMENT DEPARTMENT- ORGANIZATION CHART-DEC 1980

Also a financial control and co-ondination branch is included which deals with financial aspects and control of expenditure.

Legal Matters

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 1979 was:

(i) Experts—Paphos Irrigation Project.

B Milinusic, FAO Senior Irrigation Engineer continued his services with us throughout the year as the Project Manager of the Paphos Irrigation Project.

T J Sytsema, FAO Associate Expert continued his services with Paphos Irrigation Project throughout 1980.

A A Metekoy, FAO Associate Expert was assigned to Paphos Irrigation Project as from November 1979.

(ii) Experts—Khrysokhou Watershed *Irrigation Project.*

By summer of 1979 the KWIP became

REORGANIZATION CHART 1980

TECHNICAL STAFF OF W. D. D. ON 31.12.1980

DRG. No. BM/G/206

	MONTHLY, DAILY AND ON CONTRACT TECHNICAL STAFF		D	AD	CWE	SWE	EH	EE	ME	Geo	H	CH	QS	TIE	TS	ST	T1	CF	ACF	T2		F	PR	TOTAL
1	Permanent staff		1	1	1	7	1	19	1	2	3			1	6	15	41	6	17	58		49		229
2	Temporary staff							11	1		1	1		3						38		9		64
3	Daily paid staff and on contract							5					2	1						38			1	47
	TOTAL NUMBERS		1	1	1	7	1	35	2	2	4	1	2	5	6	15	41	6	17	134		58	1	340
	DISTRIBUTION OF STAFF																							
4	Divisions	i Water Resources						1			1					2	5			15		3		27
		ii Planning						2									2		1	7				12
		iii Design				1		7						2		2	2	1		22				37
		iv Construction				1		3	1						1	3	9	3	6	4		18		49
		v Small Projects Planning				1		1							1	1	5			2				11
		vi Operation & Maintenance						1				1			2	2	1	1		1		5		14
		vii Paphos Irrig. Project						7	1								2			27				37
		viii Southern Conveyor Project				1		6		1	2			1						14			1	26
		ix Khrysokhou Project						2			2			1						2				7
5	Administration (Head Office)		1	1																1				3
6	Regional Offices (Limassol, L/ca & Paphos)							3									4		7	24		32		70
7	On Scholarship																			2				2
8	Vacancies					1	3		3					2	1	2	5	11	1	3	13				45
	TOTAL NUMBERS		1	1	1	7	1	35	2	2	4	1	2	5	6	15	41	6	17	134		58	1	340

REFERENCE	
D	Director
AD	Assistant Director
CWE	Chief Water Engineer
SWE	Senior Water Engineer
EH	Engineer Hydrologist
EE	Executive Engineer
ME	Mechanical Engineer
Geo	Geologist
H	Hydrologist
CH	Chemist
QS	Quantity Surveyor
TIE	Topographer Irrigation Eng.
TS	Technical Superintendent
ST	Senior Technician
T1	Technician 1st Grade
CF	Chief Foreman
ACF	Assistant Chief Foreman
T2	Technician 2nd Grade
PR	Programmer
F	Foreman

operational when offices in Nicosia and Polis had been established, the counterparts appointed and the field investigation programme established. The International staff members started their work in the period between September 1979 and February 1980.

J H Visser, FAO Water Resources Engineer, arrived in March 1979 as Project Manager of the Khrysokhou Watershed Irrigation Project.

JWF Cools, FAO Associate - expert Agro-economy. Continued his services with KWIP throughout the year.

A J Meulenbroek, FAO Associate-expert Hydrology. Continued his services with KWIP throughout the year.

R G Bloemers, FAO Water Resources Engineer. Transferred from Paphos Irrigation Project to KWIP as from 1.1.1980. He finished his assignment with KWIP on 31.12.1980.

M M Bral, FAO Economist, Assigned to KWIP as from 1st March 1980.

W van der Linden, FAO Associate - expert, Hydraulics Engineer. Assigned to KWIP as from 26th August 1980.

Consultants—KWIP

KWIP Project document provided for consultants in: Water Resources Systems, Irrigation Engineering, Dam Engineering and Geology and Hydrogeology. The following were assigned and continued their missions in 1980 as follows:

R M Doake, Dam Engineer. He is working with KWIP as from 14th March 1980 on the studies of two dams (Evretou and Ezousas) and the Uplands and Lowlands Water Conveyors, as part of the KWIP irrigation development scheme.

I M Goodwill, Consultant in Water Resources Systems: Continued his services with four missions totalling 12 weeks (January, March, August and September missions).

P Boyd, Consultant in Irrigation Engineering. He continued his visits to KWIP with 3 missions totalling 15 weeks (February, May and September missions).

E H Taylor, Consultant in Dam Engineering. Continued his visits to KWIP with 3 missions totalling 6 weeks to assist the KWIP dam engineers (March, June and September missions).

Dr J C Laming, Consultant in Dam Geology. He had 3 missions totalling 4 weeks to assist the KWIP Dam Engineers (March, June and September missions).

G P Kruseman, Consultant in Hydrogeology. He had 2 missions totalling 2 weeks to assist with the pumping test analyses (May and October missions).

All consultant missions are covered by appropriate mission reports, copies of which are available in the WDD library.

(iii) Experts—Vasilikos Pendaskinos Project.

M A Gutierrez Frias, FAO Expert was appointed Project Manager, Vasilikos - Pendaskinos Project as from February 1980.

BRITISH TECHNICAL ASSISTANCE

Southern Conveyor Project

Four experts, from U.K. Ministry of Overseas Development (ODM) continued throughout 1980 their work together with Cypriot staff on the preparation of a feasibility study for the Southern Conveyor Project.

They are:

J F Laurence * ..... Project Manager
M J Makin ..... Agriculturist
Dr R J Grimble ..... Agr. Economist
T J Kingham ..... Civil Engineer

* Up to the end of September 1980 when H B Jackson took over as Project Manager.

A detailed description of the work carried out during 1980 is given in chapter III of this report.

Consultants (SCP)

Dr B W Eavis, Irrigation Agronomist, of the Land Resources Development Centre (LRDC) ODA, visited the project from September 27 to October 3 and from June 23 to June 28 to assist on refining the computation of crop water requirements and of crop yield under conditions of water supply constraints.

M Beran and *Dr J Stewart,* Hydrologists, from UK Institute of Hydrology visited the project on 26 October for periods of 16 days and 13 days respectively to collect data for a review of the Kouris Dam hydrology and to advise on the flow sequences to be used for the SCP system studies. Their report is expected in January.

J L Beaver, Principal Engineer of Sir William Halcrow and Partners, UK, visited the project from December 5 to 12 to negotiate the terms of an agreement with his firm for the provision of engineering assistance to the SCP. This agreement was duly signed on December 11 and J L Beaver will return to Cyprus in early January to take over the responsibilities of the engineering work.

SUMMARY OF ACTIVITIES

Water Resources

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 for the hydrometeorological year 1979 - 1980 averaged 582 mm which is 109% of normal. Rainfall was generally above normal with the exception of a coastal strip from Zyyi to Larnaca, Xylophaghou and on to Famagusta which was 85 - 100% of normal. Similarly an area from Kykko to Troodos, Kakopetria, Kapoura, and on to Limassol was 90% of normal. Well above normal was an area from Pomos to Polis, Paphos town and on to Phasouri which was above 120% of normal as well as an area from Mos-

philoti to Kornos and on to Alethriko which was between 120—130% of normal. A pocket within this latter area, around Lythrodhonda was below normal.

The maximum amount of rainfall in a 24 hour period was 112.3 mm by Alaminos on 13th February 1980.

The first snowfall occurred on mount Olympus, the highest peak of Troodos mountain range, on the 28th of November 1979. The last snowfall occurred on the 14th of April 1980.

The air temperature was slightly below normal in most areas. The extreme maximum temperature was 45°C at Nicosia on the 26th and the 30th June 1980 and the extreme minimum temperature was reported to be -7°C at Prodhromos on the 2nd of March 1980.

The total annual evaporation from a USWB pan was 1824 mm at Athalassa and 1651 mm at Saittas.

Surface flows at most flow gauging stations were slightly above normal during 1979-80 due to above normal precipitation.

The maximum water accumulated in 31 dams under observation was 31.1 MCM or 73% of the total capacity of these dams which is 42.5 MCM. Twenty three of the dams overflowed, mostly in January and February of 1980.

Regarding the groundwater situation there was a marked improvement in the aquifers of Akrotiri and Yialias whereas in other areas the situation continued to be grave, especially in the Kokkinokhoria area due to over extraction of water from the aquifer.

PLANNING AND DESIGN OF PROJECTS

Planning was concentrated again on the studies for the Southern Conveyor Project and the Khrysokhou Watershed Irrigation Project.

Stage 1 of the feasibility study for the *Southern Conveyor Project* (SCP) was completed in 1980 and stage 2 involving the preparation of a detailed feasibility study of the option selected by the government was started. By the end of 1980 a British firm of Consulting Engineers was employed to undertake the engineering component of the feasibility study.

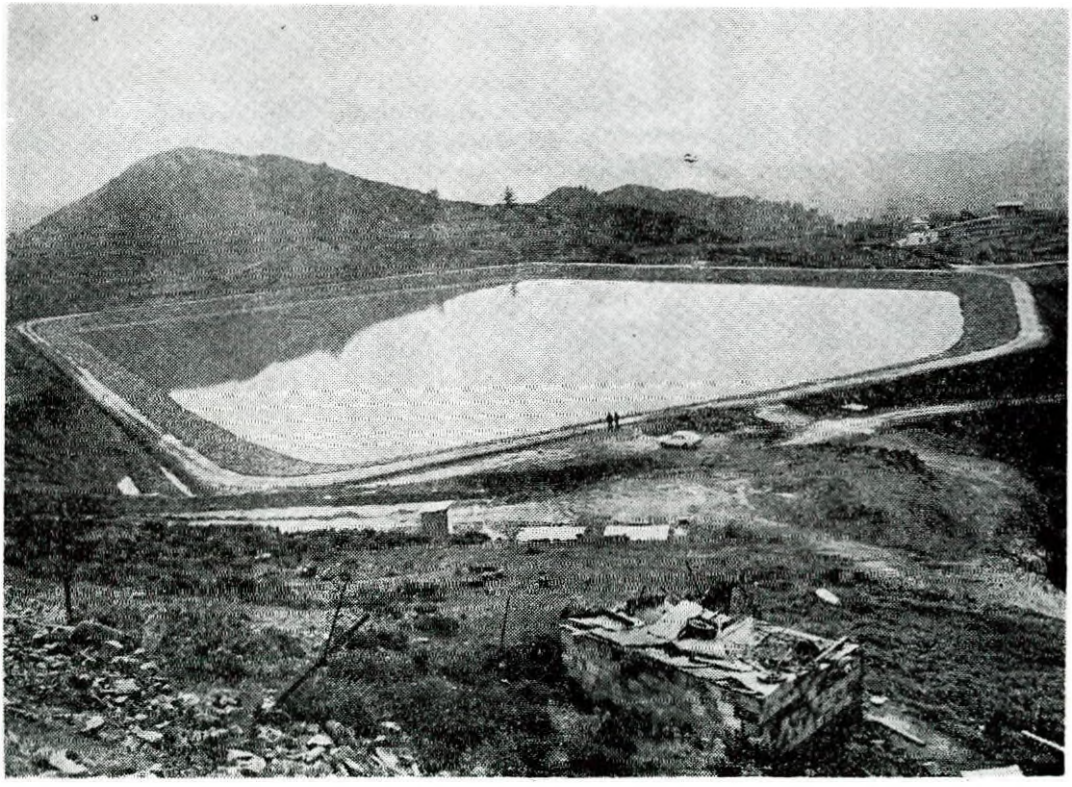
The Southern Conveyor Project study is being carried out with the cooperation of the UK Overseas Development Administration which has since the spring of 1978 provided the Project Manager and 3 experts to work with local staff of various expertises, on the various aspects of the study. The main water source of the SCP will be Kouris dam the design of which will be assigned to a foreign firm of Consultants in 1981.

The *Khrysokhou Watershed Irrigation Project* (KWIP) was initiated in the spring of 1979 with financial assistance from the United Nations Development Programme (UNDP). During 1980 a preliminary report was produced presenting 9 different options which were submitted to the Government. Work on the feasibility study of the option se-

lected commenced in September 1980 and will be completed by October 1981. The water source of the KWIP will be Evretou and Ezousas dams and 3 intakes to augment the water of existing dam projects in the northern coastal part of the project.

At the end of the year under review a British consulting firm was appointed to carry out the design of the components of the *Vasilikos - Pendaskinos Project.*

During 1980 the Design Division of the Department concentrated its efforts mainly on the feasibility studies, detailed design work and specification and contract documents for ponds and irrigation schemes for the *Pitsilia Integrated Rural Development Project.*



The construction of Pelendria polythene lined earth reservoir, of Pitsilia Integrated Rural Development Project, was completed in 1980 but the first impoundment was at the beginning of 1981. Pelendria Pond has a capacity of 123,000 m³ and is used to irrigate some 300 donums of which 50% will be deciduous trees and the rest potatoes, other vegetables and legumes. The expenditure for the construction of the pond was approx £120,000. WDD Photo C31-3 (6.2.81).

CONSTRUCTION OF PROJECTS

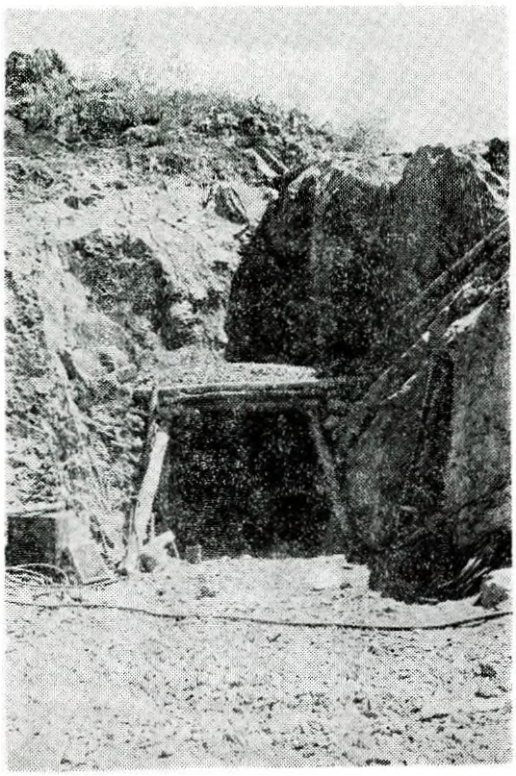
An all time record was reached again on water development works construction expenditure rising to £9,389,027 as against £8,819,836 in 1979.

By far the single biggest expenditure was for *Paphos Irrigation Project* which continued its construction works during 1980 at full swing aiming to complete its first phase (eastern area of the project) so that it will be fully operative by the beginning of 1981. Overall the progress has been satisfactory and the total expenditure for the year reached £4,939,839. The main activities continued on the Asprokremmos dam, the construction of the 14 pumping stations and the distribution systems of the eastern area. Due to the additional works on the Asprokremmos dam, arising from the geotechnical works full completion of the project will be delayed up to the middle of 1982 which will mean a delay on the operation of the second and final phase of the Project (western area) by one year. The total expenditure from the commencement of the construction of the project to the end of 1980 reached the sum of £16 million while the total revised cost estimate for full completion of the project was brought up to £24.6 million.

Nicosia Water Supply features second in construction expenditure reaching the sum of £1,917,110. Part of this expenditure (£267,742) was for the construction of the new Lakatamia reservoir which commenced in 1978 and will be completed in 1981, another part for Peristerona and Kokkini Trimithia BHs (£44,050) the remaining expenditure (£1,616,356) being for the Nicosia Water Supply (Phase A) component of the *Vasilikos - Pendaskinos Project* (VPP) which provides for the construction of a pump house at the Dhypotamos damsite and a pipeline to Nicosia with a balancing tank at Stavrovouni and a break pressure tank at Nisou. This scheme also provides for a temporary connection to Larnaca—Famagusta water supply system so as to enable Nicosia to draw any treated water surpluses (approx. 1 to 2 MCM/year) from the aforementioned system. Ultimately the 38 km long, 500 and 600 mm dia pipeline will be conveying water to Nicosia from Dhypotamos Dam and a water treatment plant which will be built at a later stage within the VPP enabling Nicosia to draw 5 MCM of water per year. The contract for the construction of Phase A was awarded to J & P of Nicosia and work commenced early in 1980. The total expenditure for this scheme will be approx. £3 million. This sum includes the cost of Dhypotamos PS being built by the Construction Division of the Department, the supply and installation of pumps the contract for which has been awarded to Mather and Platt of UK at a total cost of £355,000 and the value of pipes, pipe fittings, valves etc.

Pitsilia Integrated Rural Development Project entered the 2nd full year of construction in 1980 with an expenditure amounting to £881,326 mainly for the construction of earth ponds. Four ponds were completed and work on 6

others started in 1980. The Xyliatos dam the construction of which commenced in March 1980 will be completed in August 1982 at a total cost of approx. £1 million. The expenditure for this dam in 1980 was £253,822.



Work on the construction of Xyliatos rockfill dam, Pitsilia Integrated Rural Development Project started in March 1980 and will be completed in mid 1982 at a total cost of approximately £1 million. The water to be stored in this dam reservoir will irrigate some 2100 donums of citrus, olives, almonds, potatoes and other vegetables. The photograph shows the entrance of the diversion tunnel. This tunnel is 110.7 m long and has an elongated horse-shoe shape 2.40x2.40 m. Its excavation was carried out by controlled blasting and concrete lining commenced in October and by December 1980 more than 50% of the lining was completed. WDD Photo B100-7 (21.7.80).

Other major irrigation works were the *Pissouri Scheme* for which expenditure in 1980 rose to £33,926 and the Khrysokhou valley irrigation scheme from BHs for which £97,408 was spent in 1980.

On rural domestic water supplies and *water supply schemes for refugee housing and self housing estates* the expenditure for 1980 reached the amount of £820,797.

A total number of 28 *minor irrigation schemes* were constructed in 1980 at a total cost of £271,252.

Works undertaken for other Government Departments

During 1980 the Department undertook 49 schemes for construction for other Departments amounting to an expenditure of £238,383. Such schemes were mostly for the construction of water supply schemes for livestock farm areas and T/C villages.

OPERATION AND MAINTENANCE OF PROJECTS

Town Water Supplies

The amalgamation of the *greater Nicosia* "area of supply" with that of Nicosia Water Board "area of supply" was approved by decision No 18,720 of the Council of Ministers at its meeting on the 17 January 1980, with effect from

1 January 1980. Ever since the Department has kept the responsibility for the operation and maintenance of all sources for Nicosia Water Supply while the Nicosia Water Board has undertaken the distribution of water within the areas involved. Water is being supplied and delivered to Nicosia Water Board reservoir points at an agreed rate per cubic meter.

During 1980 the total quantity of water delivered to Nicosia Water Board reached the figure of 9,108,050 m^3. Although Nicosia water supply was augmented by 5000 m^3/day by the implementation of Peristerona—Akaki emergency scheme yet restrictions were imposed during the summer months and a 14 hours supply every other day was provided.

The total expenditure for the operation and maintenance of all sources was £393,972 and the revenue from the sale of water was £166,193. Water to the Turkish sector of the town was supplied free.

The *Famagusta* water supply scheme supplied water in bulk to the Turkish occupied Town of Famagusta free of charge, to Larnaca Water Board and to villages and refugee estates en route. The revenue from the sale of water during 1980 was £154,528 and the operation and maintenance expenses were £139,672.

Irrigation Works

The management of major irrigation works is done jointly with the District Administration, whilst the management of small irrigation and village water supply schemes is done by the District Administration and local committees. Town water supplies are managed by Water Boards.

In the year under review the total water available in all dams in Cyprus, in the Government controlled areas, amounted to 36.495 MCM. From this quantity 16.526 MCM were used for the irrigation of 29,724 donums, 2.210 MCM were used for domestic water supplies, 6.579 were used for recharge and 5.087 MCM seeped through or below the dams and 2.732 MCM were lost as evaporation. The remaining 3.361 MCM were retained in the dams as over annual storage.

Water available for utilization from Government projects reached the figure of 34.408 MCM. Out of this only 23.609 MCM was utilized, 14.820 MCM for irrigation, 2.210 for domestic water supply and 6.579 MCM for recharge. Irrigation water was utilized on 27,109 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes, cereals and olives. The gross income from the sale of water amounted to £103,059 whereas the operational expenses reached £84,496. The maintenance expenses amounted to £18,563. The net income to Government projects for the year was £66,159.

Water available for utilization from contributory schemes was 2.087 MCM out of which 1.706 MCM was used for the irrigation of 2,615 donums.

Recharge works in the Government controlled areas represent only 11.5%

of the total recharge capacity available in Cyprus and collected total quantity of 0.09 MCM out of which 0.072 MCM was used for recharge whereas the rest was lost in the form of evaporation.

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 legal adviser performs legal work as well as any other duties concerning the every day activities, administration and operation of the Department of Water Development of the Ministry of Agricture and Natural Resources and more general by the Ministry itself.

He performs all the duties and obligations that are assigned to any counsel of the Republic to perform.

He enters appearances and prepares all necessary pleadings for any actions or recourses filed against the Republic which they have as subject matter the commodity of water, differences which derive from breach of contracts, trespass to property, compulsory acquisition and requisition of immovable property, nuisance, negligence and so on.

The said actions and recourses are being handled by the legal adviser before any Court of Law in the Republic until their final conclusion.

His legal duties consist of the preparation of legal opinions either written or oral on numberless subjects and questions, which contribute to the smooth and rapid operation of the Department thus avoiding great troubles and expences.

Acting under the supervision and auspices of the Attorney General the legal adviser prepares any amendments to any existing water Laws which by their practical operation are found to be needing amendment.

In actual fact the legal adviser is a member of a specially constituted committee assigned to study the revision and consolidation of water legislation prevailing in Cyprus today and prepare new bills to be proposed as laws before the House of Representatives.

The legal adviser performs the duties of the secretary to the Committee for fixing new prices in contracts for the Paphos Irrigation Project. He keeps records and minutes of all meetings and he advises on legal issues which ensue from civil and engineering contracts signed with various foreign as well as local firms.

CYPRUS NATIONAL, INTERDEPARTMENTAL AND DEPARTMENTAL COMMITTEES

International Hydrological Programme

The Cyprus National Committee for

DAMS CONSTRUCTED UP TO 1960

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

Total Storage Capacity 6,174 $m^3 \times 10^6$

MINOR RECHARGE DAMS FROM 1960-70

No	DAM	TYPE	HT	1000m³	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	1966
55	Avgorou (7)	Earth	3	68	1966
56	Kondea (2)	Earth	5	82	1966
57	Xylophaghou (4)	Earth	7	86	1966
58	Sotira (4)	Earth	5	32	1966
59	Lysi	Earth	7	77	1967
60	Ay. Yeoryios (9)	Earth	3	68	1967
61	Ay. Epiktitos (6)	Earth	6	34	1968
62	Akanthou (6)	Earth	6	45	1968
63	Akhna (3)	Earth	4	40	1968
64	Xylotymbou (5)	Earth	5	50	1969

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

MAJOR DAM PROJECTS FROM 1960-70

No	DAM	TYPE	HT	1000m³	YEAR
17	Prodhromos	Earth	10	122	1962
18	Morphou	Earth	13	1,879	1962
19	Lefka	Gravity	35	368	1962
20	Geunyeli	Earth	15	1,045	1962
21	Athalassa	Earth	18	791	1962
22	Kanli Kevy	Earth	19	1,113	1963
23	Argaka	Rockfill	41	1,150	1964
24	Mia Milia	Earth	22	355	1964
25	Ovgos	Earth	16	845	1964
26	Kiti	Earth	22	1,614	1964
27	Agros	Earth	26	99	1964
28	Liopetri	Earth	18	340	1964
29	Polemidhia	Earth	45	3,864	1965
30	Ayia Marina	Rockfill	33	311	1965
31	Kalopanayiotis	Earth	40	391	1966
32	Mavrokolymbos	Earth	45	2,180	1966
33	Pomos	Rockfill	38	859	1966
34	Yermasoyia	Earth	49	13,600	1968
35	Syngrasis	Earth	7	1 115	1968

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

MAJOR RECHARGE DAMS FROM 1960-70

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

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

MAJOR DAM PROJECTS FROM 1971-80

No	DAM	TYPE	HT	1000m³	YEAR
65	Lefkara	Earth Rockfill	71	13,850	1973
66	Massari Recharge dam	Earth	15	2,273	1973
67	Palekhori-Kambi	Gravity	33	620	1973
68	Arakapas	Gravity	23	130	1975
69	New Lymbia	Gravity	12	220	1977
70	Ayii Vavatsinias	Arch	14	54	1980
71	Ayii Vavatsinias	Earth	10	55	1980
72	Ephtagonia No 1	Earth	10	92	1980
73	Khandria	Earth	10	70	1980
74	Melini	Earth	10	59	1980
75	Pelendria	Earth	10	123	1980

Total Storage Capacity 17,546 $m^3 \times 10^6$

GRAND TOTAL UP TO END OF 1980: 65.0 $m^3 \times 10^6$

Note
Ref. Nos 71 to 75 are PIRDP polythene lined earth ponds

(1) Dams constructed up to 1960

(12) Major dam projects from 1960-70

(69) Major dam projects from 1971-80

(36) Major recharge dams from 1960-70

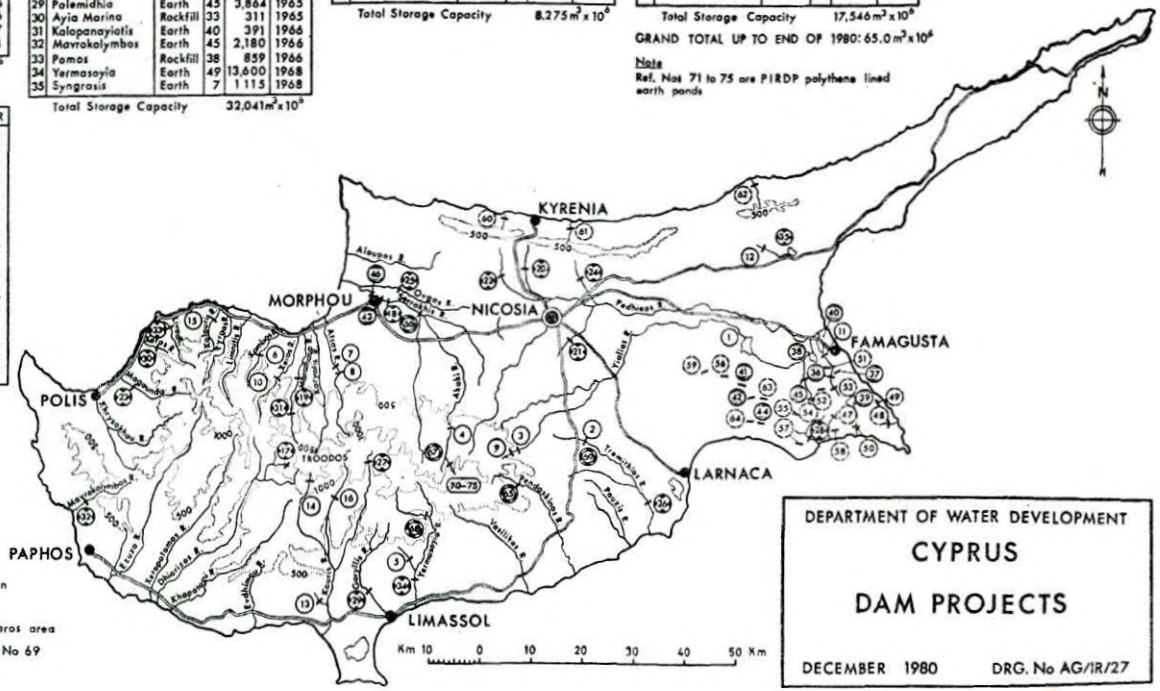
(47) Minor recharge dams from 1960-70

HT refers to height in meters from foundation

YEAR is the year of completion

Phrenaros (6) means six small dams in Phrenaros area

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



DEPARTMENT OF WATER DEVELOPMENT

CYPRUS

DAM PROJECTS

DECEMBER 1980 DRG. No AG/IR/27

the IHP consists of the following:

Chairman

C St Lytras, Director, WDD

Secretary

I Iacovides, Hydrologist, WDD

Members

Dr V Krentos, Director, Agricultural Research Institute.

Dr A Louca, Director, Department of Agriculture.

E Michaelides, Director, Department of Forests.

Dr G Constantinou, Director, Geological Survey Department.

Cl Philaniotis, Head, Meteorological Office.

The IHP is sponsored by UNESCO and its purpose is to implement and carry on the findings and activities of international Hydrologic Decade which ended in 1975. The IHP officially started being operational in 1976 with the establishment of National Committees to act as focal points for IHP activities.

Several scientific and educational IHP projects have already been decided upon and questionnaires regarding local practice have been answered. Data from the Cyprus Decade stations were continued to be provided.

As a contribution of the Cyprus National Committee to the second phase of the IHP terminating in 1983 it has been decided to host and organize a symposium in Cyprus with the subjects "hydrological aspects of water supply and waste water disposal in coastal urban areas and tourist sites in the Mediterranean area".

All national committees of the Mediterranean countries will be invited to attend. Formalities with Unesco are expected to be concluded in 1981 and the symposium is planned for October 1982.

The committee following a request from Unesco submitted the name of P Aristotelous of the Department of Agriculture who has been subsequently appointed by the IHP secretariat in the working group responsible for the preparation of material illustrating the importance of water resources in socio-economic development.

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 (CYNCOLD) was elected to full membership of ICOLD in 1969. During 1980 the National Committee

was composed of the following:

Chairman

C St Lytras, Director, WDD

Secretary

C C Artemis, Executive Engineer I, WDD

Members

K C Hassabis, Assistant Director, WDD

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

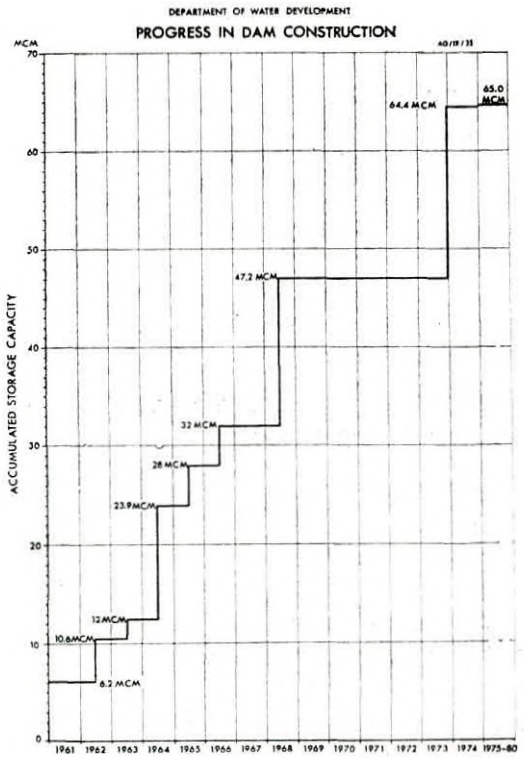
The post of the Representative of the Association of Building Contractors remained vacant.

The 48th Executive Meeting of the Commission was held in Rome, Italy on 6th to 9th October, 1980, and was followed by Study Tours in Italy during the period 10th to 15th October.

The Rome meeting selected the following topics which are to be dealt with at the 14th Congress on Large Dams to be held in Rio de Janeiro, Brazil on 3rd to 7th May, 1982:

* Safety of dams in operation,
* Influence of geology and geotechnics on the design of dams,
* Reservoir sedimentation and slope stability: Technical and environmental effects,
* Materials and construction methods for embankment dams and cofferdams.

During the year under review CYNCOLD has 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.



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 as-

REGISTRE DES BARRAGES EN CHYPRE | ***REGISTER OF DAMS IN*** CYPRUS | **DRG. No. AG/IR/39**

LIGNE LINE No.	NOM DU BARRAGE NAME OF DAM	ANNEE D'ACHEVEMENT YEAR OF COMPLETION	SITUATION LOCATION: COURS D'EAU RIVER	VILLE LA PLUS PROCHE NEAREST CITY	ETAT PROVINCE OU DEPARTEMENT STATE PROVINCE OR COUNTY	TYPE	HAUTEUR AU DESSUS DE LA PLUS BASSE FONDATION (m) HEIGHT ABOVE LOWEST FOUNDATION	LONGUEUR DE CRETE LENGTH OF CREST (m)	VOLUME DU BARRAGE VOLUME CONTENT OF DAM (10^3 m^3)	CAPACITE TOTALE DU RESERVOIR GROSS CAPACITY OF RESERVOIR (10^3 m^3)	DESTINATION	CAPACITE MAXIMALE DES EVACUATEURS MAXIMUM DISCHARGE CAPACITY OF SPILLWAYS (m^3/s)	TYPE DES EVACUATEURS TYPE OF SPILL WAYS	PROPRIETAIRE OWNER	BUREAU D'ETUDES ENGINEERING BY	CONSTRUCTEUR CONSTRUCTION BY	LIGNE LINE No.
1	KAFIZES	1953	Keros (Morphou)	Nicosia	Nicosia	PG	23	27	4	113	I	54	L	Lefka Irrigation Division	Department of Water Development	Department of Water Development	1
2	KANDOU	1956	Kouris	Limassol	Limassol	PG	15	53	2	34	I	59	L	Kandou Irrigation Division	Department of Water Development	Department of Water Development	2
3	PERAPEDHI	1956	Kouris	Limassol	Limassol	PG	22	62	4	55	I	107	L	Perapedhi Irrigation Division	Department of Water Development	Department of Water Development	3
4	PYRGOS	1957	Katouris	Nicosia	Nicosia	PG	22	66	5	285	I	125	L	Pyrgos Irrigation Division	Department of Water Development	Department of Water Development	4
5	TRIMIKLINI	1958	Kouris	Limassol	Limassol	PG	33	76	6	340	I	59	L	Trimiklini Irrigation Division	Department of Water Development	Department of Water Development	5
6	ATHALASSA	1962	Pedhieos	Nicosia	Nicosia	TE	18	447	103	791	I	48	L	Government	Department of Water Development	Department of Water Development	6
7	GEUNYELI	1962	Pedhieos	Nicosia	Nicosia	TE	15	254	50	1 045	I	173	L	Geunyeli Irrigation Division	Department of Water Development	Department of Water Development	7
8	LEFKA	1962	Marathasa	Nicosia	Nicosia	PG	35	149	11	368	I	246	L	Lefka Irrigation Division	Department of Water Development	Department of Water Development	8
9	MORPHOU	1962	Serakhis	Nicosia	Nicosia	TE	13	1 436	206	1 879	I	764	L	Morphou Irrigation Division	Department of Water Development	Department of Water Development	9
10	PRODHROMOS	1962	off stream	Limassol	Limassol	TE	18	756	73	122	I	-	L	Prodromos Irrigation Division	Department of Water Development	Department of Water Development	10
11	KANLI KEUY	1963	Pedhieos	Nicosia	Nicosia	TE	19	311	47	1 113	I	116	L	Kanli Keuy Irrigation Division	Department of Water Development	Department of Water Development	11
12	AGROS	1964	Kouris	Limassol	Limassol	TE	26	180	61	99	I	6	L	Agros Irrigation Division	Department of Water Development	Department of Water Development	12
13	ARGAKA	1964	Magounda	Paphos	Paphos	ER	41	175	138	1 150	I	0.3	L	Government	Howard Humphreys & Sons of U.K.	Department of Water Development	13
14	KITI	1964	Tremithos	Larnaca	Larnaca	TE	22	990	183	1 614	I	602	L	Government	Il Nuovo Castoro of Italy	Department of Water Development	14
15	LIOPETRI	1964	Potamos	Famagusta	Famagusta	TE	18	579	50	340	R	150	L	Liopetri Irrigation Division	Department of Water Development	Department of Water Development	15
16	MIA MILEA	1964	Pedhieos	Nicosia	Nicosia	TE	22	140	54	355	I	24	L	Mia Milea Irrigation Division	Department of Water Development	Department of Water Development	16
17	OVGOS	1964	Serakhis	Nicosia	Nicosia	TE	16	745	130	845	I	786	L	Morphou Irrigation Division	Department of Water Development	Department of Water Development	17
18	AYIA MARINA	1965	Xeros (Tyllirias)	Paphos	Paphos	ER	33	142	61	311	I	161	L	Ayia Marina Irrigation Division	Energoprojekt of Yugoslavia	Mediterranean Constructors Greece - G.P.Zachariades Cyprus	18
19	POLEMIDHIA	1965	Garyllis	Limassol	Limassol	TE	45	196	215	3 864	I	581	L	Government	Energoprojekt of Yugoslavia	Mowlem & Ridgway of U.K.	19
20	KALOPANAYIOTIS	1966	Marathasa	Nicosia	Nicosia	TE	40	137	156	391	I	207	L	Government	Howard Humphreys & Sons of U.K.	Department of Water Development	20
21	MAVROKOLYMBOS	1966	Mavrokolym-bos	Paphos	Paphos	TE	45	528	267	2 180	I	340	L	Government	Energoprojekt of Yugoslavia	Cybarco of Cyprus	21
22	POMOS	1966	Livadhi	Paphos	Paphos	ER	38	302	153	859	I	300	L	Pomos Irrigation Division	Energoprojekt of Yugoslavia	Mediterranean Constructors Greece - G.P.Zachariades Cyprus	22
23	YERMASOYIA	1968	Yermasoyia	Limassol	Limassol	TE	49	409	539	13 600	I	850	V	Government	Energoprojekt of Yugoslavia	Cybarco of Cyprus	23
24	LEFKARA	1973	Pendaskinos	Larnaca	Larnaca	TE/ER	74	240	820	13 850	S/I	316	L	Famagusta Water Board & Lefkara Irrigation Division	Howard Humphreys & Sons of U.K.	L. Fairclough & Hedcon Construction Ltd.	24
25	NASARI	1973	Serakhis	Nicosia	Nicosia	TE	15	929	245	2 273	I	622	V	Government	Department of Water Development	Department of Water Development	25
26	PALEKHORI-KAMBI	1973	Akaki	Nicosia	Nicosia	PG	33	131	27	620	I	65	L	Government & Palekhori Irrigation Division	Department of Water Development	Department of Water Development	26
27	ARAKAPAS	1975	Yermasoyia	Limassol	Limassol	PG	23	97	10	129	I	205	L	Arakapas Irrigation Division	Department of Water Development	Department of Water Development	27

pects. The ICID was set up in 1950 with central office in New Delhi, India.

Membership to the ICID totals now 76 National Committees.

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, Executive Engineer I, WDD

Members, Ex-officio

Director, Department of Forests
Director, Department of Agriculture
Director, Agricultural Research Institute.

During the year 1980 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 CYNCID.

In the year under review the following activities of the ICID took place:

* The third Afroasian Regional Conference which was held in New Delhi from 23 - 28 October, 1980 and was followed by study tours. A total of 58 papers were submitted and discussed and 26 delegates participated from 26 countries.
* The first American Conference was originally scheduled from 21 - 27 July 1980, then rescheduled from 3 - 6 August 1980 and finally postponed indefinitely by the Colombian National Committee.
* The thirty first International Ecexutive Council Meeting was held in London (Great Britain) on November 13 - 14, 1980.

The International Executive Council meeting has dealt with the following:

* Publications,
* Dates for the coming meetings and congresses,
* and to consider the reports of the various Working Groups.

The following working groups or permanent committees have been established in the past by ICID and are now working:

(i) Working group on standardization of Technical Terms commonly used in Irrigation and Drainage,

(ii) Permanent Committee to focus attention on New Development,

(iii) Working Group on Evapotranspiration,

(iv) Permanent Paper Committee,

(v) Committee on Irrigation and Drainage Construction Techniques,

(vi) Working Group on Irrigation by 2000 A.D.,

(vii) Committee on History of Irrigation,
(viii) Committee on Irrigation Efficiencies,
(ix) Working Group on Drip Irrigation and Similar Methods,
(x) Permanent commitee on Application of System Analysis to Irrigation, Drainage and Root Control.

The Cyprus National Committee does not participate in any of the above activities of the ICID.

International Water Supply Association

The Department of Water Development was an associate member of the IWSA until 1969. Late in 1969 a National Committee was established. The 1980 Committee was:

Chairman

C St Lytras, Director, WDD

Secretary

G Charalambous, Superintendent of Works, WDD, and the representatives of Ministry of Interior and Water Boards of Nicosia, Limassol, Famagusta and Larnaca as members.

The Cyprus National Committee of the International Water Supply Association exchanged regular correspondence with the Head Office of the Association relative to the activities of the Organization.

MEETINGS OF THE DIRECTOR WITH THE STAFF

Several meetings were held during the year under the Chairmanship of the Director with the Heads of the various Divisions, Regional Engineers as well as with other members of the staff to discuss various aspects of work 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 1980 the total expenditure by the Department was £11,328, 399 from budgeted and non-budgeted votes amounting to £13,104,610.

This is by far the highest expenditure made since the creation of this Department.

The general picture is as follows:

TABLE 1—1a
GENERAL BUDGET — EXPENDITURE FIGURES

Description	Budget	Expenditure
	£	£
WDD Development Estimates including loans	9 515 659	8 589 406
WDD Ordinary Estimates	1 354 577	1 088 967
WDD expenditure for Pitsilia Project	1 207 669	881 326
Non Budgeted votes for Refugee housing estates, works for other Government Departments and private developers and village deposits	1 026 705	768 700
Totals	£13 104 610	£11 328 399

The level of Construction Works carried out during 1980 was £9,389,027 from WDD and other votes. See table V—1 under Construction Division.

The largest item of expenditure was for the Paphos Irrigation Project for which the sum of £4,939,839 was spent.

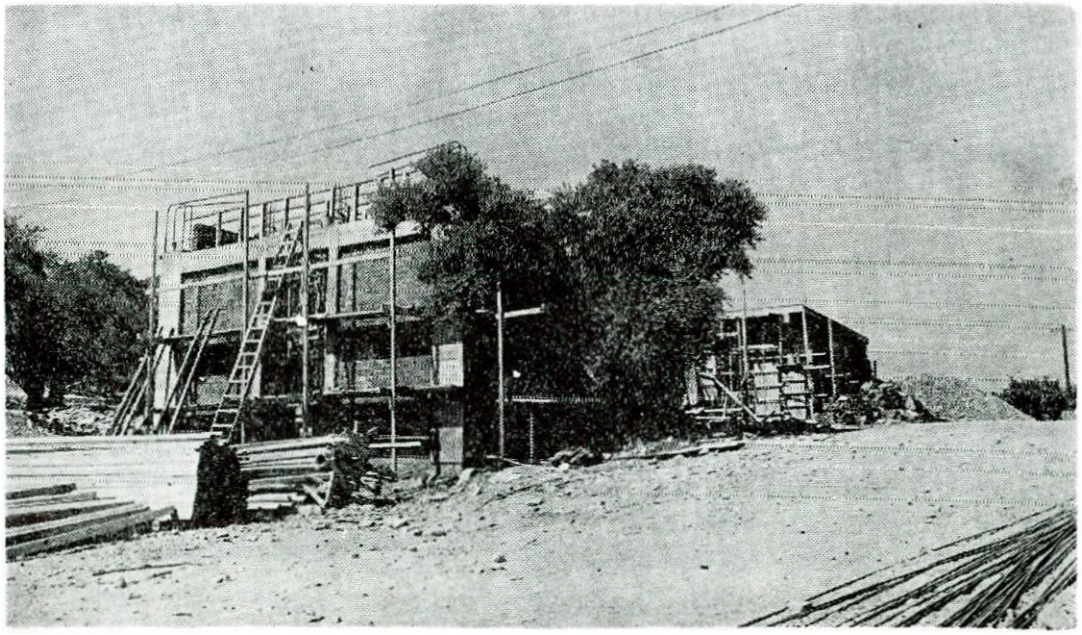
Loan Proceeds

(a) Three loans from the Federal Republic of Germany for the sum of £3,210,000 (approx) were approved for the construction of Irrigation Schemes in rural areas. During the period 6.12.76—11.9.80, the sum of £2,508,815 was withdrawn from the loan.

(b) Loan from the International Bank of Reconstruction and Development for the Paphos Irrigation Project ($14,000,000). During the period 22.1.76—31.8.80, the sum of £3,985,023 was withdrawn from the loan.

Revenue

The sum of £463,634 was collected during the year (1979 was £532,637) as revenue mainly from the sale of water for the Greater Nicosia and Famagusta Water Supply Schemes.



Dhypotamos pumping station being built just downstream of Dhypotamos damsite, belongs to Vasilikos-Pendaskinos Project. Initially, treated water from Khirokitia water treatment plant will be pumped to Nicosia through a balancing reservoir at Stavrovouni. WDD Photo C12-3 (26.9.80).

TABLE I—1

EXPENDITURE—WATER DEVELOPMENT DEPARTMENT VOTES FOR THE YEAR 1980

Ser. No.	Details	Expenditure Govt £	Village £	Total £
1	Administration			
	Ordinary £527,177	1 062 238	—	1 062 238
	Developt £535,061			
2	Greater Nicosia scheme— Running expenses . . .	393 958	—	393 958
3	Famagusta water supply— Running expenses . . .	134 573	—	134 573
4	Regional village water supply— Running expenses . . .	26 999	—	26 999
5	Irrigation drainage & Dams	5 304 376	80 222	5 384 598
6	Water control	189	—	189
7	Town water supplies	1 928 325	33 037	1 961 362
8	Village water supplies	355 323	67 795	419 118
9	Drilling and prospecting	10 827	—	10 827
10	Hydrology	94 447	—	94 447
11	Surveys & investigations	159 502	—	159 502
12	Purchase of machinery and equipment . .	16 613	—	16 613
13	Stores	12 246	—	12 246
14	Others	1 703	—	1 703
	Total	£9 501 319	£177 054	£9 678 373

Breakdown of Administration

		£
1	Personal emoluments	813 041
2	Casual assistance	—
3	Technical assistance	160 330
4	Travelling	49 846
5	M/nance & operation for motor transport	4 984
6	Office expenses	17 773
7	Leave pay to regular employees . .	9 944
8	Govt. water supply	6 320
	Total	£1 062 238

Breakdown of "Irrigation, Drainage & Dams"

		£
1	Paphos Irrigation Project	4 939 839
2	Major irrigation works	138 900
3	Minor irrigation works	270 448
4	Dam m/ce and distribution system	16 374
5	Consultant's fees	19 037
	Total	£5 384 598

TABLE I–2

MONTHLY STATEMENT OF ORDINARY EXPENDITURE FOR THE YEAR 1980

Head 20A—Water Development

1980 Approved	£ 994 520
Add Special Warrants	£ 360 057
Total	£1 354 577

Month	Monthly Expend. £	Expend. to date £	%
January	44 733	44 733	3.3
February	47 742	92 475	6.83
March	73 035	165 510	12.22
April	76 385	241 895	17.86
May	127 045	368 940	27.24
June	80 893	449 833	33.21
July	74 348	524 181	38.70
August	92 511	616 692	45.53
September	59 654	676 346	49.93
October	65 702	742 048	54.78
November	92 152	834 200	61.58
December	254 767	1 088 967	80.39

Summary

Amount approved	1 354 577	100%
Less actual expend.	1 088 967	80.39%
Balance	265 610	19.61%

TABLE I–3

MONTHLY STATEMENT OF DEVELOPMENT EXPENDITURE FOR THE YEAR 1980

1980 Approved	£8 344 634
Add special warrants	£ 993 971
Total	£9 338 605

Month	Monthly Expend. £	Expend. to date £	%
January	99 710	99 710	1.07
February	555 466	655 176	7.02
March	512 529	1 167 705	12.05
April	651 407	1 819 112	19 48
May	560 960	2 380 072	25.49
June	737 759	3 117 831	33.39
July	1 171 709	4 289 540	45.93
August	397 192	4 686 732	50.19
September	745 217	5 431 949	58.17
October	607 844	6 039 793	64.68
November	697 071	6 736 864	72.14
December	1 675 488	8 412 352	90.08

Summary

Amount approved	9 338 605	100%
Less actual expend.	8 412 352	90.08%
Balance	926 253	9.92%

TABLE I–4

STATEMENT OF REVENUE COLLECTED DURING THE YEAR 1980

Description	£
Drilling charges	73
Greater Nicosia Scheme	233 767
Famagusta WS Scheme	150 493
Village Water Supplies	23 281
Other Fees	56 020
Total	£463 634

Handing over of the completed diversion weir which will serve Ephtagonia No 1 pond of Pitsilia Integrated Rural Development Project. WDD Photo C3-7 (8.8.80).

TABLE 1—5. PAPHOS IRRIGATION PROJECT—EXPENDITURE 1980

Ser No	Description	1980 Expenditure	Total Expenditure upto 31.12.80
1	**Wellfield Conveyance System**	£	£
	Drilling and testing of boreholes		81 914
	Supply and installation of well pumps	11 994	143 813
	Supply of pipes and valves	—	212 535
	Supply of canaletti	—	56 599
	Installation of wellfield conveyance system by ASPEM	7 477	25 157
	Installation of WCS by WDD	4 768	239 027
	Topographical control works	—	1 784
	Redevelopment of boreholes and lowering well pumps	1 110	2 720
	Diversion of river water into the canaletti	1 163	1 163
2	**Construction of Main Canal**		
	Main canal construction (GCC)	3 412	908 240
	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	922	4 162
	Repairs and additional works	12 615	12 615
3	**Irrigation Network Eastern Area**		
	Installation of irrigation network (SOCEA)	503 581	1 889 719
	Supply of AC pipes (CPI)	25 384	1 261 353
	Handling of AC pipes	4 914	41 577
	Topographical control works	3 968	18 476
	Inspection of cast iron fittings	—	316
	Survey works eastern area	—	2 595
	Preparation of steel fittings (workshop WDD)	5 256	8 227
	Compensation of damages to field crops	—	2 025
	Inspection of CPI factory	—	1 570

TABLE 1—5. PAPHOS IRRIGATION PROJECT—EXPENDITURE 1980 (Cont.)

Ser No	Description	1980 Expenditure	Total Expenditure upto 31.12.80
		£	£
	Reinstallation of AC Pipes at Akhelia	2 954	2 954
	Supply and installation of strainers	—	—
	Inspection of hydraulic equipment installed by SOCEA	125	653
4	**Main Contract. Western Conveyor Pumping Stations and Remote Indication**		
	Supply and installation of pumping stations, western main pipeline and remote indication (Costain)	1 013 014	3 191 677
	Topographical control works	2 056	5 944
	Compensation to damages	—	499
	Investigations western conveyor	100	444
	Installations of four private wires - remote indication telemetry	8 978	8 978
	Supply and installation of louvers for 13 pumping stations for ventilation	2 161	2 161
	Roofing of pumping stations	601	601
	Installation of steel gates	3 745	3 745
	Connection of main pumping station with the canal	3 624	3 624
	Asphalting Roads	7 311	7 311
5	**Asprokremmos Dam**		
	Construction of Asprokremmos dam (J & P & Medcon, "Joint Venture")	2 737 251	6 157 361
	Model testing	—	18 834
	Asprokremmos dam investigations	—	21 610
	Diversion of services	—	1 509
	Asprokremmos dam, laboratory triaxal tests	—	—
	Design of spillway	—	530
	Supply of progress photographs	432	911
	Topographical control works	2 801	6 316
	Pentonitic clay dispersion tests	—	—

TABLE 1—5. PAPHOS IRRIGATION PROJECT—EXPENDITURE 1980 (Cont.)

Ser No	Description	1980 Expenditure	Total Expenditure upto 31.12.80
		£	£
	Alkali activity reaction tests abroad	—	1 500
	Compensations: Water supply to Mandria	—	1 417
6	**Erection of Buildings and Offices**	—	72 232
7	**Electricity supply**		
	Electricity supply	74 216	222 195
	Metering units	—	—
8	**Other works by WDD**		
	Purchase of equipment	4 115	74 744
	Agriculture research activities	2 329	36 191
	Agriculture development	7 645	7 645
	Land acquisition	1 596	10 612
	Installation of six automatic recorders	—	4 118
	Soil and concrete laboratory	9 998	10 959
	Operator drawing/printing machine	1 099	1 099
	New agriculture research station at Akhelia	2 041	11 019
	Green house Akhelia	9 959	9 959
9	**Management**		
	Furniture & fittings	—	4 625
	Office requirements	7 607	24 124
	Wages of drivers	32 536	82 897
	Operation of motor transport	7 935	24 770
	Maintenance of project vehicles	3 882	10 474
	Training programme	220	5 417
	Travelling	11 124	36 472
	Purchase of tools	—	—
	Advertisements	—	2 159
	Overtime fees	21 908	59 917
	Poster "Paphos irrigation project"	—	335
	Computer charges	—	291

TABLE 1—5. PAPHOS IRRIGATION PROJECT—EXPENDITURE 1980 (Cont.)

Ser No	Description	1980 Expenditure	Total Expenditure upto 31.12.80
10	**Consultants Fees**	£	£
	Sogreah	65 295	402 538
	MacDonalds & Partners	83 814	266 897
	PAC	—	2 626
	Mr G Post	2 955	3 947
	Extension services (J Hanan—Dr Providenti)	—	14 651
	Mr Sabarly	—	1 748
11	**Maintenance & Operation of the Project**		
	Well pumps & Conveyance System		
	(a) Operation and Maintenance	—	—
	(b) Electricity	3 554	3 554
	Main canal		
	(a) Cleaning	1 155	2 235
	(b) Maintenance & operation	4 637	4 637
	Purchase of equipment	3 425	3 425
	Operation of vehicles	—	—
	Electrotechnician & Mechanic	3 039	3 039
12	**Irrigation Network & Reservoir Western Area**		
	Installation of irrigation network	—	—
	Supply of pipes	190 670	190 680
	Handling of pipes	11 366	11 366
	Total	£4 939 837	£16 007 460

TABLE I—6. EXPENDITURE FOR MAJOR WATERWORKS FOR 1980

Scheme	Contribution			Expenses			Balance		
	Government	Village	Total	Government	Village	Total	Government	Village	Total
	£	£	£	£	£	£	£	£	£
Khrysokhou Valley	125 000	—	125 000	97 408	—	97 408	27 592	—	27 592
Pissouri Scheme	34 366	—	34 366	33 926	—	33 926	440	—	440
Trakhoni Extension	7 800	—	7 800	2 854CR	—	2 854CR	10 654	—	10 654
Ayios Theodhoros (Larnaca)	1 000	—	1 000	846	—	846	154	—	154
Pomos "Nea Dhimmata"	6 500	—	6 500	6 134	—	6 134	366	—	366
Lefkara dam	390	—	390	24	—	24	366	—	366
Vasilikos Pendaskinos Project									
Purchase of diesel bus	2 500	—	2 500	2 500	—	2 500	—	—	—
Agr. Research Institute	2 800	—	2 800	917	—	917	1 883	—	1 883
Palekhori Kambi dam (Comp.)	414	138	552	—	—	—	414	138	552
Lymbia dam (Compensations)	3 038	1 519	4 557	—	—	—	3 038	1 519	4 557
Total	£183 808	£1 657	£185 465	£138 901	—	£138 901	£44 907	£1 657	£46 564

TABLE I—7. EXPENDITURE FOR MINOR IRRIGATION WORKS FOR 1980

Scheme	Contribution			Expenses			Balance		
	Government	Village	Total	Government	Village	Total	Government	Village	Total
	£	£	£	£	£	£	£	£	£
Akaki "Kamena"	5 750	5 750	11 500	11 053	4 828	16 637	570	570	1 140
Akaki—Meniko "Riatiko"	11 053	4 704	16 580	5 180	5 180	10 360	—	124CR	124CR
		823			756			67	67
Ayios Ioannis "Pitsilis"	1 653	1 197	2 850	83	60	143	1 570	1 137	2 707
Ayia Marina "Yialias"	10 091	6 727	16 818	10 035	6 691	16 726	56	36	92
Dhali	2 934	733	3 667	2 934	826	3 760		93CR	93CR
Kambos "Pot. Kalogiros"	36 545	18 272	54 817	29 923	14 962	44 885	6 622	3 310	9 932
Meniko 'Lytharkes"	8 658	4 330	12 988	8 658	4 399	13 057	—	69CR	69CR
Mathikoloni "Esso Pervolia"	547	273	820	506	253	759	41	20	61
Moutoullas	400	200	600	392	196	588	8	4	12
Nisou "Frangos"	13 000	—	13 000	12 201	—	12 201	799	—	799
Orounda "Limni"	3 352	2 235	5 587	3 388	2 254	5 642	36CR	19CR	55CR
Peristerona Recharge	35 630	—	35 630	27 922	—	27 922	7 708	—	7 708
Phlasou - Katydhata "Karydhes"	12 019	6 010	18 029	11 813	5 907	17 720	206	103	309
Pera "Fassera"	16 000	8 000	24 000	6 392	3 196	9 588	9 608	4 804	14 412
Phini "Mylos"	4 867	2 433	7 300	4 815	2 408	7 223	52	25	77
Prodhromos "Kyparissi"	1 012	600	1 612	198	119	317	814	481	1 295
Tris Elies "Mylarka"	466	234	700	454	228	682	12	6	18
Chakistra	26 456	13 228	39 684	23 626	11 814	35 440	2 830	1 414	4 244
Vasa (Kilani)	1 000	—	1 000	218	—	218	782	—	782
Yerakies "Xeros"	38 953	19 477	58 430	30 860	15 430	46 290	8 093	4 047	12 140
Pedhoulas "Lacotos"	2 400	—	2 400	—	—	—	2 400	—	2 400
Kalavasos "Syrmata Kopetra"	333	—	333	332	—	332	1	—	1
Total	£233 119	£95 226	£328 345	£190 983	£79 507	£270 490	£42 136	£15 719	£57 855

TABLE I—8. EXPENDITURE FOR VILLAGE WATER SUPPLY FOR 1980

Scheme	Contribution			Expenses			Balance		
	Government	Village	Total	Government	Village	Total	Government	Village	Total
	£	£	£	£	£	£	£	£	£
Amathus	258 000	—	258 000	231 154	—	231 154	26 846	—	26 846
Ayii Trimithias	4 315	2 157	6 472	2 924	1 462	4 386	1 391	695	2 086
Anayia	11 667	5 833	17 500	10 168	5 084	15 252	1 499	749	2 248
Asomatos	430	430	860	419	419	838	11	11	22
Ayios Epiphanios	4 752	2 875	7 627	1 446	7 724	2 170	3 306	2 151	5 457
Ayios Ioannis	10 867	1 684	16 300	8 361	1 296	12 542	2 506	388	3 758
Aredhiou		3 749			2 885			864	
Astromeritis	15 700	—	15 700	8 651	—	8 651	7 049	—	7 049
Dherinia	190	95	285	102	51	153	88	44	132
Erimi	1 000	560	2 000	743	416	1 486	257	144	514
Kolossi		440			327			113	
Kouka	2 467	1 633	4 100	2 467	1 633	4 100	—	—	—
Kedhares	400	400	800	386	386	772	14	14	28
Liopetri	249	249	498	56	56	112	193	193	386
Moniatis—Pelendria	2 000	—	2 000	280	—	280	1 720	—	1 720
Mathikoloni	365	365	730	308	311	619	57	54	111
Nata	3 700	3 700	7 400	2 292	2 292	4 584	1 408	1 408	2 816
Odhou	300	372	672	300	695	995	—	323CR	323CR
Ormidhia	1 000	1 000	2 000	352	352	704	648	648	1 296
Psomolophou	749	749	1 498	749	1 420	2 169	—	—	—
Perakhorio Nisou "A"	8 800	—	8 800	6 058	—	6 058	1 942	—	1 942
Perakhorio Nisou "B"	20 200	—	20 200	4 405	—	4 405	15 795	—	15 795

TABLE I—8. EXPENDITURE FOR VILLAGE WATER SUPPLY FOR 1980 (continued)

Scheme	Contribution			Expenses			Balance		
	Government	Village	Total	Government	Village	Total	Government	Village	Total
	£	£	£	£	£	£	£	£	£
Peristerona (P)	1 840	1 840	3 680	491	491	982	1 349	1 349	2 698
Phrenaros	3 750	3 750	7 500	2 293	2 293	4 586	1 457	1 457	2 914
Peyia	13 000	13 000	26 000	3 782	3 783	7 565	9 218	9 217	18 435
P & K Lakatamia	13 000	13 000	26 000	7 369	7 369	14 738	5 631	5 631	11 262
Pyrga	1 750	1 750	3 500	911	911	1 822	839	839	1 678
Silikou	230	230	460	174	175	349	56	55	111
Tseri	3 457	1 728	5 185	2 494	1 248	3 742	963	480	1 443
Ypsonas		16 000			7 867			8 133	
Polemidhia	112 462	16 000	167 000	55 295	7 867	82 115	57 167	8 133	84 885
C.T.A.		22 538			11 086			11 452	
Athienou	896	896	1 792	896	896	1 792	—	—	—
Total	£496 640	£116 127	£612 767	£355 326	£63 795	£419 121	£141 560	£54 049	£195 609

TABLE I—9. EXPENDITURE FOR VASILIKOS PENDASKINOS PROJECT--NICOSIA WATER SUPPLY FOR 1980

Scheme	Contribution			Expenses			Balance		
	Government	Village	Total	Government	Village	Total	Government	Village	Total
	£	£	£	£	£	£	£	£	£
Electricity & telephones	53 964	—	53 964	53 964	—	53 964	—	—	—
Land acquisition	—	—	—	—	—	—	—	—	—
UDD Administration	62 356	—	62 356	62 356	—	62 356	—	—	—
Dhypotamos pumping station	75 800	—	75 800	63 384	—	63 384	12 416	—	12 416
39/78/38 Civil engineering works	214 694	—	214 694	214 694	—	214 694	—	—	—
39/78/39 Mechanical & electrical works	75 800	—	75 800	45 658	—	45 658	30 142	—	30 142
39/78/40 Steel pipes (Ph. Epiphaniou)	482 196	—	482 196	482 196	—	482 196	—	—	—
39/78/41 AC pipes (CPI)	611 696	—	611 696	610 810	—	610 810	886	—	886
39/78/42									
(a) Valves (A Mousson)	47 913	—	47 913	45 863	—	45 863	2 050	—	2 050
(b) Valves (J Blakeborough)	39 346	—	39 346	37 431	—	37 431	1 915	—	1 915
New Lakatamia Reservoir	267 742	—	267 742	267 742	—	267 742	—	—	—
Peristerona - Akaki - Orounda	30 750	—	30 750	29 919	—	29 919	821	—	821
Kokkini - Trimithia B/H 2/76	4 500	—	4 500	788	—	788	3 712	—	3 712
" " 46/78	722	—	722	475	—	475	247	—	247
" " 91/76	3 000	—	3 000	1 830	—	1 830	1 170	—	1 170
Total	£1 970 479	—	£1 970 479	£1 917 110	—	£1 917 110	£53 359	—	£53 359

STAFF MATTERS

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

Promotions

Constantinos St Lytras, from the post of Assistant Director to the permanent post of Director, with effect from 1.1.1980.

Andreas Lambrou, from the post of Executive Engineer, Class II, to the permanent (Ordinary) post of Executive Engineer, Class I, with effect from 15.5.1980.

Antonios Zakheos, from the permanent post of Assistant Chief Foreman (on secondment), to the permanent (Ordinary) post of Assistant Chief Foreman, with effect from 24.3.1980.

Anastasis Nicola, from the temporary post of Assistant Chief Foreman (on secondment), to the permanent (Development) post of Assistant Chief Foreman, with effect from 24.3.1980.

Andreas Kyprianou, from the temporary post of Assistant Chief Foreman (on secondment) to the permanent (Development) post of Assistant Chief Foreman, with effect from 24.3.1980.

Costas Mavropetrou, from the temporary post of Assistant Chief Foreman (on secondment) to the permanent (Development) post of Assistant Chief Foreman with effect from 24.3.1980.

Secondments

Meletios Michael, from the temporary (Development) post of Assistant Chief Foreman (on secondment) to the permanent (Ordinary) post of Assistant Chief Foreman with effect from 24.3.1980.

Panayiotis Andreou, from the permanent post of Foreman 1st Grade, to the temporary (Development) post of Assistant Chief Foreman, with effect from 24.3.1980.

RESIGNATIONS, TRANSFERS, RETIREMENTS, DEATHS

Resignations

Stylianos Theodorou, Technical Assistant, resigned from his post with effect from 1.8.1980.

Termination of Appointments

Christodoulos Theocharides, Technical Assistant. His services were terminated by the Council of Ministers for reasons of public interest as from 1.2.1980.

Transfers

Antonis Antoniou, Clerical Assistant, was transferred from this Department to the Department of Inland Revenue with effect from 18.8.1980.

Retirements

Neophytos Yiannakou, Superintendent of Works, retired from the Government Service, with effect from 1.5.1980.

Vassos Athanasiou, Chief Foreman, retired from the Government Service, with effect from 1.4.1980.

Andreas Kyprianou, Assistant Chief Foreman, retired from the Government Service, with effect from 1.5.1980.

Costas Mavropetrou, Assistant Chief Foreman, retired from the Government Service, with effect from 1.4.1980.

Photis Vasiliou, Foreman 1st Grade, retired from the Government Service, with effect from 1.2.1980.

Miltiades Ioannou, Foreman 1st Grade, retired from the Government Service, with effect from 1.8.1980.

Elias Neophytou, Foreman 1st Grade, retired from the Government Service, with effect from 1.5.1980.

Takis Antoniou, Foreman 1st Grade, retired from the Government Service, with effect from 31.12.1980.

Deaths

With deep sorrow we record here the death of our highly esteemed colleague
Agni Miltiadous, Stenographer 2nd Grade who died on 22.12.1980 soon after the birth of her first baby.

SCHOLARSHIPS, STUDY LEAVE, DUTY ABROAD

Scholarships

Tassos Hamatsos, Executive Engineer, Class I, was awarded a scholarship by the U.K., of Technical Cooperation Training Programme in Construction Management at the University of Loughborough, for the purpose of obtaining the M.Sc. He left Cyprus on the 18th July, 1980 and the duration of his scholarship is 14 months.

Pantelis Eliades, Executive Engineer, Class II was awarded a scholaship by the Fulbright Programme in Cyprus, for the purpose of obtaining the M.Sc. degree in Civil Engineering at the University of New York, America. He left Cyprus on the 1st September, 1980 and the duration of his scholarship is 18 months.

Andreas Tziakouris, Technical Assistant, who has been granted a scholarship by J and P Ltd., through the Government of Cyprus at the University of London, for the purpose of obtaining the B.Sc. degree in Civil Engineering, completed his studies and was awarded the B.Sc., in Civil Engineering. He resumed his duties on the 17th July, 1980.

Study Leave

Paraskevoulla Maratheftou, Draughtsman, who has been granted a two years study leave without pay at the City University of London, for the purpose of obtaining the B.Sc. degree in Civil Engineering, completed her studies and was awarded the B.Sc. in Civil Engineering. She resumed her duties on the 20th February, 1980.

Conferences and Duty Abroad

Constantinos St Lytras, Director of Water Development and Dr Christodoulos Christodoulou, Senior Water Engineer, travelled to Greece from 6-13 September, 1980, for official duties to visit Water Development Works at Peloponisos, Greece.

Andreas Georghiades, Senior Water Engineer, participated in a course for the International Building Contracts—Summer School—held at Lady Margaret Hall, Oxford, between 6—11 July 1980.

Dedalos Kypris, Engineer Hydrologist, participated in the Regional Development and Application of the Hydrological Operation Multipurpose System, (HOMS), at World Meteorological Organization (WMO), held in Geneva during 18—21 February, 1980.

Georghios Socratous, Executive Engineer, Class II, attended the Water Resources in Rural Development Conference, held at the Cambridge University, U.K., from 5—12 July, 1980. He lectured on the comprehensive optimization model developed during the first stage Southern Conveyor Project.

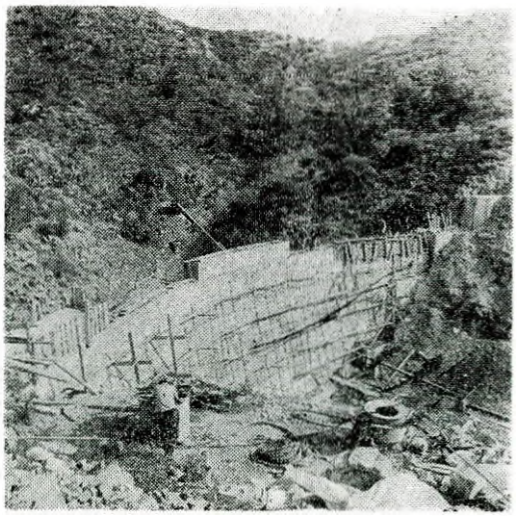
Andreas Christodoulides, Hydrologist, Class II, was awarded a fellowship of 2 months duration, 25th April to 25th June, 1980, for practical training at B.F.G. and R., Hannover, Germany, in the field of Hydrogeology.

Iacovos Iacovides, Hydrologist, Class I, attended the seminar on Radioisotopes in Hydrology held in Athens, between 14—28.9.80.

Christodoulos Artemis and *Nicos Tsiourtis* both Executive Engineers Class I, visited the Corinth pipeworks factory in Greece which produces steel pipes from 28.1.80—3.2.80, in connection with supplies to Vasilikos - Pendaskinos Project, Nicosia Water Supply—First Phase.

Charalambos Kridiotis, Executive Engineer I, visited the Sandberg Laboratories, London, England, between the 11th to the 20th March, 1980, in order to follow test and investigations for the problem of alkali-aggregate reactivity on corcrete aggregates to be used for the P.I.P.

Constantinos St Lytras, Director and *Savvas Theodosiou*, Mechanical Engineer, Class I, travelled to United Kingdom from 12—20 October, 1980, for official duties to visit organisations as the Institute of Hydrology, the Water Research Centre, the Hydrology Research Centre, and British manufacturers of desalination and other water processing equipment.



Ayii Vavatsinias irrigation scheme belonging to Pitsilia Integrated Rural Development Project consists of two water storage structures. One is a small arch dam of 54,000 m³ capacity shown in the photograph above and the other is a polythene lined earth reservoir of similar capacity. WDD Photo C21-3 (20.11.80)

II DIVISION OF WATER RESOURCES

by
D C Kypris
Engineer Hydrologist
Head of Division

INTRODUCTION

During 1980 again no hydrological data could be collected by this Department in the Northern part of Cyprus. because this area amounting to 40% of the Cyprus land is for six years under the occupation of the Turkish troops. So the behaviour of both surface runoff and groundwater bodies could not be followed or recorded there during the year under examination.

During the year, new areas have been brought under hydrological observation in addition to the reconstruction of our hydrogeological archives, which were destroyed during the events of July, 1974 or lost in the area occupied by the Turkish troops. A number of 117 wells/boreholes and springs were plotted or replotted in an area of 46 sq kilometers, with their relative information recorded.

General

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 36.

During 1980, D C Kypris, Engineer Hydrologist, acted as the Head of Division, M Peppis, Geologist, Class I, was the Assistant Head. He was also Head of the Drilling Permits and Water Control Branch. M Peppis acted also as the chairman of the specially formed advisory committee for the issue of well permits.

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 15 existing boreholes.

* Drilling of five boreholes, one as observation borehole, two for irrigation purposes and two for domestic water supply purposes one of which not completed. Penetrated depth 347 m.

* Removing pumps stuck or broken in boreholes.

* Enlarging, deepening and casing of two boreholes drilled for domestic water supply purposes. Penetrated depth 196 m.

Test Pumpings

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 1980, 70 test pumpings were carried out as follows:-

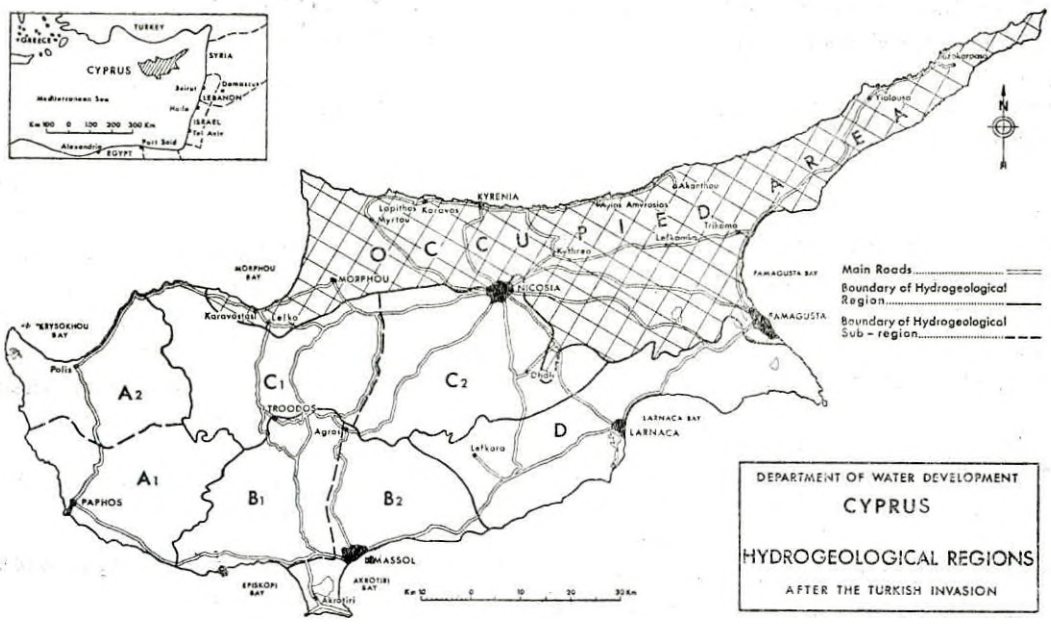
* 23 for division of land with total hours pumped 951
* 33 for building permits with total hours pumped 768
* 2 for irrigation divisions with total hours pumped 66
* 12 for village water supplies with total hours pumped 392

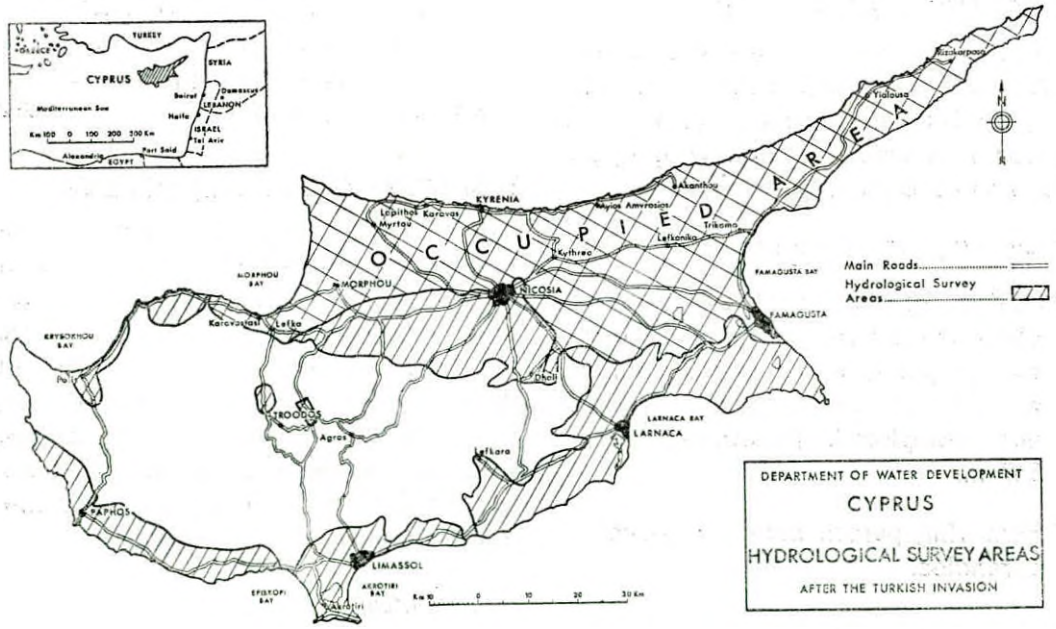
METEOROLOGICAL SUMMARY

Note: 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 of its being occupied by Turkish troops, the data given below relate to the weather experienced in the southern part of the Island during the hydrometeorological year 1979—1980.

Precipitation

The yearly total precipitation averaged


TURKEY
GREECE
CYPRUS
SYRIA
Beirut
Damascus
LEBANON
Haifa
ISRAEL
Tel Aviv
Alexandria
EGYPT
Port Said
Km 100 0 100 200 300 Km
OCCUPIED AREA
KYRENIA
Lapithos
Karavas
Myrtou
Agios Amvrosios
Akanthou
Trikomo
Lefkonika
Kythrea
NICOSIA
MORPHOU
MORPHOU BAY
Karavostasi
Lefka
KRYSOKHOU BAY
Polis
FAMAGUSTA BAY
FAMAGUSTA
Dhali
TROODOS
Agros
Lefkara
LARNACA BAY
LARNACA
PAPHOS
LIMASSOL
EPISKOPI BAY
AKROTIRI BAY
Akrotiri
Km 10 0 10 20 30 Km
A2
C1
C2
D
A1
B1
B2
Main Roads
Boundary of Hydrogeological Region
Boundary of Hydrogeological Sub – region
DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
HYDROGEOLOGICAL REGIONS
AFTER THE TURKISH INVASION


TURKEY
GREECE
CYPRUS
SYRIA
Beirut
Damascus
LEBANON
Haifa
ISRAEL
Tel Aviv
Alexandria
EGYPT
Port Said
Km 100 0 100 200 300 Km
OCCUPIED AREA
KYRENIA
Lapithos
Karavas
Myrtou
Agios Amvrosios
Akanthou
Trikomo
Lefkonika
Kythrea
NICOSIA
MORPHOU
MORPHOU BAY
Karavostasi
Lefka
KRYSOKHOU BAY
FAMAGUSTA BAY
FAMAGUSTA
Dhali
TROODOS
Agros
Lefkara
LARNACA BAY
LARNACA
PAPHOS
LIMASSOL
EPISKOPI BAY
AKROTIRI BAY
Akrotiri
Km 10 0 10 20 30 Km
Main Roads
Hydrological Survey Areas
DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
HYDROLOGICAL SURVEY AREAS
AFTER THE TURKISH INVASION

over the southern part of the Island during the hydrometeorological year October 1979 to September 1980 was 582 mm which is 109% of normal (see diagram on page 38).

The total precipitation amounts during the period were slightly below normal over some parts of the northern and eastern Troodos range and over some parts of the eastern coastal areas. In the remaining areas they were above normal and ranged mainly between 100% and 115%. (see isohyetal map). As regards the monthly distribution of precipitation, it was above normal in the months of October, November, December and February, around normal in March and below normal in the remaining months (see diagram of incidence of rainfall).

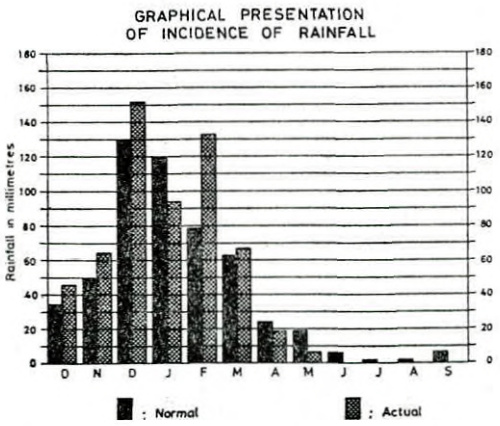


Table II—1 giving the incidence of rainfall during the hydrometeorological year 1979—1980, illustrates the situation.

The maximum amount of rainfall reported in a 24-hour period during the hydrometeorological year was 112.3 mm reported by Alaminos elementary school rainfall station on 13th February 1980.

The first snowfall occurred on mount Olympus on the 28th November 1979 which is close to the median date for the first snowfall in Cyprus. Subsequent snowfalls occurred during the ensuing months till April 1980. The last one was very slight and occurred on the 14th April 1980, which is a few days beyond the median date of the last snowfall in Cyprus.

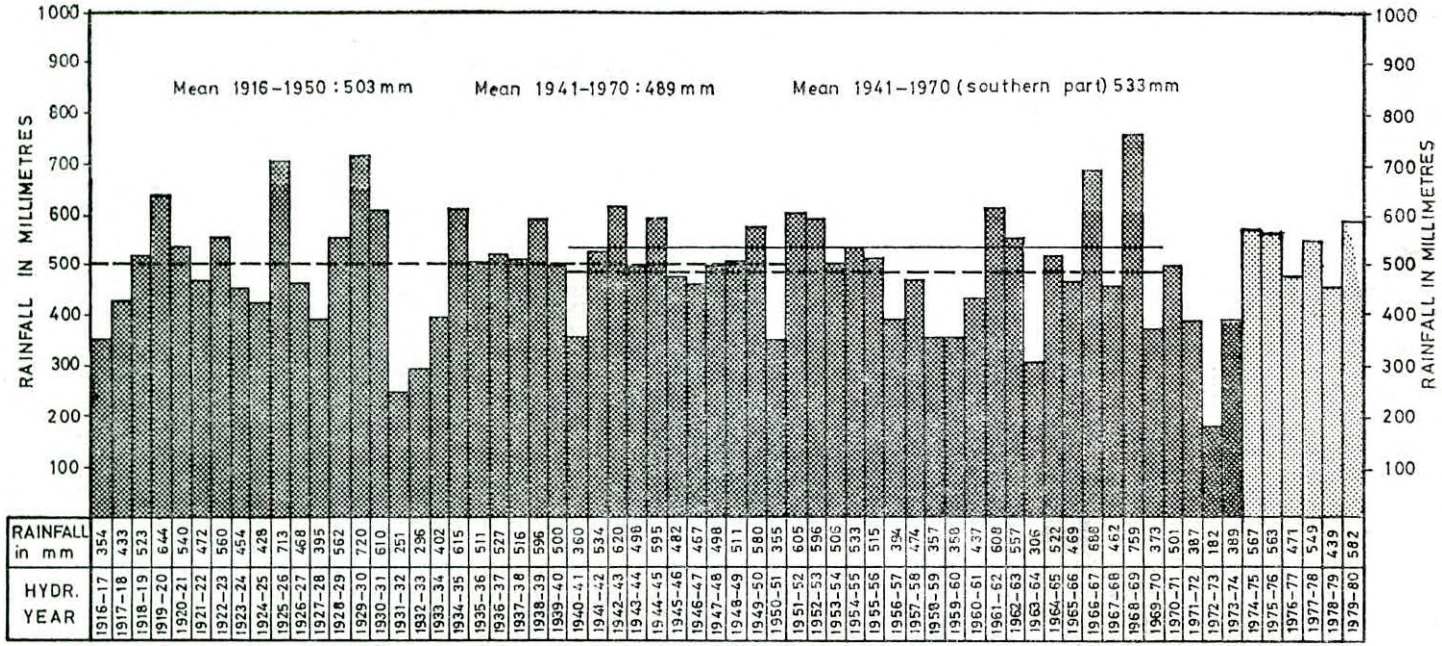
TABLE II—1

INCIDENCE OF RAINFALL DURING THE HYDROMETEOROLOGICAL YEAR 1979—1980

Months	Rainfall (in mm)	Rainfall (in inches)	Percentage of yearly total	Percentage of monthly normal
October	46.1	1.81	7.9	134
November	64.4	2.54	11.1	132
December	151.6	5.97	26.1	116
January	94	3.71	16.2	78
February	133.0	5.24	22.9	169
March	66.6	2.62	11.5	106
April	18.3	0.72	3.1	77
May	6.1	0.24	1.1	32
June	0.0	0.0	0.0	0
July	0.2	0.01	—	12
August	0.8	0.03	0.1	57
September ..	0.3	0.01	0.0	4
Totals	581.6	22.90	100.0	—

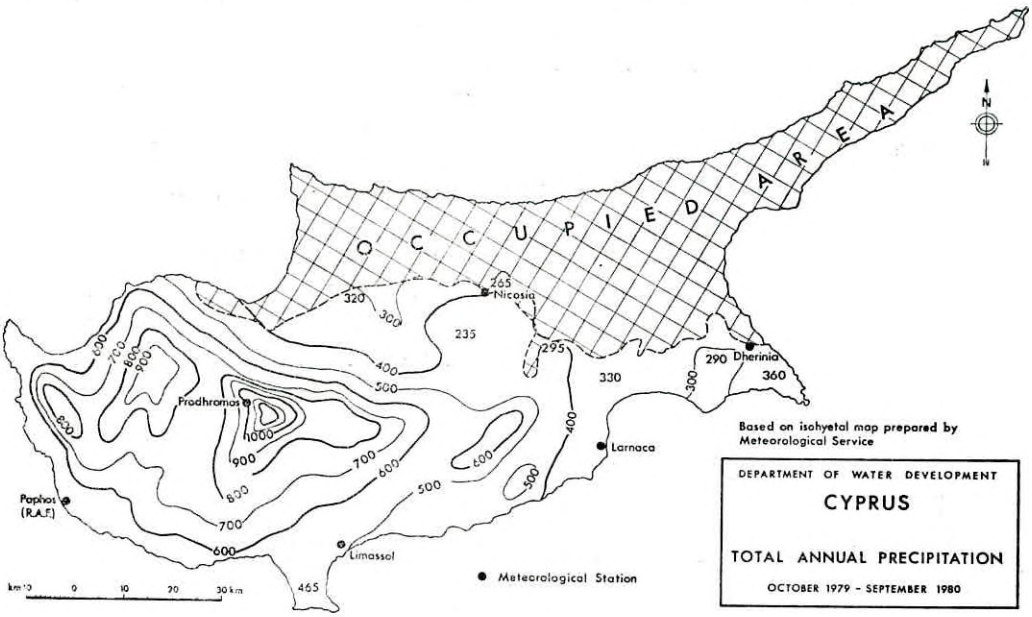
Note:—Yearly total as percentage of yearly normal: 109%

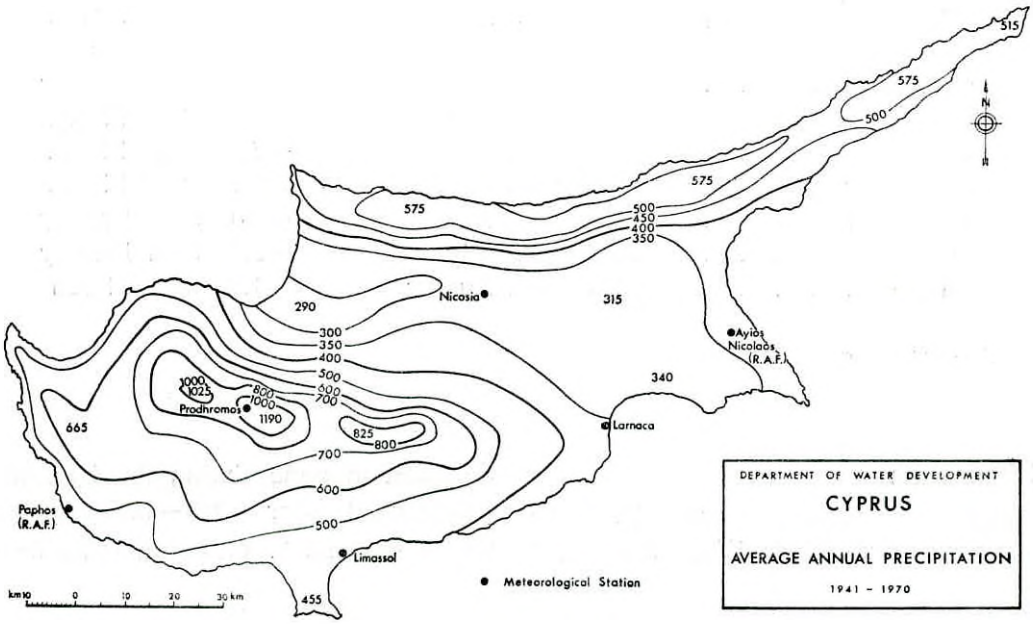
ANNUAL AVERAGE RAINFALL OF CYPRUS
FROM 1916 –1980



HYDR. YEAR	RAINFALL in mm
1916–17	354
1917–18	433
1918–19	523
1919–20	644
1920–21	540
1921–22	472
1922–23	560
1923–24	454
1924–25	428
1925–26	713
1926–27	468
1927–28	395
1928–29	562
1929–30	720
1930–31	610
1931–32	251
1932–33	296
1933–34	402
1934–35	615
1935–36	511
1936–37	527
1937–38	516
1938–39	596
1939–40	500
1940–41	360
1941–42	534
1942–43	620
1943–44	496
1944–45	595
1945–46	482
1946–47	467
1947–48	498
1948–49	511
1949–50	580
1950–51	355
1951–52	605
1952–53	596
1953–54	506
1954–55	533
1955–56	515
1956–57	394
1957–58	474
1958–59	357
1959–60	358
1960–61	437
1961–62	608
1962–63	557
1963–64	306
1964–65	522
1965–66	469
1966–67	688
1967–68	462
1968–69	759
1969–70	373
1970–71	501
1971–72	387
1972–73	182
1973–74	389
1974–75	567
1975–76	563
1976–77	471
1977–78	549
1978–79	439
1979–80	582

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


OCCUPIED AREA
N
Nicosia
Prodhromos
Larnaca
Dherinia
Paphos (R.A.F.)
Limassol
Meteorological Station
Based on isohyetal map prepared by Meteorological Service
DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
TOTAL ANNUAL PRECIPITATION
OCTOBER 1979 - SEPTEMBER 1980


N
Nicosia
Prodhromos
Larnaca
Ayios Nicolaos (R.A.F.)
Paphos (R.A.F.)
Limassol
Meteorological Station
DEPARTMENT OF WATER DEVELOPMENT
CYPRUS
AVERAGE ANNUAL PRECIPITATION
1941 - 1970

Hail occurred mainly in the mountainous and inland areas on various occasions during the period October 1979—May 1980.

Temperature

During the hydrometeorological year 1979—1980 the air temperature as a whole was slightly below normal in most areas. In particular, monthly mean temperatures were above normal in October and November and below normal from December 1979 to May 1980; in June they were below normal in coastal areas, while they were above normal in inland low lying and mountainous areas; in July they were above normal, in August around normal and in September below normal.

The extreme maximum and extreme minimum temperatures recorded during the hydrometeorological year under review were as shown on table II—2.

TABLE II—2

INCIDENCE OF MAXIMUM AND MINIMUM TEMPERATURES 1979—1980

Station	Extreme maximum temperature and date		Extreme minimum temperature and date	
	°C		°C	
Nicosia	41.5	26th & 30th June	—2.4	30th January
Limassol	36.9	11th July	1.9	16th January
Larnaca Airport	38.2	10th July	—0.9	30th January
Paphos*	34.1	5th August	1.8	2nd March
Panayia Bridge	39.6	11th July	—4.0	30th January
Saittas	38.5	12th July	—2.2	30th January
Amiandos	33.4	18th July	—6.2	2nd March
Prodhromos	34.5	18th July	—7.0	2nd March
Stavros Psokas	38.7	29th June	—3.1	2nd March
Kornos	39.1	30th June	—2.0	30th January
Platania	36.5	18th July	—5.6	30th January
Phasouri	36.5	5th August	—1.3	3rd March

* R.A.F. Station

Evaporation

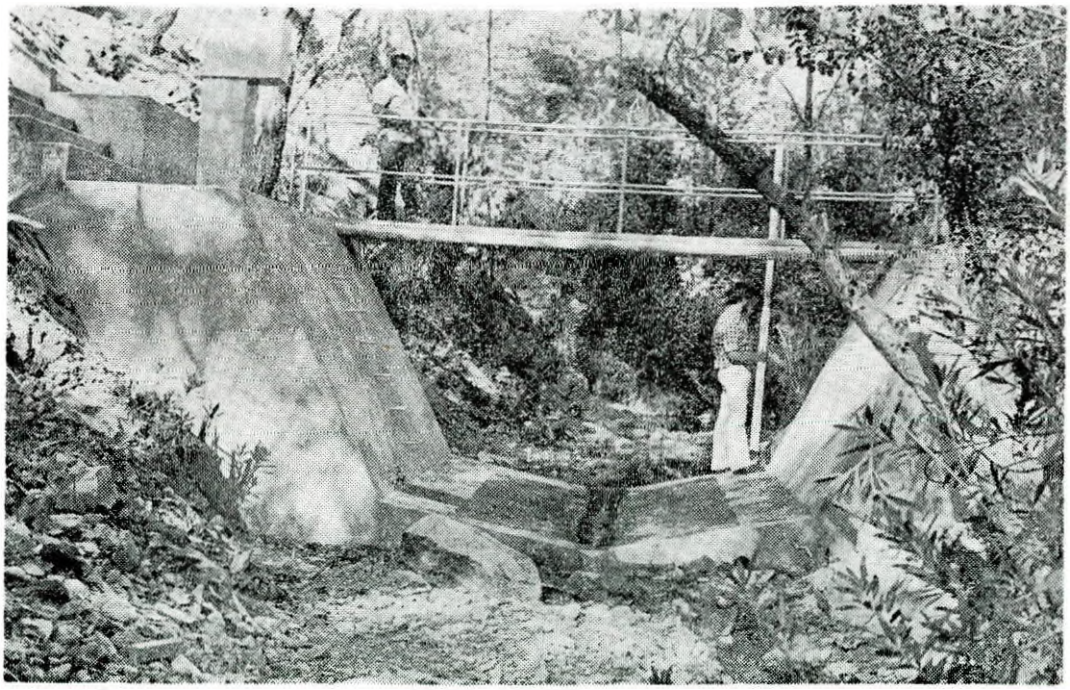
Monthly total evaporation (in mm) measured with U S WB class "A" evaporation pans during the hydrometeorological year 1979—1980 at selected stations is given on table II—3.

TABLE II–3

TOTAL MONTHLY AND ANNUAL EVAPORATION

Station	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Annual Total
Nicosia	120	69	39	36	42	63	125	209	261	283	258	183	1688
Athalassa	118	73	41	40	49	74	141	213	261	333	284	197	1824
Saittas	127	74	52	43	49	79	136	176	252	260	244	159	1651
Akheiia	143	117	81	60	66	82	111	178	217	227	220	188	1690
Yermasoyia	135	93	54	47	52	88	140	208	252	256	261	189	1775
Polemidhia	152	97	83	68	61	101	123	162	*	232	221	166	*
Prodhromos	97	55	21	*	*	54	111	171	250	257	200	140	*

* No records



Flow gauging station on Magounda river, constructed in 1980, equipped with automatic water level recorder. It is situated upstream of Argaka-Magounda Dam, for the recording of the inflow into the dam. Another flow gauging station, equipped with automatic water level recorder was established in 1979 on the spillway of the same dam for the recording of the overfow. WDD Photo C17-5 (14.9.80).

SURFACE WATER

Permanent Stream Gauging Stations

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

Out of our 103 stations only 65 on streams and 8 on intakes 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 sixth year now.

The general conclusion obtained from the study of this year's records of the above flow gauging stations, is that the flow at most of them was slightly higher than normal. In catchments where precipitation was well above normal this was reflected in the high flows recorded in their respective rivers.

The position of our flow gauging stations and 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 1979—80

Ser. No.	Station No.	Stream	Location	Annual flow $m^3 \times 10^6$
1	2—8—3—10	Limnitis	Saw mill	16.1
2	3—3—1—70	Ayios Nicolaos	Kakopetria	11.5
3	3—3—3—95	Karyotis	Evrykhou	13.0
4	3—5—4—40	Elea	Vizakia	6.8
5	3—7—1—50	Peristerona	Panayia Br	18.4
6	3—7—3—90	Akaki	Malounda	17.4
7	6—1—1—80	Ayios Onoufrios	Kambia	2.0
8	6—1—1—85	Pedhieos	Kambia	5.0
9	6—5—3—15	Yialias	Nisou	6.4
10	8—4—5—30	Tremithos	Klavdhia	4.0
11	8—9—7—95	Vasilikos	Coast	10.0

New Flow Gauging Stations

During the year under review, one new flow gauging station was constructed:

Magounda River upstream of Argaka - Magounda Dam. Construction of a "V" shaped structure 5m wide, slope 1:10, and installation of a foot-bridge for high flow measurements.

Repairs and Improvements to Existing Flow Gauging Stations

During the year repairs and improvements were carried out on the following flow gauging stations:

* Pyrgos River near Phlevas locality: Repairs to the lower section of the sill, which had been badly damaged, and coating it with 6 mm metal sheet.
* Peristerona River near Panayia Bridge F.S. Repairs to the lower section of the sill, which had been badly damaged, and coating it with 6 mm metal sheet.
* Yialias River near Kochati : Alterations to the lower section of the sill by the construction of a half "V" shaped structures 12m long, slope 1:20, a retaining wall, and the installation of a foot-bridge for high flow measurements.

Flood Discharges

As the rainfall during the hydrological year was above normal some remarkable floods were recorded. The most noteworthy floods were recorded on the following flow gauging stations:

* Tremithos River near Klavdhia about 65 m^3/s on 13th February 1980. Its catchment area is 142 km^2.
* Tremithos River near Ayia Anna about 63 m^3/s on 13th February 1980. Its catchment area is 90 km^2.
* Pouzis River near Mazotos about 50 m^3/s on 4th December 1979 and about 25 m^3/s on 13th February 1980. Its catchment area is 59 km^2.
* Mylou River near Kornos about 34 m^3/s on 2nd October 1979. Its catchment area is 32 km^2.
* Syrgatis River near Skarinou about 26 m^3/s on 2nd October 1979. Its catchment area is 131 km^2.
* Peristerona River near Panayia Bridge about 28 m^3/s on 13th December 1979. Its catchment area is 78 km^2.
* Akaki River near Malounda about 28 m^3/s on 14th February 1980. Its catchment area is 92 km^2.
* Yialias River near Nisou about 20 m^3/s on 14th February 1980. Its catchment area is 93 km^2.
* Aradhippou River near Panayia Yematousa church about 12 m^3/s on 24th December 1979. Its catchment is 20km^2.

Inflow of Water in Dams

During 1980, out of 48 most important dams in Cyprus which were under regular observations in the past, only 31 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 31 dams under regular observations was considered satisfactory; the maximum volume accumulated was 31.1 MCM or 73% of the total capacity of these dams which is 42.5 MCM. Out of these dams, 23 overflowed, most of them in January and February. Analytically the situation is shown on table II—5.

TABLE II–5

VOLUME OF WATER ACCUMULATED AND COMMENCING DATE OF INFLOW FOR VARIOUS DAMS DURING THE YEAR 1980

Ser No	Dam	Capacity $10^3 \times m^3$	Inflow commencing date (1980)	Maximum volume accumulated $10^3 \times m^3$	Date of maximum accumulation (1980)	Minimum volume accumulated $10^3 \times m^3$	Date of minimum accumulation (1980)	Remarks
1	Agros	72	January	67	April	7	November	
2	Akrounda	22	January	22	January	Empty	August	Overflowed
3	Arakapas	130	January	130	January	11	September	Overflowed
4	Argaka	1150	January	1150	February	225	November	Overflowed
5	Athalassa	790	February	300	February	Empty	December	
6	Ayia Marina	300	January	300	February	57	November	Overflowed
7	Kalokhorio	81	January	81	January	4	October	Overflowed
8	Kalopanayiotis	363	January	363	January	128	October	Overflowed
9	Kandou	38	January	38	January	18	October	Overflowed
10	Kiti	1600	January	1380	February	Empty	October	—
11	Kyperounda	60	January	60	February	Empty	November	Overflowed
12	Lefka (Marathasa)	360	January	360	January	191	October	Overflowed
13	Lefka (Kafizes)	113	January	113	January	(No information)		Overflowed
14	Lefkara	13850	January	5704	May	3413	January 81	
15	Liopetri	340	—	—	—	—		No inflow in 1980
16	Lymbia	220	January	220	February	96	December	Overflowed
17	Lythrodhonda Upper	32	January	32	January	Empty	August	Overflowed
18	Lythrodhonda Lower	32	January	32	January	3	November	Overflowed
19	Mavrokolymbos	2200	January	1350	April	88	October	
20	Ormidhia (Vathys)	100	—	—	—	—		No inflow in 1980
21	Palekhori (Kambi)	650	January	650	January	Empty	November	Overflowed

22	Paralimni Lake	1365	December	7950	February	Empty	June	
23	Pera Pedhi	55	January	55	February	16	August	Overflowed
								(Gate closed 23.1.80)
24	Petra Upper	22	January	22	January	Empty	July	Overflowed
25	Petra Lower	32	January	32	January	Empty	September	Overflowed
26	Pomos	860	January	860	January	27	November	Overflowed
27	Polemidhia	3400	January	3400	February	970	December	Overflowed
28	Prodhromos	110	January	110	April	15	November	Overflowed
29	Pyrgos	270	January	270	January	140	September	Overflowed
30	Trimiklini	330	January	330	May	120	September	Overflowed
								(Gate closed 17.5.80)
31	Yermasoyia	13600	January	13600	February	5680	December	Overflowed
	Totals	42547		31081				

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 Division of the Department.

During the hydrological year 1979—1980, 3020 springs and minor stream discharges were taken on 252 springs and minor streams; 1008 discharges were taken on 84 springs which are under regular monthly observations and 2012 discharges were taken on 168 springs and minor streams for a certain period at various intervals.

As the rainfall during the hydrological year under review was above normal, most of the springs had an increase of flow during winter and spring time and maintained a higher than normal flow during the whole summer.

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 hydro-

logical work was being carried out before. The area during the current year where such work has been carried out was 2701 km² (see map on page 36). The springs, wells/boreholes which were on register at the end of 1980 were 22342.

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 1980 is 1389 and, every month or fortnight 534.

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 1980 9400 wells/boreholes and springs were in use in our most important irrigating areas.

Out of a large portion of the above network of wells and boreholes, water samples are obtained twice a year (November and March), for chemical analysis to evaluate the trends of any quality change of the water in each aquifer.

During 1980 the number of groundwater samples from observation boreholes analysed for Cl was 1011.

As regards the groundwater situation, there was a marked improvement in some aquifers. It is worth mentioning among those the Akrotiri and Yialias valley aquifers. On the contrary in others due to the over pumping the situation became grave especially at Kokkinokhoria area. Details may be seen in table II—6 of selected observation boreholes.

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 Agricultural 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.

TABLE II—6

SELECTED OBSERVATION BOREHOLES

Water level increase (+) or decrease (—)

Serial No.	Hydr. No.	Village	March 1979	November 1979	March 1980	November 1980	March 79—80	Nov. 79—80
56/56	192	Liopetri	+0.95	+0.38	+0.13	+0.12	—0.82	—0.26
51/51	774	Phrenaros	+4.49	+3.47	+3.34	+2.46	—1.15	—1.01
79/56	975	"	+8.18	+8.21	+8.63	+8.22	+0.45	+0.01
20/63	1516	Paralimni	+19.68	+19.38	+19.69	+19.27	+0.01	—0.11
22/63	1518	"	+5.96	+5.80	+5.92	+5.73	—0.04	—0.07
EB 94/70	1236	Akrotiri	+1.66	—0.29	+1.56	—0.04	—0.10	+0.25
125/60	15	Episkopi	+26.19*	+17.36	+26.46*	+19.31	+0.27	+1.95
88/54	24	Kolossi	+2.60*	—0.45	+2.70	+0.20	+0.10	+0.65
45/63	811	Zakaki	+0.86	+0.38	+1.20	+0.83	+0.34	+0.45
51/63	813	Limassol	+1.13*	+0.78	+1.53	+1.18	+0.40	+0.40
107/61	17	Yermasoyia ..	+8.13	+1.18	+15.16	+1.13	+7.03	—0.05
108/59	8	"	+30.00	+16.65	+35.44	—	+5.44	—
7/60	22	"	+1.48	+0.28	+6.63	—0.12	+5.15	—0.40
134/59	27	"	+5.81	+0.76	+11.01	+0.46	+5.20	—0.30
161/50	180	K. Trimithia ..	+187.35	+187.34	+187.45	+187.23	+0.10	—0.11
160/50	222	"	+194.83	+194.25	+194.97	+193.82	+0.14	—0.43
—	60	Dhali	+209.38	+203.76	+214.63	+204.31	+5.25	+0.55
—	37	Potamia	+179.84	+178.35	+185.71	+181.28	+5.87	+2.93
—	179	"	+183.46	+180.56	+191.93	+183.59	+8.47	+3.03

* Measurements of April 1979 and 1980

The committee performed during 1980, 34 meetings and examined 2324 applications sent to the Director, WDD by the District Officers, as follows:-

Water Supply (Special Measures)
Law areas 63
Water Conservation areas 1725
Non Water Conservation areas .. 531

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 the map on page 48 the areas which have been declared as "Water Conservation Areas" under the Wells Law Cap 351 are shown. Particulars of these areas are also shown on the following table II—7.

Applications for well permits falling within a Water Conservation Area, are being sent by the District Officers to the Water Development Department

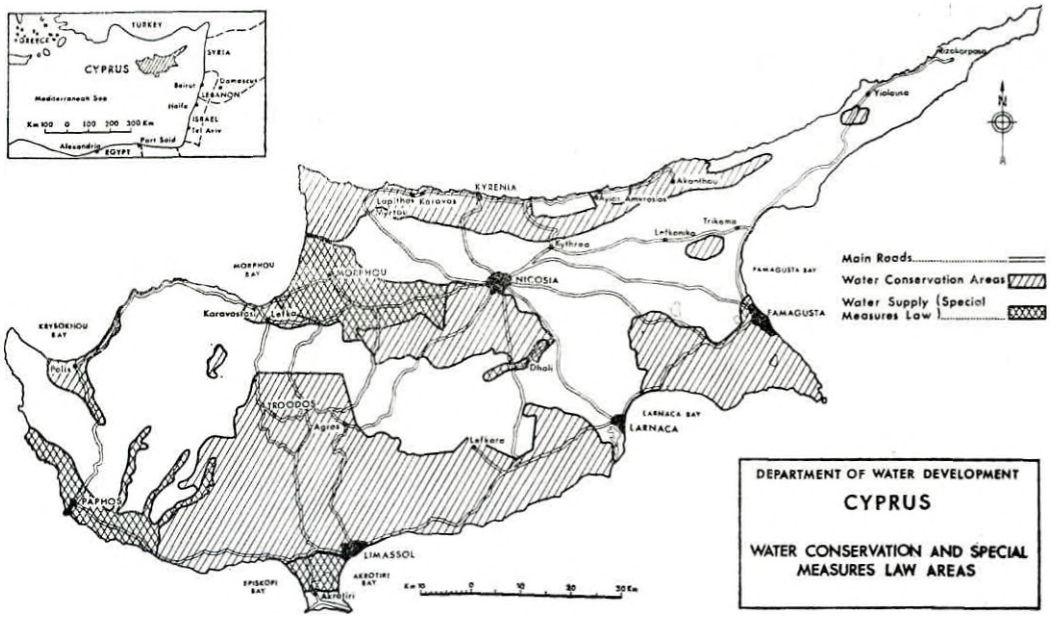


TABLE II—7

WATER CONSERVATION AREAS

Ser No	Water Conservation Area	Order No	Date	Cazette No	Date
1	Kokkini Trimithia—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	Vasilia, Lapithos, Kyrenia, Ayios Epiktitos, etc.	245	28. 4.59	4228	30. 4.59

TABLE II—7

WATER CONSERVATION AREAS (Continued)

Ser No	Water Conservation Area	Order No	Date	Cazette No	Date
12	Makedhonitissa, 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, Dhromolaxia	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	25.11.63
23	Ayia Erini	280	19. 5.66	499	2. 6.66
24	Paramali, Evdhimou	SBA 68	29. 7.67	SBA 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 Amvrosios	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	Limassol—Paphos—Larnaca extension of WCA	215	30. 9.77	1429	3. 3.78

for technical advice and recommendations. These recomendations 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 48 and particulars given in 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.

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 borehole or well.

According to the provisions of the above referred law, water meters should be installed in the Water Supply (Special Measures) Law areas. Information about the installation and operation of water meters are not available for Western Mesaoria area, since this area is still under Turkish occupation. For Paphos area the Law has not yet been enforced. In Limassol-Akrotiri area 393 water meters have been installed of which 346 are under continuous operation. The total volume of water recorded is 11.9 MCM. During the year 225 illegal pumpings have been reported to the District Officer, out of which 130 were presented to Court.

Private Drillers (Wells Law, Section 36)

According to the above law, no one is allowed to operate a drilling rig without a Driller's licence. Such a licence is issued by the Director of the Water Development Department, after the interested person to become a Driller applied for it and when the Director

TABLE II—8

WATER SUPPLY (SPECIAL MEASURES) LAW AREAS

Ser No	Area	Order No	Date	Cazette No	Date
1	Western Mesaoria (Pendayia—Morphou—Kokkini Trimithia)	—	—	331	9. 7.64
2	Akrotiri peninsula	—	—	331	9. 7.64
3	South-Eastern Mesaoria (F'sta—Paralimni—Ormidhia—Akhna), later withdrawn	—	—	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	Ezousas 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	Mavrokolymbos 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

of Department is satisfied that the applicant is competent to carry out such a job. A fee is paid for the licence and each year for its renewal.

According to the same law, every driller has to notify the Director of the Water Development Department of his intention to drill a borehole, to keep samples from the rocks penetrated and send to the above said Director, together with a technical report on each borehole drilled.

During 1980, this Department issued 6 Drillers licences and renewed 50 others. The number of private drilling rigs which drilled for water during 1980, was 68 and this Department has been notified about the drilling or cleaning of 152 boreholes. Information from private drillers have been received by this Department for 137 boreholes.

During 1980, 49 private Drillers were reported to the District Officers for illegal drilling.

WATER QUALITY

Chemical Analyses

During the year, 794 samples of water were sent to the Government Analyst and 1309 to the WDD Laboratory for chemical analysis. Out of these, 1096 samples were taken from springs,

wells or boreholes, which are used or proposed as water supply sources. The remaining 1007 samples were taken from rivers, springs, observation boreholes and other miscellaneous sources.

In addition to the above, 1200 samples of water taken from observation boreholes in the hydrological survey areas were analysed by the Water Resources Division for chloride content.

Bacteriological Analyses

During the year, 411 samples were sent to the Pathological Laboratory for bacteriological analysis with results as follows:-

Water Supply	No of samples	No of unsatisfactory samples
Nicosia	78	22
Limassol	169	11
Larnaca	164	22
Total	411	55

The unsatisfactory samples at Nicosia, Limassol and Larnaca were of unchlorinated water. All chlorinated samples at main reservoirs were highly satisfactory.

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, 78 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 applications from Greek Cypriot displaced farmers to use wells/boreholes abandoned by their Turkish Cypriot owners and to grant loans for the purchase, repair and installation of pumping plants and pipelines for the irrigation of abandoned fields of Turkish Cypriot ownership. For this purpose, the Government placed at the disposal of the Committee, the sum of £457 500 for the above said loans.

According to the above said decision of the Council of Ministers, the Committee is chaired by the Director - General, Ministry of Agriculture and Natural Resources, who transferred the chairmanship to the Director of Water Development Department. Other members are the Director-General, Ministry of the Interior, the Director-General, Ministry of Finance, the Director-General, Planning Bureau, the Commissioner for Co-operative Development, the Director, Department of Agriculture and the representatives of the Ministry of Agriculture and Natural Resources at the District Committees

for the protection of Turkish Cypriot properties, or their representatives.

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

Accordingly, special application forms have been prepared, obtainable from its Regional Offices 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 Agricultural Officer. When the applicant or applicants are lawful tenants of abandoned by their owners Turkish Cypriot fields, leased to them by the Central Committee for the protection of Turkish Cypriot Property—the District Engineer transmits the application with suggestions as to which fields may be irrigated from the same boreholes 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 so that it may be distributed by the local cooperative Banks to the interested farmers. In case of groups of farmers the loan remains in the hands of the local cooperative Banks which undertake to purchase, install and run the pumping plants and to deliver water for irrigation to the interested farmers, who sign an agreement for the repayment of loan and the running expenses as well.

The repayment period for the loans has been set to seven years with an interest of 4.5%.

When part or the hole 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 substracting 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.

From its establishment the Central Committee for the issue of loans and the reactivation of Turkish Cypriot owned wells/boreholes had 53 meetings during which it approved 421 applications from 1222 displaced farmers for the irrigation of 11974 donums of land. The amount of loans granted by the end of this year was £357,319.- and the pumping plants of Turkish Cypriot ownership to £42,190,-

During the year under examination, the Committee had 2 meetings during which

it approved 9 applications from 9 farmers for the irrigation of 123 donums of land. The amount of loans granted is £6360. See table II—9, below.

TABLE II—9

APPLICATIONS EXAMINED AND LOANS ISSUED FOR THE REACTIVATION OF TURKISH CYPRIOT WELLS ABANDONED BY THEIR OWNERS

Particulars	N'sia	L'ssol	L'ca	Paphos	Totals
Applications approved (No)	—	—	4	5	9
Wells/boreholes allocated (No)	—	—	4	3	7
Farmers benefited (No)	—	—	4	5	9
Area to be irrigated (donums)	—	—	52	71	123
Loans granted (No)	—	—	4	3	7
Loans granted (£)	—	—	2730	3630	6360
Loans issued (£)	—	—	2730	3630	6360
T/C pumping plant allowed to be used (No)	—	—	—	—	—
Estimated value of T/C pumping plants (£)	—	—	—	—	—
Amortization rate (£/year)	—	—	—	—	—

Current meter measurement for the calibration of the measuring weir at Phinikaria flow gauging station on Yermasoyia River. WDD Photo 48EN-15A (6.3.80).

III DIVISION OF PLANNING

by
Dr C A Christodoulou
Senior Water Engineer
Head of Division

INTRODUCTION

The Planning Division of the Water Development Department consists of the following two branches:

* *Reconnaissance and Feasibility Reporting*
* *Investigations and Laboratory*

RECONNAISSANCE AND FEASIBILITY REPORTING BRANCH

SOUTHERN CONVEYOR PROJECT

General

Since the Spring of 1978 (March-April) a detailed study of the water resources of southern catchments of Cyprus known as the Southern Conveyor Project is being carried out by a team in the Water Development Department. This study is being carried out in co-operation with the Overseas Development Administration of the United Kingdom, which has provided for this purpose, the Project Manager as well as three specialists to augment the local team.

The main objective of the SCP is to determine how much surplus water is available in south-west Cyprus and whether it would be technically and economically feasible to convey it to areas where it could meet predictable future domestic needs and the remainder be used for irrigation development.

The study was designed to be carried out in two stages. The ultimate objective of stage 1 was to identify diffe-

rent development options and to appraise their respective economic viability.

Stage 2 would involve the preparation of a detailed feasibility study—suitable for presentation to funding agencies—of the option which the Government would select on the basis of the findings of stage 1.

Stage 1 has been completed and the Government has selected the option to be implemented. Under this option it is estimated that about 7,500 ha of land will be irrigated in the areas of Akrotiri, Parekklisha, Mazotos, Kiti and Kokkinokhoria. At the end of 1980 (11 December) Consulting Engineers were employed (Sir William Halcrow and Partners) to undertake the Engineering component of the feasibility study).

The implementation of the Project would require the construction of a main dam on Kouris (120 MCM), a smaller dam at Akhna (5 MCM) and possibly two other smaller dams. Furthermore it would involve the construction of:

* A closed conduit of approximate length of 110 km
* A diversion tunnel from Dhiarizos to Kouris
* Pumping stations and water treatment plants
* Water conveyors for domestic supply to the towns of Limassol, Larnaca, Nicosia and Famagusta
* Distribution network systems.

HYDROLOGY

A major part of the team's work during 1980 was devoted to the evaluation of surface water resources at the following points and with the use of the rainfall-runoff mathematical model for the period 1916—1978.

* Kouris river: at Zygos, Kryos, and Kouris
* Garyllis river: at Polemidhia dam
* Yermasoyia river: at Phinikaria and Akrounda
* Pyrgos river: at the proposed damsite
* Vasilikos river: at Megas, Kalavassos, at the coast and at the proposed damsite
* Maroni river: at Vavla and Khirokitia
* Pendaskinos river : at Lefkara dam, Mylou, Skarinou and at the proposed damsite
* Khapotami river: at Kissousa and the coast
* Evdhimou river
* Paramali river

HYDROGEOLOGY

During 1980 the team was occupied with the collection and processing of data for the aquifers listed below, as well as their water balances. This work has been achieved by the use of groundwater mathematical models. After the successful calibration of the mathematical model of each aquifer with real observations the water balances were determined and the safe yield under certain conditions was estimated. For at least two areas, namely Akrotiri and Kokkinokhoria, the groundwater models were used for the evaluation of several alternative solutions regarding the future redistribution and utilisation of groundwater. The follow-

ing aquifers have been studied in detail:

* Evdhimou—Paramali
* Akrotiri
* Parekklisha
* Kiti—Perivolia
* Alaminos
* Kokkinokhoria

ENGINEERING

During 1980 the engineering team of the SCP completed the costings of all major engineering components of the Project, based on preliminary designs. In most cases the costs of dams, pipelines and irrigation works were prepared in the form of curves covering a significant range of sizes as this was the form of input needed for the project's comprehensive computer simulation and optimisation model. The engineering works comprised:

* A diversion weir on the Dhiarizos river above the village of Arminou.
* A canal conveyor of 10 km length downstream from the weir as far as Yerovasa.
* As an alternative to the canal conveyor above, a pipeline of similar length laid on the river bed.
* A 12 km long tunnel from Yerovasa to Kryos tributary of the Kouris river.
* The main conveyor pipeline of 110 km length from Kouris dam to Akhna terminal storage reservoir at Kokkinokhoria.
* Connecting pipelines to irrigation areas and the existing Khirokitia treatment works.
* Water treatment works at Limassol and Tersephanou for Larnaca and Nicosia.
* Water pipeline of 40 km length from Tersephanou to Nicosia, including pumping station.
* Small earth dams at Pyrgos (1.5 MCM) and Akhna (up to 5 MCM).
* 20 km pipeline from Kouris dam to Evdhimou.
* Pressurised irrigation networks, including night storage reservoirs in Evdhimou, Akrotiri, Parekklisha, Mazotos, Kiti and Kokkinokhoria.

Following completion of the pre-feasibility study it was decided that in view of the large engineering component of the feasibility study an additional input would be sought from Consulting Engineers. Detailed terms of reference were drawn up, and a firm "Sir William Halcrow and Partners" were selected in December. Programmes were prepared of the surveying and site investigation requirements for the feasibility study, and additional surveyors had to be recruited.

The route of the main conveyor pipeline was firmed up and profile levelling started, with the aim of finishing this section of work by Easter 1981. In order to speed up the drawing work a decision was taken to produce the longitudinal sections along the pipeline route by computer plotter.

Final boundaries of some of the irrigation areas became available towards the end of the year, enabling detailed design work on the layouts to proceed.

AGRICULTURE

With the completion of the Stage 1 fieldwork (towards the end of 1979), efforts were directed towards the development and analysis of the alternative irrigation options which were to be compared. Until the conclusion of Stage 1 of the study (April '80) the time was divided between project design and report preparation. An outline programme was also prepared of Stage 2 (the feasibility study) which envisaged completion of most agricultural activities by July 1981.

In February 1980, the southern half of the Kokkinokhoria was re-flown by RAF in support of the land use mapping which occupied a significant part of the year. In all, some 11,000 ha of Kokkinokhoria were covered once to map all the spring crops and for a second time to map the summer vegetable crops. The staffing situation unfortunately did not permit coverage of Kokkinokhoria for a third time and consequently the autumn potato crop went unmapped; instead a visual estimation of cropped areas was undertaken. The other major field operation in 1980 involved the double mapping of land use on the Kouris Delta (1,000 ha).

By the end of the year, final delineation of the Project area was well advanced and, in the case of Kiti, completed. Working parties were established to advice on local water allocation within the individual project areas; allocations were finalised for Kiti, Mazotos and Parekklisha. The Akrotiri area was also delineated with a view to programing land consolidation and designing the irrigation layout.

Provisional cropping patterns were devised for all the project areas and their net irrigation requirements were computed. Several "new" crops were proposed for economic evaluation, including avocado pears, artichokes, groundnuts, durum wheat, winter fodders and virginia tobacco. Standard irrigation systems were agreed for all crops selected. Compilation of the appropriate crop (seed, fertilizer, machinery etc) and the labour requirements for each crop proved a major task occupying a considerable part of the latter half of the year. Inputs for a total of 17 crops were assembled. For the additional crops, functions were produced relating anticipated yields to projected water consumption. An outline proposal was prepared for trials on early onion production.

AGRICULTURAL ECONOMICS

Stage 1 Options and Reports

Early in 1980 the preparation of the supplementary Report of Stage 1 began. While report preparation continued, examination interpretation and discussion of the various options took place. The results for each of the options were tabulated and presented for comparison in the Stage 1 Main Report.

Following completion of Stage 1, considerable work was carried out to split overall project costs and benefits of option 4 between irrigation and domestic water sectors, and between each

of the project areas. The costs and benefits were broken down in this way to indicate the viability of individual project areas.

Subsequently the section prepared preliminary crop budgets for new crops which were not included in Stage 1.

A computer programme for estimating crop profitability was borrowed from the economists of Khrysokhou Watershed Irrigation Project and adapted to suit SCP requirements.

Concurrently, the technical assumptions regarding crop inputs and outputs were revised. Further study was also made of irrigation requirements of the SCP crops with the attempt to determine the most profitable application level.

Studies - Surveys

A survey has been conducted in 70 villages in or adjacent to the project area aiming at defining labour availability for agricultural development on a local basis.

A study has been prepared on the production, consumption, import and export of agricultural commodities with a view to establish opportunities for local substitution of certain crops currently imported.

Domestic Water Demand

Further study was made of non-agricultural water demand. Forecasts of tourist arrivals have been re-estimated in conjuction with the Cyprus Tourism Organisation and the Planning Bureau and revised population projections have also been prepared. The section also undertook to present land consolidation cost estimates for the areas where land consolidation is feasible, therefore discussions and meetings with personnel from the Land Consolidation Authority took place during the year under review.

Miscellaneous

Finally the team participated in the village water allocation and the desalination study.

SYSTEMS ANALYSIS

During 1980 work was focussed on developing a comprehensive simulation - optimisation model for the Southern Conveyor System. The existing model was updated according to the findings of the prefeasibility study. Twelve development options were studied and the optimal pattern relating the sizes and timing of the hydraulic structures was determined. Each development option was ascribed a varying size of development. It is on the basis of these results that the Council of Ministers adopted the option to be implemented.

In parallel to the development of the aforementioned model work in systems analysis was completed in the following fields.

* Simulation studies of the Vasilikos - Pendaskhinos Project using updated hydrological data.
* Operation studies of the Asprokremmos reservoir.
* Operation studies of the Kouris reservoir.

* Formulation of a computer programme for calculating the monthly net and gross irrigation requirements and effective rainfall using daily input data.

KHRYSOKHOU WATERSHED IRRIGATION PROJECT (KWIP)

General

The study of KWIP began in March 1979 and it is being carried out in co-operation with the FAO with financial assistance from the United National Development Programme (UNDP).

The area of study covers about 900 sq km and includes Khrysokhou Bay, Akamas, Tylliria, Marathasa and the uplands in the upper Khrysokhou basin.

The main long term objectives of the Project are the optimum development of Agriculture in the area through irrigation and the creation of employment.

The team which includes both local and FAO personnel includes, Engineers, Hydrologists, Agriculturists and Economists. The study is to be carried out in two stages; stage 1 will identify the various development options and stage 2 will carry out the detailed feasibility study.

It is estimated that the Project will irrigate 4,000 ha of land. This would involve the construction of two dams one at Evretou and one at Ezousas. The conveyance of water will be done by both closed and open conduits. Finally it would involve the construction of new irrigation network systems and land development.

WATER RESOURCES INVENTORY GROUP

During 1980 the activities of this group were centred on the followings:

Groundwater

* Extension of the existing groundwater observation network in the Project area.
* Supervision of the drilling and pumping test programmes carried out in Project area.
* Studies on aquifer characteristics, potentials and interactions.
* Preparation of a groundwater model for the Khrysokhou river gravel aquifer.

Surface Water

* The construction of new weirs was completed.
* Data collection and processing of river discharges and climatological records.
* Estimation of present surface water use, mainly for irrigation purposes.
* Flood studies.

ENGINEERING

Irrigation Engineering

During 1980 the section completed detailed designs and costings for seven sample areas which have been selected, one in each of the main areas of irrigation. Topographical, Soil and Farm surveys were conducted and the final designs were illustrated at a scale of 1:2500. Also the design and costing of the "on farm" works was carried out on the basis of dimensioned sketches of typical plots.

The outline design of the irrigation network of the lowland area was completed and cost estimates and all relevant drawings were produced. The designs were prepared, using the 1:5000 cadastral and topographical maps with some field checking where necessary.

During the same period the working papers "Irrigation Design Criteria", "Efficiency" and "Summary of Preliminary Irrigation Engineering Studies" were completed.

Dam Engineering

Initial dam studies concentrated on identifying for possible new dams at Evretou and Ezousas the most efficient axes of alternatives proposed by earlier investigations.

Site investigations and preliminary designs were subsequently carried out for two axes at Evretou to identify the most economic one at what are geologically probably the most complex sites considered for dams in Cyprus. One axis, using a limestone rockfill dam with an earthfill core, was subsequently adopted for further consideration and full feasibility studies were started. The first studies for the lowlands conveyor to link the small rivers to Evretou dam identified a gravity pressure pipeline as the most suitable form, except where the Tylliria rivers might be diverted by tunnel to the Livadhi river if this should be required.

Several possible pipe and tunnel routes were examined for conveying water from an Ezousa dam to the uplands region. Finally a gravity pressure pipeline following the Ezousas river for much of the way was identified as the most suitable scheme.

AGRONOMY

The agro-economical studies of the Project continued throughout 1980. Nine development options were prepared from which one was selected for detailed feasibility study. This option includes all the coastal areas and river valleys below the 80 m contour line, a net area of about 3,100 ha, and an upland area between Yiolou—Stroumbi—Polemi of about 1,200 ha. The selections were based on agro-economic criteria such as soils, labour and water resources and cost of water mobilisation. Agro-economic input data norms were finalised, with emphasis on new modern irrigation systems and a preliminary report was published in a KWIP working paper in July 1980.

In cooperation with the Agricultural Research Institute, about 200 farms were intensively surveyed. On the basis of the results an assessment has been made of the "Without Project" case. The soil survey and land suitability classification studies undertaken by the Soils and Plant Nutrition Section of the Department of Agriculture, were executed.

For more detailed analysis of land tenure, existing cropping pattern, available accesses ownership and soil studies seven sample areas were chosen and a detailed survey was carried out.

Finally the cropping pattern and the crop water requirements were finalised.

WATER RESOURCES SYSTEMS

The assessment of the water resources in the Project area was carried out in three steps. The first was to estimate the available surface water using a stochastic hydrological model. This model uses historic records of precipitation. Temperature and streamflows to generate simulated series of stream flows and water demands for different areas of irrigation and sets of cropping pattern. The second step was to estimate the groundwater resources. The third was to use the results from steps one and two as input to a Reservoir Operation Model to determine the area that can be irrigated under various alternatives. These three steps form the water resources systems. Available rainfall and temperature records in the project area and stream flow data from the six major watersheds in the region were compiled and prepared for use as input information for the first step. The extent and physical characteristics of the aquifers in the project area were determined from the available hydrogeological information and the analysis of performed pumping tests. The water abstructed from these aquifers was also estimated. This information was compiled for the second step. The input information required for step three, i.e. the various reservoir sizes, conveyance systems and the results of steps one and two were also compiled.

Finally, much time was spent on running the three steps of the water resources systems on an IBM 370 computer for the prefeasibility stages of the Project.

INVESTIGATION AND LABORATORY BRANCH

General

In 1980 the work of the Site Investigation, Laboratories and Grouting Sections of the Division of Planning, related to a number of major and more minor projects of the Department. Furthermore at the request of other Government Departments and private organizations, a number of projects were undertaken and completed during out the year.

The increased volume of work noted in previous years persisted in 1980 and this again led to full utilization of available equipment and personnel throughout the year.

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

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

* Southern Conveyor Project: Main western tunnel, Pyrgos Dam.
* Khrysokhou Watershed Irrigation Project: Evretou Dam — Feasibility study.
* Pissouri Irrigation Project: Pissouri Pond.
* Khirokitia Treatment Plant.
* Pitsilia Rural Development Project: Ayii Vavatsinias Dam, Kyperounda, Agridhia, Lagoudhera, Sarandi No. 1 and Sarandi No 2 Ponds.
* Peristerona observation borehole.

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

* Foundation investigations for Refugee housing estates at the request of the Department of Town Planning and Housing were carried out at Ayios Pavlos, Apostolos Andreas, Apostolos Loucas and Athalassa.
* Site investigation for the Nicosia Sewerage Board.
* Site investigation for the Civil Servants' Housing Scheme, Larnaca.
* Drilling at Acropolis, Nicosia, for Kermia and J & P.

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

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

Site/Material Investigations, Grouting Works

Table III—1 gives relevant details of all site, construction material and grouting works performed during the year, giving also duration of work and cost for each project.

Laboratories

The work performed in the Soils Laboratory is analysed in table III—2 with relevant details as to the type and number of tests performed for each project.

The work of the concrete and field laboratories is presented in the same way on table III—3.

Personnel

On the 31st of December 1980 the total number of personnel employed with the section was 33. The number of, title or speciality and function of personnel employed are as shown below:

Title	Function		
	Sup.	Lab.	Drillers
Executive Engineer I ...	1	-	-
Executive Engineer II ...	1	-	-
Technician I	1	1	-
Technician II	1	6	-
Laboratory Technician II	-	7	-
Foreman	-	-	2
Driller	-	-	4
Casual labour	-	9	-

Machinery and Equipment

During 1980 the Laboratory acquired the following additional equipment: one vibrating table, pin-hole apparatus, Harvard compacting apparatus, two ovens and two impact hammers for testing concrete.

TABLE III—1. 1980 SITE/MATERIALS INVESTIGATIONS AND GROUTING

Ser. No.	Project	Aim and Investigation	Fieldwork as carried out	Machinery used	Expenditure
A. DEPARTMENTAL PROJECTS					£
1.	Southern Conveyor Project, main western tunnel investigations (Continued from 1979 to 7.2.80 and 1.3—31.5.80)	Subsurface geological investigations, permeability and excavation conditions	Drilling of 4 No. coredrilled holes with associated water pressure testing, total depth 520.85 m	—Core drills —Traxcavator —Backactor —Flush pumps	7 000
2.	Khrysokhou Irrigation Project. Evretou Damsite investigations (Continued from 1979 to 31.12.80)	Subsurface geological investigations to establish permeability and excavation conditions, bearing capacities and quality of embankment materials	—Drilling of 15 No. boreholes with associated water pressure testing, total depth 831.70 m —Drilling of 13 No. boreholes total depth 58.95 m —17 No. trial pits	—Core drills —Flush pumps —Overburden rig —Compressors —Traxcavator —Diggers	27 000
3.	Pissouri Pond (11.3—3.4.80)	Subsurface geological investigations to establish depth to fresh rock and foundation conditions		—Mobile Auger drill	700

TABLE III—1. 1980 SITE/MATERIALS INVESTIGATIONS AND GROUTING (continued)

Ser. No.	Project	Aim and Investigation	Fieldwork as carried out	Machinery used	Expenditure £
4.	Khrirokitia Treatment Plant (9.7—22.7.80)	Subsurface geological investigation to establish the reasons of settlement and cracking of the existing building	3 No. boreholes, total depth 18.0 m, with associated SPT testing	—Mobile Auger drill	750
5.	Ayii Vavatsinias Dam (13.8—21.11.80)	Grout curtain cut-off, Drainage drilling, Grouting of construction joints		—Core drills —Wagon drill —Grout pump —Compressor —Mixer —Mini wagon drill —Pumps	7 000
6.	PITSILIA PROJECT a Kyperounda Pond b Agridhia Pond c Lagoudhera Pond d Sarandi Pond No. 1 e Sarandi Pond No. 2 (1.10—30.11.80)	Subsurface geological investigation to establish excavation conditions and depth to fresh rock		—Auger drill —Digger —Traxcavator	600
7.	Peristerona observation borehole (11.11—28.11.80)	Boring of an observation borehole near BH100/78 and installation of piezometer at 68m below ground surface	Excavation of 1 No. borehole, depth 68 m	—Overburden drill —Compressor —Flush pump	700

TABLE III—1. 1980 SITE/MATERIALS INVESTIGATIONS AND GROUTING (continued)

Ser. No.	Project	Aim and Investigation	Fieldwork as carried out	Machinery used	Expenditure £
8.	Pyrgos Dam (27.11—31.12.80)	Subsurface geological investigations, permeability and excavation conditions	2 No. boreholes, total depth 33.0 m, water testing 1 No. borehole, 12.0 m depth	—Core drill —Auger drill —Flush pump	730
B. OTHER GOVERNMENT PROJECTS					
1.	Ayios Pavlos Refugee housing scheme (12.2—20.2.80)	Subsurface geological investigations	2 No. boreholes, total depth 20.0 m with associated SPT testing and disturbed/ undisturbed sampling	—Mobile Auger drill	300
2.	Apostolos Andreas Refugee housing scheme (21.2—27.2.80)	Subsurface geological investigations	2 No. boreholes, total depth 20.0 m disturbed sampling	—Mobile Auger drill	300
3.	Apostolos Loucas Refugee housing scheme (23.4—30.4.80)	Subsurface geological investigations	2 No. boreholes, total depth 20.0 m with associated SPT testing and disturbed/ undisturbed sampling	—Mobile Auger drill	300

TABLE III—1. 1980 SITE/MATERIALS INVESTIGATIONS AND GROUTING (continued)

Ser. No.	Project	Aim and Investigation	Fieldwork as carried out	Machinery used	Expenditure £
4.	Athalassa Refugee housing scheme (28.2—10.3.80)	Subsurface geological investigations	3 No. boreholes, total depth 36.0 m with associated SPT testing and disturbed sampling	—Mobile Auger drill	400
	PRIVATE AND BOARD PROJECTS				
1.	Nicosia sewerage scheme (9.4—22.4.80)	Subsurface geological investigations to establish the foundation conditions	Excavation of 7 No. boreholes total depth 35.65 m, piezometer installation	—Mobile Auger drill	572
2.	J & P Project at Acropolis Nicosia (continued from 1979 to 10.1.80)	Subsurface geological investigations		—Mobile Auger drill	650
3.	Kermia Project at Acropolis, Nicosia (3.6—27.6.80)	Subsurface geological investigations		—Mobile Auger drill —Overburden drill —Compressor	850

TABLE III—1. 1980 SITE/MATERIALS INVESTIGATIONS AND GROUTING (continued)

Ser. No.	Project	Aim and Investigation	Fieldwork as carried out	Machinery used	Expenditure £
4.	Civil Servants Housing scheme, Larnaca (23.7—8.8.80)	Subsurface geological investigations	4 No. boreholes, total depth 41.80 m with associated SPT testing and disturbed/ undisturbed sampling	—Mobile Auger drill	1,100
5.	Minas Zannetos, Paphos (9.12—17.12.80)	Subsurface geological investigations	4 No. boreholes, total depth 54.0 m with associated SPT testing and sampling	—Auger drill	360
6.	C Levas, Ayios Pavlos, Nicosia	Subsurface geological investigations	3 No. boreholes, total depth 25.9 m with associated SPT testing and sampling	—Auger drill	168
7.	Andreas Damianos Project	Subsurface geological investigations	7 No. boreholes, total depth 77.80 m with associated SPT testing and sampling	—Auger drill	100

TABLE III—2. SOILS LABORATORY TESTS DURING 1980

PROJECT / Type of Test	Asprokremmos dam	Evretou dam	Khirokitia Treatment Plant	PITSILIA RURAL DEVELOPMENT							Pissouri Reservoir	Private Firms	Miscellaneous	Total of each test
				Xyliatos dam	Ephtaghonia Ponds	Ayii Vavatsinias Pond	Kato Mylos Pond	Pelendria Pond	Khandria Pond	Other Pitsilia Ponds				
Sieve analysis (Wet/Dry)	210	3	10	—	46	9	4	2	2	9	1	20	8	324
Hydrometer analysis . .	60	23	10	7	3	—	—	—	3	5	10	13	19	153
Atterberg Limits . . .	106	23	29	7	—	—	—	—	—	4	10	24	21	224
Specific gravity	56	23	—	3	3	—	—	—	3	3	10	9	19	129
Natural density	397	—	—	80	241	86	45	173	50	—	—	—	—	1072
Moisture content . . .	397	23	29	120	218	86	45	173	50	—	10	3	—	1154
Compaction	251	3	—	10	23	6	2	3	3	5	2	—	—	57
Permeability	44	4	—	5	—	—	—	—	—	—	2	4	—	59
Undrained triaxial . . .	—	1	2	—	—	—	—	—	—	—	—	1	1	5
Drained triaxial	17	1	—	—	—	—	—	—	—	—	1	1	—	20
Large shearbox	—	—	—	—	1	—	—	1	—	4	—	4	—	10
Consolidation	6	—	2	—	—	—	—	—	—	—	—	—	—	8
Suspended sediment . .	13	—	—	—	—	—	—	—	—	—	—	—	78	91
Relative density	36	—	—	—	—	—	—	—	—	—	—	—	—	36
Total	1342	104	82	232	535	187	96	352	111	30	46	79	146	3342

TABLE III–3. CONCRETE & FIELD LABORATORY TESTS DURING 1980

TESTS	Asprokremmos Dam	Xyliatos dam	Ayii Vavatsinias dam	Tenders for concrete aggregate	Miscellaneous	Stavrovouni Balancing Reservoir	New Lakatamia Reservoir	Total
Mix design	—	14	12	—	2	23	12	63
Density of aggregates	—	4	6	—	2	10	57	79
Sieve analysis	127	8	12	75	10	39	120	391
Silt content	43	14	12	35	10	70	60	244
Organic impurities	43	14	12	35	10	70	60	244
Specific gravity	—	4	6	8	2	15	12	47
Water absorbtion	—	4	6	8	2	15	12	47
Moisture content	75	120	140	12	4	27	135	513
Aggregate crushing value	4	4	4	2	2	—	4	20
Bulking of sand	—	—	2	—	2	—	—	4
Cube crushing	520	480	520	36	76	198	1048	2878
Slump	162	180	210	—	24	140	262	978
Core crushing strength	—	—	—	—	65	—	—	65
TOTAL	974	846	942	211	211	607	1782	5573

IV DIVISION OF DESIGN

by
Chr. Marcoullis
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 minor or local importance, which cannot be undertaken by the Planning Division or to proceed with the necessary financial arrangements for project implementation, before such projects are proceeded to the Division of Construction. 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.

Furthermore, in addition to the Bran-

ches particular to the above mentioned kind of works, this Division encorporates the Topography and the Drawing and Records Branches of the Department. The first undertakes topographical works of the Department, whereas the second 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 the photo-process lab work.

By the end of 1980 the following qualified personnel were working with the Design Division.

One Senior Water Engineer, Head of the Division
Three Executive Engineers, Class I
Three Executive Engineers, Class II
Two Topographer/Irrigation Engineers.

The personnel of the Topography and Drawing and Records Branches are given in the respective sections.

MAIN ACTIVITIES

The main activities of the Design Division continued during 1980 to be focussed on the implementation of the Pitsilia Integrated Rural Development Project. Furthermore this Division continued to be involved in the implementation of the Vasilikos-Pendaskinos Project, inspite of the fact that in February 1980, a foreign Project Manager was appointed and undertook the responsibility for the administration of this project. Finally the designs of some small works were carried out and the feasibility studies of some other small projects were completed.

The main component of the Pitsilia Integrated Rural Development Project, which is also the main input of the Department into the Project is irrigation. A part of this component provides for the rehabilitation of existing irrigation works which along with the village water supply schemes constitute the input of the Division of Small Project Planning. The rest of this component, which is the direct responsibility of this Division, includes the construction of Xyliatos Dam and of several pond and borehole schemes.

The implementation of a pond or borehole scheme, involves a very complex procedure which includes a preliminary but quite advanced design and cost estimate, which form the basis for a preliminary approval of the scheme by the interested farmers, the preparation of a feasibility study, an appraisal and approval of the scheme by the Planning Bureau and the World Bank and the preparation of the final designs and construction drawings together with all necessary contract documents. As it is provided in the Loan Agreement with the World Bank the construction of ponds is carried out by local contractors whereas all other works are undertaken by the Division of Construction of the Department. In the case of boreholes schemes, before embarking in the above mentioned procedure, a prolonged pumping test is carried out by the Department assisted by the Geological Surveys Department, in order to verify the results of the short period test, which is performed right after the drilling of the borehole.

As it is known the overall coordination of the project works has been undertaken by the Ministry of Agriculture and Natural Resources, whereas the coodrination of the WDD input into the project is handled by the Division of Design. An account of the progress achieved during 1980 on pond and borehole schemes is given in a tabulary form in Table IV—1. Details of the progress of construction of Xyliatos Dam as well as of ponds which entered the construction stage is given in the respective section of the report.

TABLE IV—1

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

Major Irrigation Works—Progress during 1980

Scheme	Pre/ary Design—Pumping	Pre/ary Approval by Farmers	Feasibility Studies	Final Designs Contract Docum.	Approval by P.B. and W.B.	Tendering	Construction
Pelendria Pond							C
" D.S. & B/H							X
Ephtagonia P. No. 1							C
" D.S.				X			
Khandria Pond							C
" D.S.							X
Melini Pond							C
" D.S.							X
Ayii Vavatsinias Pond and Dam							X
" D.S.							X
Akapnou-Ephtagonia Pond							X
" D.S.				P.L.C.			
Ephtagonia P. No. 2							X
" D.S.				P.L.C.			

TABLE VI–1

PITSILIA INTERGRATED RURAL DEVELOPMENT PROJECT (continued)

Scheme	Pre/ary Design— Pumping	Pre/ary Approval by Farmers	Feasibility Studies	Final Designs Contract Docum.	Approval by P.B. and W.B.	Tender- ing	Cons- truction
Ephtagonia P. No. 3							X
" D.S.				P.L.C.			
Kato Mylos Pond							X
" D.S. & B/H				X			
Arakapas Pond							X
" D.S.				P.L.C.			
Pharmakas Pond		X	X				
" D.S.		X	X				
Kyperounda Pond	X	X	X				
Agridhia Pond	X	X	X				
Lagoudhera Pond	X	X	X				
Sarandi Ponds	X	X	X				
Odhou Ponds	X						
Kalokhorio B/Hs							X
Potamitissa B/Hs				X	X		X
Arakapas B/Hs (Nos 106 & 107/76)	X	X	X	X	X		X
Ayios Theodhoros B/H (No 105/76)	X	X	X	X	X		
Ayios Ioannis B/H	X		X				
Agros B/H	X	X	X				
Polystipos B/H	X	X	X				

X: Work done, not necessarily completed
P.L.C.: Pending due to Land Consolidation
W.B.: World Bank
P.B.: Planning Bureau
D.S.: Distribution System
P.: Pond
C.: Completed prior to 1980

PITSILIA INTERGRATED RURAL DEVELOPMENT PROJECT

POND SCHEMES

Detailed Studies

The detailed designs of five ponds which started in 1979 was completed by February 1980. Tenders for their construction were then invited and awarded in July 1980.

These ponds, details of which are given in the 1979 annual report, are:

* Akapnou-Ephtagonia Pond
* Ephtagonia Ponds Nos 2 and 3
* Arakapas Pond
* Kato Mylos Pond

Detail designs for the distribution networks were only prepared for Kato Mylos Pond (estimated cost £74,000) whereas for the rest of the above schemes, such designs will be carried out in 1981 since the decision to eliminate land consolidation came late in the year. A revision of the design and of the respective cost estimate of the distribution network of Ephtagonia Pond No 1 was also prepared (estimated cost £26,000).

Feasibility Studies

As shown on Table IV—1, feasibility studies covered the following six pond schemes:

* Pharmakas Ponds
* Kyperounda Pond
* Agridhia Pond
* Lagoudhera Pond
* Sarandi Ponds
* Platanistasa Pond

The feasibility study for the first pond was completed in 1980.
The studies for the next three ponds were substantially completed by the end of 1980 and reporting will be ready early in 1981. Details of the four pond schemes are given below.

The feasibility studies of two small pond schemes for Sarandi village and another one for Platanistasa village were completed in 1980. However, since both schemes turned not to be economically viable, their further consideration was not recommended.

Pharmakas Ponds

The preliminary study of this scheme was completed in 1979 and a brief description of it was given in the same annual report.

The two ponds of the scheme are located near the entrance to the village on either side of the road from Nicosia.

Their storage capacities are 21,000 m^3 and 50,000 m^3 respectively. Water for their impoundment will be taken from the Koshinas spring during winter when water is not needed for direct irrigation. An 810 m long 100 mm dia GI pipeline will be used to take the water to the two ponds.

Geologically the ponds are located in diabase. The topographical and geological conditions are not quite favourable and hence the estimated cost of the scheme is quite high. Since the second pond is not an off stream one, it necessitated the provision for diversion of the main stream, which also contributed to the high cost of the scheme.

The total estimated volume earthworks (cuts and fills) will be about 37,000 m^3 and 100,000 m^3 for the two ponds respectively, whereas the membrane lining needed for watertightness will be 6,300 m^2 and 18,000 m^2.

The scheme will provide water for the irrigation of a gross area of 125 donums of new land (107 donums net) to be cultivated with tomatoes and olive trees.

The scheme although economically feasible seems to be quite costly and no decision was taken for its implementation till the end of the year.

Kyperounda Pond

Originally this scheme involved the construction of two ponds. The second however was eliminated during the early stages of the study, based on well justified wishes of the village. Instead a larger pond was decided to be constructed on the site of the first one, which is located about 1.5 km west of the village.

The storage capacity of the pond is 270,000 m^3 which is the largest envisaged pond to be constructed within Pitsilia Project. Two different sources for its impoundment were examined and a technoeconomic study was carried out. Eventually it was decided to use Amiandos river which involves no pumping in diverting the water to the pond. The effect on the river from the envisaged diversion is very minor. The water will be diverted through a 5400 m long 200 mm dia steel and AC pipeline.

Geologically the site is situated in a valley of weathered gabbro which will be easy to excavate. The total volume of earthworks is estimated at about 206,000 m^3 and the total area of membrane lining to be used for watertightness is about 42,000 m^2.

The pond will be used to irrigate a gross area of 530 donums (460 donums net) of cherries, apples, potatoes and vegetables. Half of this area is new, whereas the rest covers existing small irrigation schemes which experience severe water shortage almost every year.

As earlier stated the feasibility report will be ready early in 1981 and detailed designs will follow.

Agridhia Pond

This is a small pond with a storage capacity of 59,000 m^3. It is located near the junction of the main Kyperounda - Agros road with the road to Agridhia village.

The pond will be impounded with water from a nearby small stream called Enetikos. The water will be diverted and pumped to the pond through a 530 m long 200 mm dia AC pipeline.

Geologically the site is situated in a valley of weathered diabase. The total volume of earthworks is estimated at about 59,000 m^3 and the total area of membrane lining to be used for watertightness is about 13,500 m^2.

The pond will be used for the irrigation of a gross area of 110 donums (99 donums net), of cherries, apples, almonds and potatoes. Out of this area 43 donums belong to two existing irrigation schemes which suffer from water

shortage whereas the rest 67 donums constitute new land.

By the end of the year the feasibility study were almost completed. An alternative solution to the diversion to the pond, eliminating pumping, will be examined in 1981.

Lagoudhera Pond

This pond is located about one km north-east of Lagoudhera village. Its storage capacity will be 70,000 m^3. The pond will be impounded with water diverted from Lagoudhera river, which is a tributary of Elea river, on which Xyliatos dam is constructed. A 530 m long, 150 mm dia steel pipeline will be used for the diversion of water.

Geologically the pond is located in diabase. The encountered geological and topographical conditions are not quite favourable, resulting in a rather costly scheme. The total volume of earthworks is estimated to about 126,000 m^3 and the total area of lining membrane to be used for watertightness is about 17,000 m^2.

The pond will be needed to irrigate a new area of 130 donums gross (102 donums net) of cherries, peaches, almonds and table olives.

The feasibility studies which were substantially completed by the end of the year indicate a rather marginally feasible scheme.

BOREHOLE SCHEMES

Detailed Studies

Detailed designs were prepared for the following four borehole schemes.

Potamitissa B/Hs (Nos 67/76 and 69/79)

This scheme provides for the irrigation of an area of 210 donums which will undergo land consolidation. The first borehole was tested in 1979 and since its safe yield could not sustain the irrigation of the selected area, another borehole was drilled in 1979 to supplement the water requirements. The safe yields of boreholes are 47 and 45 m^3/hr. The cost of the scheme is estimated to reach £60,000.

Arakapas B/Hs (Nos 106/76 and 107/76)

These boreholes had undergone a prolonged pumping test during 1979. The safe yields of the boreholes are 37 and 29 m^3/hr respectively. Their utilization will be made in conjunction with surface water from a stream to irrigate an existing irrigation scheme at Arakapas of 130 donums gross and add a new area of 50 donums gross. Most of this area is cultivated with citrus. The cost of the scheme will be about £63,000.

Ayios Theodhoros (Agros) B/H (No 105/76)

This borehole was tested in 1978. Its utilization was delayed due to administrative problems. The safe yield of the borehole is 40 m^3/hr. The borehole will provide water to three existing irrigation schemes of a total area of 95 donums gross which experience severe water shortage. The cost of the scheme along with the rehabilitation of the existing irrigation works will reach about £30,000.

Kato Mylos B/H (No 66/76)

This borehole was drilled near the already mentioned Kato Mylos Pond and its utilization will be made in conjunction with the pond scheme. The borehole was tested in 1979 resulting in a safe yield of 41 m^3/hr. The borehole will contribute into the irrigation of a gross area of 120 donums out of the total of the scheme which is 300 donums.

Feasibility Studies

Feasibility studies were carried out for the following three borehole schemes.

* Agros B/H (No 63/76)
* Polystipos B/H (No 21/77)
* Ayios Ioannis (Agros) B/H (No 65/76)

The studies were substantially completed by the end of 1980. However, due to the extensive involvement of existing irrigated land, further work, will be required in connection with rehabilitation works needed. Reporting on the feasibility studies will be made in 1981.

Pumping Tests

Due to the rather complex conditions of occurence of groundwater in the igneous rock formations of the Troodos range, before embarking into the implementation of borehole schemes, it was decided to verify the results of the short term pumping tests with prolonged pumping tests.

These tests are planned and carried out by the WDD during summer and autumn months and tend to simulate actual scheme pumping conditions. The tests are coupled by observations on any adverse effects on neighbouring springs and wells, and are completed by observations on water level recovery during spring of next year. The results are then intepreted and reported by both the WDD and the GSD. During 1980 such tests were performed on nine boreholes. The results—pending verification by water level recovery—versus those of the short duration tests which are carried out during the drilling of the borehole are as follows:

TABLE IV—2
BOREHOLE PUMPING TESTS

Village	B/H No	Prolonged Test Average Yield (m^3/hr)	Short Duration Test Yield (m^3/hr)
Ayios Konstantinos	123/76	11	18
Kalokhorio Limassol	87/76	11	22
Louvaras	32/77	30	36
Arakapas	124/76	30	40
Ephtagonia	13/77	12	44
Akapnou	29/77	25	32
Ayios Theodhoros L'ssol	64/76	50	68
Kato Amiandos	31/76	50	97
Potamitissa	69/79	45	53

The significant difference observed in the yield of almost all of the tested boreholes, between the long and short duration tests indicate the importance of the prolonged pumping tests in determining the yield on which such schemes are to be designed.

VASILIKOS - PENDASKINOS PROJECT

Due to the continuous involvement of this Division in the above mentioned project an account of the progress achieved during 1980 is cited here.

In February 1980 a Project Manager was appointed and took over the management of the project from the Head of this Division. The main activities during 1980 were focussed on the appointment of consulting engineers who would undertake the preparation of the detailed designs and contract documents and would supervise the construction of the works. The prequalification stage of the procedure set for the appointment of the consultants was concluded early in 1980 and 16 firms were chosen to submit detailed technical and financial offers. After the closing date of submitting the offers, which was fixed for the 9th of June a rather complex way of evaluation was followed, as it was mainly proposed by the World Bank, in an effort to choose the best combination of technically complete and financially attractive offer, in the most objective and fair way of evaluation. This proved to be a quite laborious process, involving continuous screening of the firms as further information was made available. The selected by the Tender Board and approved by the Ministerial Committee group of firms of Rofe, Kennard and Lapworth and Wallace Evans and Partners of U.K. in Association with C. Chr. Ioannides of Cyprus were to sign the negotiated contract and start work during the first week of January 1981.

Other activities on this project undertaken during 1981 included:

* Up dating of the hydrological data, based on further records collected during the years after the preparation of the feasibility studies.
* Additional soil surveys in the Vasilikos Irrigation Scheme in an effort to finalize the boundaries of the scheme.
* Final setting of the boundaries of the Maroni groundwater scheme. This became necessary due to unavoidable changes in the areas planned to develop water from the gypsum acquifer.
* First steps towards the establishment of a sub-station of the Agricultural Research Institute for the purposes of the project.
* Initiation of the long procedure for the planned land consolidation which will take place in a considerable area of the project.
* Procurement of vehicles and equipment.

It is well mentioning finally that the part of the project connected with the Nicosia Water Supply Scheme has entered the construction stage and the progress is reported in Chapter V.

OTHER PROJECTS

As earlier mentioned, in addition to the detailed designs in connection with the already stated projects, the Division has undertaken the preparation of feasibility studies of some projects of minor and rather local importance such as the Larnaca Orini Project and the Solea Valley Project. However, whereas for Larnaca Orini Project, substantial part of the work was completed, studies for the second project did not advance satisfactory due mainly to personnel shortage and progress does not justify any further details.

Larnaca Orini Project

As it was stated in the 1979 annual re-

port, the schemes selected to be studied at a feasibility level were:

(a) The Pavlias Dam to provide irrigagation water for the villages of Ayii Vavatsinias, Ora and Vavatsinia.
(b) The Vavla Pond to serve Kato Dhrys and Vavla.
(c) The Khirokitia Pond and one borehole to provide irrigation water for Khirokitia village.

Pavlias Dam

The damsite is located on the main tributary of Maroni river at its upper reaches.

The selection of the storage capacity of the dam, which is 300,000 m^3 was mainly based on hydrological and topographical criteria.

A concrete gravity type of dam was adopted dictated mainly by the topography of the site and allowed by its geology.

The height of the dam above groundlevel is 29.3 m and its length at the crest 98.0 m. The design flood is 73 m^3/s requiring a spillway length of 20 m and height of 1.9 m. The concrete volume required is estimated at 19,000 m^3.

The water stored in the dam will be used to irrigate a gross area of 500 donums of land, to be cultivated mainly with citrus, table olives and cherries. The area to be rrigated belongs to the three neighbouring villages of Ayii Vavatsinias, Ora and Vavatsinia. The conveyance system to the three areas to be irrigated involved alternative solutions and although the cheapest solution was selected through technoeconomic studies the cost involved is still quite high.

The economic studies of the project indicate a rather marginally viable project, with an internal rate of return of the order of 9%. By the end of the year the study was proceeded to the Ministry of Agriculture and Natural Resources for evaluation and decision on its merits for implementation.

Vavla Pond

This is a pond similar to those constructed within Pitsilia Project. The pond site is located very near to Vavla village.

The contemplated storage capacity is 150,000 m^3. Water will be diverted from Maroni river through a 3100 m long, 200 mm dia AC and steel pipeline.

Geologically the site is situated in a valley of diabase. Although topographic conditions are rather favourable, excavations will be rather difficult due to the geology of the site. The total volume of earthworks is estimated at about 132,000 m^3 and the total area of membrane lining to be used for watertightness is about 30,000 m^2.

The pond will be used to irrigate a gross area of about 175 donums which belongs mainly to Kato Dhrys village. The area of Vavla village is rather limited due to suitability limitations. Contemplated crops are mainly citrus, deciduous, almonds and vegetables.

The feasibility studies where completed by the end of the year but due to the

fact, that the scheme seems to be marginally viable, reporting will be done during 1981 if proved warranted.

Khirokitia Pond

Works on this pond were mostly concentrated on field investigations although designs at a feasibility study were advanced but not completed. Details on this scheme will be given in next year's report.

TOPOGRAPHY BRANCH

The Topography Branch of the Design Division is assigned to carry-out the major surveys of the Department. These surveys usually cover the whole circle of the engineering studies of a project, that is from reconnaissance to post construction stage. In general these surveys consist of: Contour surveys, profile-levelling, cross-sectioning, setting-out of project outlines and instrumental observations for movement detection of constructed major structures or of the neighbouring slopes.

During the year 1980 in addition to other routine surveys this Branch has dealt specifically with the following major projects: Pitsilia, Khrysokhou and the Southern Conveyor. To cope with the load of work it was found necessary to employ 16 new Technical Assistants on contract and on a yearly basis. After receiving a two months training in the Department these T/As have been assigned to the Southern Conveyor Project survey operations.

The staff of this Branch during the year of 1980 consisted of:

1 Senior Technician
24 Technical Assistants 2nd grade
11 Rodmen
10 Skilled labourers

A list of the projects for which surveys have been conducted during the year is given below:

TABLE IV—3

SURVEYING WORKS CONDUCTED DURING 1980

(a) Southern Conveyor Project

Contour surveys

1 Alaminos Reservoir
2 Akhna Terminal (Extension)
3 Pyrgos Dam (Extension)
4 Pyrgos pipeline
5 Southern Conveyor route

Profile-levelling

(i) From Kouris Dam to Akrotiri SBA
(ii) From Kouris Dam to Polemidhia
(iii) From Mari area to Larnaca water treatment works plant

(b) Khrysokhou Project

Contour surveys

1 Evretou damsites A, C, D & E
2 Evretou borrow area
3 Ezousas damsite No 2

Profile-levelling

4 Polis Khrysokhou sampling area
5 Argaka sampling area
6 Ayia Marina sampling area
7 Saramas sampling area
8 Stroumbi-Polemi sampling area
9 Yiolou sampling area

(c) Pitsilia Project

Contour surveys and longitudinal sections

1 Akapnou Pond

TABLE IV—3
SURVEYING WORKS CONDUCTED DURING 1980 (continued)

2 Sarandi Pond, diversion weir and pipeline
3 Lagoudhera, diversion weir and pipeline
4 Kambi, diversion weir and pipeline
5 Kyperounda No 1, diversion weir and pipeline
6 Xyliatos Dam (preconstruction works and dumped material)
7 Syrfilos damsite
8 Kapoura damsite
9 Khirokitia diversion weir and pipe-
10 Odhou Pond
11 Kyperounda Pond No 2
12 Xyliatos distribution system (main conveyor)
13 Akapnou Pond

Setting-out

14 Ephtagonia Pond No 2 and pipeline
15 Ephtagonia Pond No 3
16 Kato Mylos Pond
17 Kato Mylos pipeline
18 Arakapas Pond
19 Pharmakas Pond No 1
20 Pharmakas Pond No 2

(d) Solea Valley

1 Phlasou Pond

(e) Vasilikos - Pendaskinos - Nicosia Water Supply Scheme — Phase I

Setting-out

1 Khrirokitia-Nicosia pipeline

(f) Routine Works

Sedimentation studies

1 Lymbia Dam
2 Arakapas Dam
3 Ayia Marina Dam
4 Argaka Dam
5 Pomos Dam
6 Kiti Dam
7 Kambi Dam

Settlement measurements

8 Kalopanayiotis Dam
9 Lefkara Dam
10 Khirokitia Treatment Works
11 Amiandos Asbestos Mines. Movement detection for dumped material
12 Peristerona Recharge Scheme

DRAWING AND RECORDS BRANCH

This branch is made up of the following sections:

- *The Drawing and Cartography section*
- *The Plan Reproduction and Plan Registry section*
- *The Photographic section and Photo Process lab*, and
- *The Technical Library and Technical Information section*

At the end of 1980 the staff of the Drawing and Records Branch numbered 19 ie 17 Technicians II and two hourly paid assistants of the print room.

Six of the Technicians were working throughout the year with the Planning Division, two on KWIP and four on SCP.

Due to lack of funds no HTI students were employed during the summer of 1980 to carry out their training programme with the exception of one student who opted to work free of charge for approx. one month.

The work carried out by the Drawing and Records Branch is listed as follows:

TABLE IV—4

WORK CARRIED OUT BY THE DRAWING BRANCH

		Time spent in hours	Man months	% of total
a	Existing dams (completion plans, sedimentation maps, control monuments etc) ...	707	4.6	2.0
b	Irrigation distribution systems for dams	209	1.3	0.6
c	Routine irrigation schemes	1108	7.2	3.1
d	Routine domestic water supply schemes	2277	14.8	6.4
e	Paphos project	910	5.9	2.5
f	Pitsilia Integrated Rural Development Project	3320	21.6	9.4
g	Vasilikos - Pendaskinos Project	1143	7.4	3.2
h	Southern Conveyor Project	7691	49.9	21.6
i	Khrysokhou Watershed Irrigation Project	3250	21.1	9.1
j	Solea Valley Project	201	1.3	0.5
k	Larnaca - Orini Project	342	2.2	1.0
l	Recharge works	84	0.5	0.2
m	Antiflood works	19	0.1	0.0
n	River training works	8	0.0	0.0
o	Watersheds surveys	210	1.3	0.5
p	Hydrological	194	1.2	0.5
q	Programmes and organisation	391	2.5	1.1
r	Agriculture show	299	1.9	0.8
s	Productivity centre course	123	0.8	0.3
t	Training of staff	—	—	—
u	Completion plans and reports	1274	8.2	5.6
v	Reports	601	3.9	1.7
w	General	475	3.1	1.3
x	Odd jobs	156	1.0	0.4
y	Auxilary services			
	(i) Library	1122	7.3	3.1
	(ii) Plan registry	410	2.6	1.1
	(iii) Plan reproduction	1993	12.9	5.6
	(iv) Drg materials store	329	2.1	0.9
	(v) Photographic section and photoprocess lab	1855	12.0	5.2
	Total for auxilary services	5709	36.9	15.9
z	Leave etc.			
	(i) Leave paid	1832	11.9	5.1
	(ii) Leave without pay ...	228	1.4	0.6
	(iii) Sick leave	1228	8.0	3.5
	(iv) Maternity leave	1140	7.4	3.2
	(v) D.C.	296	1.9	0.8
	Total for leave etc	4724	30.4	13.2
	Grand total	35425	229.1	100%

Drawing and Cartography Section

As with previous years the table above shows that major projects occupy approx. 50% of the work load with 30% taken up by auxiliary services, leave etc and the remaining 20% by routine water supply and Irrigation Schemes as well as water supply schemes for refugee estates throughout the government controlled areas of Cyprus.

Plan Reproduction and Plan Registry Section

During the year production of prints continued with the new GAF continuous process printing machine with the old HH machine as standby. Some 2725 orders were executed for a total number of 39,312 prints of all types and sizes.

The plan registry work is being shared by the drawing office staff.

The Photographic Section and Photo Process Lab

Work continued during 1980 on photographic coverage of construction works of the Department in black and white and colour still photography as well as in cinematographic colour coverage. Monthly visits to Paphos Project and Asprokremmos Dam were continued throughout the year and albums of B & H and colour photoes are kept in the technical library at WDD HQs.

The work of the photo process laboratory continued smoothly during the year for the reproduction, reduction or enlargement of maps inspite of the fact that work load for this one-man section is getting too heavy.

Technical Library and Technical Information Section

In 1980 the Library secured a satisfactory number of technical books which have been requested by the technical staff of the department. An amount of £426 was spent on 23 volumes of books through Governmental votes. In addition 57 books were presented by BRITAIN through the BRITISH COUNCIL /ODM books presentation programme of a total value of stg. £853.38 for which the Library is very grateful.

Two books were purchased for our Technical Library by FAO/UNDP on the account of the project CYP/75/016.

The issue of monthly notes on material received and of articles of special interest in periodicals was continued throughout the year. Following are lists of books purchased, of books presented by BRITAIN, of books presented by FAO/UNDP and of WDD reports.

Laying of the 38 km long 500 and 600 mm AC pipeline from Skarinou to Nicosia. Initially water will be pumped to a balancing reservoir at Stavrovouni and from there it will gravitate to the new Lakatamia Reservoir through a break pressure tank at Nisou. Steel pipes were used for approx 28% of the pipeline. WDD Photo C10-3 (26.9.80).

BOOKS PURCHASED DURING 1980

D K TODD—D E O McNULTY. Polluted groundwater. New York 1976. Book No. 8709. $19.41.

R G H BOYES. Structural and cut-off diaphragm walls. Great Britain, 1975. Book No. 8710. stg £13.95.

D DICKINSON. Practical waste treatment and disposal. Great Britain, 1974. Book No. 8711. stg £12.55.

D A WOOLSHISER. Decisions with inadequate hydrologic data. USA, 1973. Book No. 8712. $8.00.

ILRI—M G BOS. Discharge measurement structures. The Netherlands, 1978. Book No. 8713. $16.00.

E F SCHULZ. Problems in applied hydrology. USA, 1976. Book No. 8714. $16.00.

J BOGARDI. Sediment transport in alluvial streams. Budapest, 1978. Book No. 8715. $50.00.

H WEN SHEN. Stochastic approaches to water resources. Volumes I & II. USA, 1976. Book Nos 8716, 8717. $25.00.

CUNHA - FIGUEIREDO - CORREIA - CONGALVES. Management and law for water resources. USA, 1977. Book No. 8718. $26.00.

D STEPHENSON. Pipeline design for water engineers. The Netherlands, 1979. Book No. 8719.

FAO. Irrigation and drainage paper No. 27. Agrometeorological field stations. Rome, 1976. Book No. 8720. $3.10.

FAO. Irrigation and drainage paper No. 28. Drainage testing. Rome, 1976. Book No. 8721. $5.50.

FAO. Irrigation and drainage paper No. 29. Water quality for agriculture. Rome, 1976. Book No. 8722. $3.30.

ARNOLD MANDESON. Τέλειον ἑλληνοαγγλικὸν λεξικόν. Ἀθῆναι. Book No. 8737. £3.000 mils.

ARNOLD MANDESON. Τέλειον ἀγγλοελληνικὸν λεξικόν. Ἀθῆναι. Book No. 8738. £3.000 mils.

N B LOOMBA. Linear programming. London, 1979. Book No. 8754. $5.06.

PHACOS ADVERTISING PUBLISHING AGENCY. Ὁδηγὸς δημοσίων ὑπηρεσιῶν Κύπρου, Λευκωσία, 1980. Ἀρ. Βιβλίου 8891. £6.500 μίλς.

CEMENT AND CONCRETE ASSOCIATION. Alkali aggregate. (silica) reaction in concrete. London, 1977. Book No. 8953. stg £0.75.

WORLD HEALTH ORGANIZATION. European standards for drinking water. Second edition, Geneva, 1970. Book No. 8917. Sw. Fr. 6.

WORLD HEALTH ORGANIZATION. International standards for drinking water. Third edition. Geneva, 1971. Book No. 8918. Sw. Fr. 12.

INSTITUTION OF CIVIL ENGINEERS. Design of dams to resist earthquake (Pre-printed papers 1 to 33). London, 1980. Book No. 8941. £30.000 mils.

McGRAW - HILL. Yearbook of science and technology encyclopaedia for 1978. USA, 1978. Book No. 8928. £14.000 mils.

McGRAW - HILL. Yearbook of science and technology encyclopaedia for 1979. USA, 1979. Book No. 8929. £14.000 mils.

Books Presented by BRITAIN through the BRITISH COUNCIL/ODM Books presentation programme of a total value of stg £853.38.

N B GREEN. Earthquake resistant building design and construction. USA, 1978. Book No. 8954. stg £13.45.

V Z PRIEL. Systematic maintenance organisation, London, 1974. Book No. 8955. stg £8.50.

A J MACDONALD. Wind loading on buildings. Great Britain, 1975. Book No. 8956. stg £16.00.

J A BARKER. Reinforced concrete detailing. Great Britain, 1967. Book No. 8960. stg £15.00.

M W ABRAHAMSON. Engineering law and the ICE contracts. London, 1979. Book No. 8957. stg £32.00.

G P JONES. A new approach to the ICE conditions of contract. Great Britain. Book No. 8958. stg £17.50.

J PARRIS. Casebook of arbitration law. Great Britain, 1976. Book No. 8959. stg £10.50.

SHERARD - WOODWARD - GIZIENSKI - CLEVENGER. Earth and earth rock dams. USA, 1963. Book No. 8962. stg £29.10.

HENRY H THOMAS. The engineering of large dams. Parts 1 and 2. London, 1979. Book Nos. 8963, 8964. stg £51.75.

R E BARTLETT. Public health engineering: Sewerage. London, 1979. Book No. 8965, stg £13.50.

R E BARTLETT. Surface water sewerage. Great Britain, 1977. Book No. 8966. stg £13.00.

D DICKINSON. Practical waste treatment and disposal. Great Britain, 1974. Book No. 8967. stg £14.60.

KARASSIK-KRUTZSCH-FRASER-MESSINA. Pump handbook. USA, 1976. Book No. 8968. stg £31.10.

R L WIEGEL. Earthquake engineering. USA, 1970. Book No. 8969. stg £21.40.

P R HELLIWELL. Urban storm drainage. Great Britain, 1979. Book No. 8970. stg £26.00.

M FINTEL. Handbook of concrete engineering. USA, 1974. Book No. 8971. stg £35.65.

D F ORCHARD. Concrete technology. 4th edition. Vol. 1. Properties of materials. Great Britain, 1979. Book No. 8972. stg £24.80.

D F ORCHARD. Concrete technology. 3rd edition. Vol. 3. Properties and testing of aggregates. Great Britain, 1976. Book No. 8973. stg £22.70.

D McINTOSH. Concrete and statistics. London, 1968. Book No. 8974. stg £8.10.

F D LYDON. Concrete mix design. London, 1979. Book No. 8975. stg £11.30.

PH H PERKINS. Concrete structures: Repair water proofing and protection. England, 1978. Book No. 8976. stg £24.30.

CEMENT AND CONCRETE ASSOCIATION. Concrete in the middle east. London, 1977. Book No. 8977. stg £1.20.

W B KAYS. Construction of linings for reservoirs tanks, and pollution control facilities. USA, 1977. Book No. 8978. stg £22.15.

R BOWEN. Grouting in engineering practice. London, 1975. Book No. 8979. stg £14.60.

R W ROOSE. Handbook of energy conservation for mechanical systems in buildings. USA, 1978. Book No. 8980. stg £29.95.

R WALKER. Water supply treatment and distribution. USA, 1978. Book No. 8981. stg £17.50.

R E BARTLETT. Pumping stations for water and sewage. London, 1978. Book No. 8982. stg £11.30.

G L CULP—R L CULP. New concepts in water purification. USA, 1974. Book No. 8983. stg £16.45.

R E BARTLETT. Public health engineering. Design in metric. Waste water treatment. London, 1971. Book No. 8984. stg £23.00.

M E HARR. Groundwater and seepage. USA, 1962. Book No. 8985. stg £20.60.

H W GEHM—J I BREGMAN. Handbook of water resources and pollution control. USA, 1976. Book No. 8986. stg £33.40.

S GOLDHABER – SHA – MACEDO. Construction management. Principles and practices. USA, 1977. Book No. 8987. stg £16.40.

J B BONNY—J P FREIN. Handbook of construction management and organization. USA, 1973. Book No. 8988. stg £29.60.

A F C SHERRATT. Energy conservation and energy management in buildings. England, 1976. Book No. 8989. stg £32.40.

J J BARTON. Domestic heating and hot water supply. SI units. London, 1970. Book No. 8990. stg £16.00.

B BOUGHTON. Reinforced concrete detailer's mannual. Third edition. Great Britain, 1979. Book No. 9051. stg £4.95.

J C McVEIGH. Sun power. An introduction to the applications of solar energy. Great Britain, 1980. Book No. 9052. stg £8.00.

R J MARKS - R J E MARFS - A GRANT - P HELSON. Aspects of civil engineering contract procedure. 2nd edition. Great Britain, 1978. Book No. 9053. stg £9.25.

R K DHIR, ED. Advances in ready-mixed concrete technology. Proceedings of the first international conference on ready-mixed concrete, held at Dundee university, 29th Sept.—1st Oct. 1975. Great Britain, 1976. Book No. 9054. stg £29.00.

T H Y TEBBUTT. Principles of water quality control. 2nd edition. Great Britain, 1979. Book No. 9055. stg £11.50.

M BARNES—ICE. Examples of the CESMM. London, 1977. Book No. 9056. stg £2.50.

M BARNES—ICE. Measurement in contract control. London, 1977. Book Nos. 9057, 9058. stg £9.00.

ICE—T L DENNIS, ED. Arch dams. A review of British research and development. Proceedings of the symposium held at the ICE, 20—21 March, 1968. London, 1968. Book No. 9060. stg £12.50.

ICE—Civil engineering procedure. Third edition. London, 1979. Book No. 9059. stg £3.00.

ICE—M MONRO, ED. Conference on safety on construction sites. London, 1975. Book No. 9061. stg £14.00.

ICE—B J HARDING, ED. Management of large capital projects. Proceedings of the conference held in London, 17—18 May, 1978. London, 1980. Book Nos. 9062, 9063. stg £11.00.

G SMETHURST. Basic water treatment for application world wide. London, 1979. Book No. 9064, stg £7.50.

THE INSTITUTION OF WATER ENGINEERS AND SCIENTISTS—THE INSTITUTION OF CIVIL ENGINEERS. Proceedings of the one-day seminar on the operational aspects of the drought of 1975—76, held in London on 29 March, 1977. Book No. 9065. stg £9.00.

ICE—TH DARWENT, ED. Instrumentation for ground vibration and earthquakes. Proceedings of the con-

ference of the society for earthquake and civil engineering dynamics held in Keele on 4 and 5 July, 1977. London, 1978. Book No. 9066. stg £11.50.

ICE—MINISTRY OF DEFENCE—HMSO. Manual of applied geology for engineers. London, 1978. Book No. 9067. stg £11.50.

ICE. A review of diaphragm walls. A discussion of "diaphragm walls and anchorages" by the ICE. London, 1977. Book No. 9068. stg £7.00.

ICE—J DAVIS. Fibre reinforced materials: design and engineering applications. Proceedings of the conference held in London, 23—24 March, 1977. Book No. 9069. stg £21.00.

ICE—K MAYALL, ED. Advances in sewage treatment. Proceedings of the conference held on 14 November, 1972 at the ICE. London, 1973. Book No. 9070. stg £11.50.

R WALKER. Pump selection. A consulting engineer's manual. USA, 1977. Book No. 8871.

UNITED NATIONS. Cost estimation of water resources projects. Water resources series No. 42. New York, 1972 Book No. 8872.

A M NEVILLE. Properties of concrete. Great Britain, 1978. Book No. 8961. stg £9.50.

Books purchased by FAO/UNDP for WDD Library:

ARPAD KEZDI. Handbook of soil mechanics. Vol. 1 Soil Physics. Budapest, 1974. Book No. 8796.

ARPAD KEZDI. Handbook of soil mechanics. Vol. 2 Soil testing. Budapest, 1980. Book No. 8797.

WDD REPORTS

B M MILINUSIC. Paphos irrigation project. Progress report No. 16 covering period from 1.10.79 to 1.1.80. Nicosia, January, 1980. Report No. D/72. Book Nos. 8723, 8724.

N TSIOURTIS—S APHRODISIS. Pitsilia integrated rural development project. Pumping tests 1979. Preliminary results. Nicosia, February, 1980. Report No. D/73. Book Nos. 8741, 8742.

G PITTAS. Chakillero and Kokkines refugee housing estates W. S. (at Aradhippou) House-to-house scheme. Completion report. Nicosia, June, 1977. Report No. C/138. Book Nos. 8761, 8762.

P ELIADES. Pitsilia integrated rural development project. Kato Mylos borehole irrigation scheme. Nicosia, April, 1980. Report No. D/74. Book Nos. 8763, 8764.

B M MILINUSIC. Paphos irrigation project Progress report No. 17. Covering period from 1.1.80 to 1.4.80. Nicosia, April, 1980. Report No. D/76. Book Nos. 8765, 8766.

M A GUTIERREZ FRIAS. Vasilikos-Pendaskinos project. Progress report No. 1. Covering period from 1.1.80 to 31.3.80. Nicosia, March, 1980. Report No. D/201. Book Nos. 8767, 8768.

C C ARTEMIS. Lefkara dam. Completion report. Nicosia, May, 1978. Report No. C/137. Book Nos. 8793, 8801.

A PENGEROS - N TSIOURTIS - S AFRODISIS. Pitsilia integrated rural development project. Pumping test results 1979. Final results. Nicosia, April, 1980. Report No. D/75. Book Nos. 8802, 8803.

G PETROCOSTAS—C KRIDIOTIS. Solea valley project. Tembria pond. Site and fill material investigations. Nicosia, May, 1980. Report No. F/72. Book Nos. 8804, 8805.

G PETROCOSTAS. Nicosia sanitary sewerage programme stage II. Site investigations. Nicosia, May, 1980. Report No. F/73. Book Nos. 8806, 8807.

J S JACOVIDES—P SKORDIS. Southern conveyor project. The runoff and divertible quantities of the Khapotami river. Nicosia, December, 1979. Report No. H/49. Book Nos. 8808, 8809.

HERODOTOU - POLYCARPOU - MAKIN - A SAVVIDES. Southern conveyor project. Stage I. Crop management practices and production inputs. Nicosia, March, 1980. Report No. P/17. Book Nos. 8810, 8811.

WDD Pitsilia integrated rural development project. Xyliatos dam. Contract No. 39/79/35. Vol. I and II. Nicosia, May, 1979. Book Nos. 8812, 8813.

N TSIOURTIS—N MICHAEL. Pitsilia integrated rural development project. Arakapas boreholes. Irrigation scheme. Mini feasibility study. Nicosia, June, 1980. Report No. D/78. Book Nos. 8827, 8828.

M A GUTIERREZ FRIAS. Vasilikos-Pendaskinos Project. Progress report No. 2. Covering period from 1.4.80 to 30.6.80. Nicosia, June, 1980. Report No. D/202. Book Nos. 8829, 8830.

B M MILINUSIC. Paphos irrigation project. Progress report No. 18. Covering period from 1.4.80 to 1.7.80. Nicosia, July, 1980. Report No. D/79. Book Nos. 8873, 8874.

Π. ΝΕΟΦΥΤΙΔΗΣ. Ὑδατοπρομήθεια Λευκωσίας. Ἔκτακτον σχέδιον Περιστερώνας—Ἀκακίου. Λευκωσία, Ἰούνιος, 1980. Ἀρ. C/139. Ἀρ. βιβλ. 8875, 8876.

N TSIOURTIS—N MICHAEL (Miss). Pitsilia integra-

ted rural development project. Ayios Ioannis (Agros) borehole irrigation scheme. Mini feasibility study. Nicosia, September, 1980. Report No. D/80. Book Nos. 8882, 8883.

J F LAURENCE. Southern conveyor project. stage I. Supplementary report. Nicosia, August, 1980. Report No. P/18. Book Nos. 8885, 8886.

J F LAURENCE. Southern conveyor project. Sixth progress report. Nicosia, 31 August, 1980. Report No. P/19. Book Nos. 8887, 8888.

C FRIAS. Vasilikos-Pendaskinos project. Progress report No. 3. Covering period from 1.7.80 to 30.9.80. Nicosia, September, 1980. Report No. D/203. Book Nos. 8892, 8893.

WDD. Construction programme for 1980. Book Nos. 8894, 8895.

C KRIDIOTIS—E SHIAKALLI. Pasydy Larnaca. Site investigation. Nicosia, September, 1980. Report No. F/74. Book Nos. 8896, 8897.

Π. ΝΕΟΦΥΤΙΔΗΣ. Φράγμα Ἁγίας Μαρίνας Χρυσοχοῦς. Ἀρδευτικὸν δίκτυον. Ἀντικατάστασις κεντρικοῦ αὐλακος μὲ σωληναγωγόν. Λευκωσία, Ὀκτώβριος, 1980. Ἀρ. Ι/20. Ἀρ. βιβλ. 8898, 8899.

CHR MARCOULLIS. Larnaca Orini project. Pavlias dam irrigation scheme. Feasibility study. Summary report. Nicosia, November, 1980. Report No. D/204/a. Book Nos. 8930, 8931.

B M MILINUSIC. Paphos Irrigation Project. Progress report No. 19. Covering period from 1.7.80 to 1.10.80. Nicosia, November, 1980. Report No. D/81. Book Nos. 8942, 8943.

C C ARTEMIS—SABBEN CLARE. Vasilikos-Pendaskinos project Nicosia water supply. First phase. Progress report No. 1 as of September 30, 1980. Nicosia, November, 1980. Report No. D/82. Book Nos. 8937, 8938.

Χ. ΚΥΡΙΑΚΙΔΗΣ. Ὁ περὶ ὑδατοπρομηθείας (εἰδικὰ μέτρα) νόμος 32/64 ὡς ἐπίσης καὶ οἱ τροποποιητικοὶ νόμοι 35/65 καὶ 17/75 ἐνσωματομένοι εἰς αὐτόν. Report No. L/23. Book Nos. 8939, 8940.

G SOCRATOUS. Cyprus fruits and vegetables project. An economic and financial appraisal. Nicosia, 1980. Book No. 8952.

OVERSEAS DEVELOPMENT ADMINISTRATION — EAVIS—SOCRATOUS—MAKIN. Southern conveyor project, Cyprus. Guidelines for computing irrigation water demand and the reduced crop production in years of water shortage. England, 1980. Book No. 9013.

Khrysokhou watershed irrigation project—Reports

G P KRUSEMAN. Mission report on pumping test analysis. Nicosia, April, 1980. Book Nos. 8790, 8791.

J W F COOLS. Population employment. Project working paper No. EC—1. Nicosia, November, 1979. Book Nos. 8814, 8815.

J W F COOLS. Guidelines for farm survey. Project working paper No. EC—2. Nicosia, February, 1980. Book Nos. 8816, 8817.

TH PAPANDREOU. Report on present land use. Project working paper No. AGR/1. Nicosia, February, 1980. Books Nos. 8818, 8819.

KWIP—J H VISSER. Report on beginning of assignment. Nicosia, 1979. Books Nos. 8991, 8992.

J H VISSER. KWIP progress report, 1st, 2nd, 3rd Nicosia 1979 and 1980. Book Nos. 9014, 9015, 9016.

PAPANDREOU—COOLS. Agricultural norms and economic returns with modern irrigation systems. Project working paper No. AGR/2. Vol. 1 Tree crops. Preliminary report. Nicosia, July, 1980. Book Nos. 9017, 9018.

R G BLOEMERS. Preliminary study on planning and development of water resources in the Polis—Khrysokhou area. Project working paper No. WR/7 First draft. Nicosia, August, 1980. Book Nos. 9019, 9020.

M BRAL. Preliminary labour analysis summary. Nicosia, July, 1980. Book Nos. 9021, 9022.

TAYLOR - LAMING - DOAKE. KWIP working paper DE/1. Preliminary study of proposed dams and main conveyors in the Polis-Khrysokhou area. Nicosia, July, 1980. Book No. 9023.

M BRAL. Economic evaluation of development options. Project working paper No. EC-3 Preliminary report. Nicosia, September, 1980. Book Nos. 9024, 9025.

MEULENBROEK — IOANNOU. Basic hydrological data. Project working paper No. WR/2, Part 1, First draft. Nicosia, October, 1980. Book Nos. 9026, 9027.

KWIP. Preliminary report No. PM10, Nicosia, October, 1980. Book No. 9028, 9029.

ALETRARIS—BOYD. KWIP Irrigation design criteria. Working paper No. IRR/7 Nicosia, October, 1980. Book Nos. 9030, 9031.

ALETRARIS—BOYD. Irrigation system water use efficiency. Project working paper No. IRR/5. Nicosia, 1980, Book Nos. 9032, 9033.

ALETRARIS—BOYD. Summary of preliminary irrigation engineering studies. Working paper No.

IRR/13. Nicosia, June, 1980. Book Nos. 9034, 9035.

I M GOODWILL. Report on the first mission. England, October, 1979. Book No. 9036.

I M GOODWILL. Report on the second mission. England, January, 1980. Book No. 9037.

I M GOODWILL. Report on the third mission. England. April, 1980. Book No. 9038.

I M GOODWILL. Report on the fourth mission. England, August, 1980. Book No. 9039.

I M GOODWILL. Report on the fifth mission. England, September, 1980. Book No. 9040.

P BOYD. Mission report of the irrigation consultant's first mission to the KWIP Cyprus. Nicosia, December, 1979. Book No. 9041.

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V DIVISION OF CONSTRUCTION

by
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Introduction

The Division of Construction is one of the major divisions of the Department, and it deals with the planning, supervision and control of all constructional activities of the Department by direct labour, or by contract. The Division is sub-divided into four main branches:-

* *The Planning and Control Branch (including the Tenders Section)*
* *The Major Projects Branch*
* *The Minor Projects Branch,* and
* *The Workshop*

During 1980 the Division consisted of the following staff:-

1	Senior Water Engineer—Head
1	Mechanical Engineer, Class I
3	Executive Engineers, Class II (on contract)
3	Senior Technicians
10	Technicians I
2	Chief Foremen
6	Assistant Chief Foremen
6	Technicians II
50	Monthly paid Foremen
35	Weekly paid Foremen
117	Total staff

In addition to the above technical staff, the Division engaged 530 regular employees of various trades, and an average daily number of 226 casual employees, mostly unskilled, for the execution of the various schemes all over the island.

During the year the Division continued the collection of data regarding actual rates, standards of materials and equip-

ment, and the results were appraised and utilized for the preparation of a manual for use in future planning and cost estimating.

As usual the commencement of execution of the new schemes included in the 1980 budget started after the spring season, soon after the approval of the budget by the House of Representatives and the availability of the funds, which represent the Government share and the Village share which is made available through the Public Loan Commissioners.

CONSTRUCTION PROGRAMME AND PROGRESS

For all the new schemes included in the 1980 development budget, as well as for other water works schemes approved in the budgets of other Government Departments the Division prepared a construction programme early in the Spring having in mind all available information about the availability of funds, administrative formalities, obstacles, requisition formalities etc.

Water works projects included in other Government Department budgets and executed by the Department constitute a great proportion of the Division's activities, more so in 1980 with the construction of Pitsilia Integrated Rural Development Project water schemes budgeted with the Ministry of Agriculture and Natural Resources which allocates each Department allotments of money for the execution of the various projects components.

Such schemes were:-

* Water supply schemes for Refugee housing or self-housing estates included in the Budget of the Department of Town Planning and Housing.
* The Pitsilia Integrated Rural Development Project water works, which represent water supply schemes to villages, rehabilitation irrigation schemes and major irrigation schemes involving the construction of ponds and one dam.
* Water supply schemes for new industrial areas for the Ministry of Commerce and Industry.
* Water supply schemes of new stock farms for the Department of Agriculture.
* Water supply schemes for water boards or municipalities.
* Water supply and irrigation schemes undertaken for village water commisions, irrigation divisions or irrigation associations from funds deposited direct by them.
* Water supply schemes undertaken for private developers from deposits.

Eventually during 1980 projects of an estimated cost of £5,643,191 were undertaken for construction, and the expenditure incurred on all these schemes reached the amount of £4,449,188.

Here it should be stated that this enormous volume of construction work justified the engagement of a much larger number of technical staff, especially at the lower grades, ie Technicians 1st and 2nd grade and in order to attend to all the urgent needs the staff had

to work hard with its utmost efficiency and zeal, so as to respond to all the emergency schemes.

Table V—1 shows in detail the volume of works undertaken for construction by the Department. Other detailed lists showing separately the schemes undertaken for construction during the year appear elsewhere in this report.

PLANNING BRANCH

Although no progress was made during 1980 in respect of adequately staffing this branch its activities were enlarged and its role for the implementation and satisfactory progress of the construction programme proved to be of vital importance.

It is believed that this branch can play

TABLE V—1

SCHEMES UNDERTAKEN FOR CONSTRUCTION DURING 1980

Ser. No.	Description	No of schemes	Amount allocated	Expenditure incurred
			£	£
1	Rural Domestic Water Supplies .	38	824 234	412 206
2	Minor Irrigation Works	28	381 179	271 252
3	Major Irrigation Works	10	185 465	152 409
4	Town Water Supply Schemes . .	9	2 017 939	1 963 295
5	Water Supply and Irrigation Schemes Included in the Pitsilia Project	41	1 207 669	881 326
6	Water Supply Schemes for Housing the Refugees	72	526 757	382 051
7	Schemes undertaken for other Government Departments . . .	49	314 705	238 383
8	Rural Domestic W.S. Schemes from village deposits	128	33 175	26 540
9	Minor Irrigation Schemes from village deposits	30	16 568	13 255
10	Works executed for Private Developers (mainly distribution mains for land development) . .	195	135 500	108 471
	Total	600	£5 643 191	£4 449 188
	Note: Paphos Project expenditure not included in the above figure is . .			4 939 839
	Grand total			£9 389 027

an important role in the field of planning and coordination of construction, and unless it is reorganized and staffed properly, it will not be able to respond to its role.

The activities of this branch are mainly the following:

* The programming and cost control of all schemes under construction.
* The checking of the estimates of the schemes designed by other Divisions of the Department so as to conform with the current rates, and to ensure their execution within estimated cost.
* The distribution of resources, such as labour force, plant, and materials to the various schemes under construction in all districts.
* The assessment of the Divisions requirements in materials and equipment, such as pipes, pipe-fittings, pumping units etc and their order in time, through the Government Central Stores Department.
* The invitation of direct tenders for the supply of other materials not available in the Central Stores, such as building materials etc and the hiring of machinery from the Private Sector, when there are no such machinery available at the E.M.S.
* The acquisition of immovable property which is affected by the construction of the schemes.
* The supply of services towards the installation of electricity supply, and telephone, at the site of various works.

CONTROL BRANCH

The main activity of this Branch is to exercise control over the execution of all the schemes. It has to follow up and see that all construction programmes are adhered to, by the Technical Supervising staff, that the progress of the works is attained at reasonable standards and as planned. The quality standard of all schemes under execution has also to be followed up and be kept always at the highest possible standards.

Another objective of this branch is to ensure that schemes are executed within the estimated cost and locate problems and excesses where this is unavoidable and take the appropriate action to remedy the situation.

The officers of the branch work in association with the Technical supervising staff for the execution of one scheme, for the solving of problems that might arise regarding the execution of the schemes, or on any modifications that become inevitable, in the light of local conditions with the least repercussions on the estimated cost of the scheme. The supervision of schemes under construction in Limassol, Paphos, Larnaca and Famagusta districts was undertaken by the respective Regional Offices, of the Department, with a Technical Officer from the main Division Offices acting as Co-ordinator. The Head of the Division carries periodic visits to the Regional Offices and at the site of the works, and is also kept informed on the progress of each scheme through the Co-ordinator and periodic progress reports from the Regional Offices.

LABOUR FORCE

For the construction of a scheme the

Division usually engaged a gang consisting of a monthly or weekly paid Foreman, regular artisans of the Department of various trades and casual skilled or unskilled labour who were recruited locally through the Government labour offices. The average daily labour force engaged by the Division during 1980 for the construction of all the schemes was 756 persons, out of which 530 were regular employees of various trades, mostly builders, pipelayers, carpenters etc and 226 were casual, skilled or unskilled labourers.

Table V—2 below shows in detail the monthly average labour force engaged by the Division during 1980.

The total expenditure incurred during 1980 on wages done on schemes executed by direct labour reached the amount of £1,265,163.

PIPES AND PIPE FITTINGS

The practice followed for many years is to purchase pipes and pipe fittings of all types from the Government Central Stores.

In order to have all pipes and fittings in stock and in time for the early and uninterrupted execution of the schemes, the Division after assessing all its needs puts an order early in the previous year prior to the approval of the Budget, as soon as the schemes proposed for execution are known.

During 1980 a length of 284,475 m* of pipes of various types were laid all over the island at an expenditure of £1,578,180,-

* Not including Paphos Project.

TABLE V—2

LABOUR FORCE 1980

Month	Skilled	Semiskilled	Unskilled	Regulars	Casuals	Total
January	635	132	18	508	277	785
February	635	128	17	520	260	780
March	662	121	12	517	278	795
April	630	110	19	517	242	759
May	622	105	15	514	228	742
June	607	99	26	516	216	732
July	632	104	56	548	244	792
August	598	94	62	544	210	754
September	578	94	47	548	171	719
October	609	83	28	545	175	720
November	625	111	24	545	215	760
December	600	114	24	542	196	738
Daily average %	82%	14%	4%	70%	30%	100%
Daily average No	620	106	30	530	226	756

Table V—3 that follows shows in detail all types of pipes laid in 1980.

TABLE V—3

PIPES LAID DURING 1980

GALVANIZED IRON PIPES—CLASS B

Dia inches	Length m	Value £
1/2	15 354	5 045
3/4	1 236	465
1	4 314	2 139
1 1/4	2 614	1 854
1 1/2	5 604	4 209
2	9 318	10 084
2 1/2	14 340	16 072
3	14 838	27 748
4	32 220	87 461
Total . .	99 838	£155 077

PVC PIPES/POLYTHENE PIPES —CLASS B

1/2	1 450	180
3/4	4 553	818
1	4 207	1 109
1 1/2	33	8
2	24	8
3	204	104
4	186	174
6	492	746
Total . .	11 149	£3 147

STEEL PIPES—CLASS B

6 5/8	8 592	41 581
8 5/8	582	2 854
10 3/4	7 068	58 714
12 3/4	3 284	65 500
20	7 116	160 608
24	5 192	142 870
Total . .	31 834	£472 127

ASBESTOS CEMENT PRESSURE PIPES—CLASS 15

Dia inches	Length m	Value £
3	4 096	3 216
4	35 405	38 759
6	19 374	37 837
8	11 710	33 532
10	1 563	6 800
12	3 107	20 909
14	5 613	51 587
16	2 238	26 082
18	3 298	44 775
20	12 823	201 749
24	1 840	39 026
Total . .	101 067	£504 272

ASBESTOS CEMENT PRESSURE PIPES—CLASSES 20 - 25

Dia inches	Length m	Value £	Class
3	2 148	1 593	20
4	11 540	12 364	20
6	7 032	13 921	20
8	625	2 005	20
10	40	75	20
12	—	—	—
14	2 040	26 586	20
20	5 163	95 433	20
24	1 252	31 945	20
20	70	1 691	22
20	10 681	257 944	25
Total ...	40 587	£443 557	

SUMMARY OF ALL TYPES OF PIPES LAID DURING 1980

Ser No	Type	Length m	Value £
1	Galvanized iron pipes - class 15...	99 838	155 077

SUMMARY OF ALL TYPES OF PIPES LAID DURING 1980 (Continued)

Ser No	Type	Length m	Value £
2	PVC/polythene pipes	11 149	3 147
3	Steel pipes	31 834	472 127
4	Asbestos cement pipes - class 15...	101 067	504 272
5	Asbestos cement pipes - classes 20-25...	40 587	443 557
	Total	284 475	£1 578 180

CONSTRUCTION PLANT

For all machinery essential for the execution of any one scheme, the Department has to apply primarily to the EMS for the hiring of Government machinery. If, however, Government machinery is not available at the time, the Department hires machinery from the private sector through open tenders. During 1980 for the execution of all the schemes the Department hired machinery of all types from the EMS at an expenditure of £23,793 and from the private sector through open tenders at an expenditure of £206,153 and for other items at an expenditure of £29,326. The types of machinery hired by the Department from the EMS as well as from the private sector and other items showing also the expenditure incurred during 1980 are given in Table V—4.

TABLE V—4

MACHINERY HIRED DURING 1980

FROM THE EMS

Ser No	Description	Working days	Value £
1	Drilling machines ...	131	1 441
2	Concrete mixers	1970	6 585
3	Dumpers	491	2 325
4	Core drill	512	3 584
5	Compressors 215 CF	241	1 724
6	RB 22	35	630
7	Tractors 160 HP	78	1 950
8	Caterpillar 977	78	2 262
9	Auger drill	60	420
10	Overburden	33	694
11	Compressor 600 CF	76	988
12	Wagon drill	30	120
13	Mini core drill	3	12
14	Tractor 130 HP	36	720
15	Compressor 250 CF	13	91
16	Traxcavator	13	247
	Total		£23 793

MACHINERY HIRED

FROM PRIVATE SECTOR

Ser No	Description	Working days or hours	Value £
1	Diggers 17 330	hours	52 374
2	Tractors 4 627	"	12 139
3	Compressors 6 361	"	7 883
4	Compressors 47	days	566
5	Dumpers 126	"	756
6	Bus 1 394	"	12 020
7	Tipper lorries .. 2 986	hours	7 299
8	Tipper lorries	agreed	23 140
9	Crane 1 583	hours	9 707
10	Electrowelding machine 769	"	652

MACHINERY HIRED
FROM PRIVATE SECTOR (Continued)

Ser No	Description	Working days or hours		Value £
11	Machine for cutting of trees	13	days	46
12	Caterpillars	1 035	hours	7 052
13	Buldozer	318	"	2 154
14	Bus		agreed	194
15	Land rovers ...	2 351	days	14 686
16	Saloon cars	4 346	"	16 989
17	Traxcavator	33	hours	179
18	Water pump ...	110	days	330
19	Mixer	235	"	551
20	Mixer elevator		agreed	1 487
21	Excavators of trenches	32 492	meters	34 859
22	Trenches	442	"	624
23	Fork lift	19		95
24	Pumping unit and generator			371
	Total			£206 153

OTHER ITEMS

Ser No	Description	Value £
1	Computer use	10 680
2	Construction of moulds	16 500
3	Casting of slabs	2 146
	Total	£29 326

BUILDING AND OTHER MATERIALS

All building materials, such as cement, shingle, sand etc are purchased by the Department from the private sector through open tenders. Cement is purchased from the two local cement factories and during the year 418 tons of cement were purchased at a value of £55,928. For all types of materials purchased by the Department during 1980 the expenditure reached the amount of £168,761 and in total the expenditure was £224,689. All materials purchased during the year by the Department are given on Table V—5.

TABLE V—5

BUILDING AND OTHER MATERIALS PURCHASED DURING 1980

Ser No	Description	Quantities		Value £
1	Cement	3 282	tons	57 623
2	Shingle	7 463	m^3	19 771
3	Sand	5 891	m^3	17 397
4	Sand for pipe	5 457	m^3	7 508
5	Aggregate	4 014	m^3	8 027
6	Havara	481	m^3	264
7	Soil	65	m^3	94
8	Mild steel	418	tons	55 928
9	Gabion wire netting	594	m^2	2 149
	Total			£168 761

In addition to the above during 1980 the division installed 5471 water meters of 1/2 inch to 8 inches in diameter valued at £28,561. These water meters are usually purchased through the Central Stores and are given in the list below.

WATER METERS INSTALLED DURING 1980

Ser No	Dia inches	Number	Value £
1	1/2	5 183	17 726
2	3/4	20	62
3	1	4	29
4	1 1/4	32	231
5	1 1/2	2	25
6	2	15	525
7	2 1/2	7	268
8	3	162	7 698
9	4	30	1 012
10	6	15	801
11	8	1	184
Total		5 471	£28 561

RURAL DOMESTIC WATER SUPPLY SCHEMES

The construction programme for 1980 included 38 Rural Domestic Water Supply Schemes of an estimated cost of £824,234 and were split in the five free districts of the island as follows:

SUMMARY OF RURAL DOMESTIC WATER SUPPLY SCHEMES

District	No of schemes	Amount approved for 1980	Expenditure in 1980
		£	£
Nicosia	13	167 062	74 113
Limassol	10	437 000	321 591
Famagusta	6	125 108	4 851
Larnaca	5	72 964	5 313
Paphos	4	22 100	6 338
Total	38	£824 234	£412 206

The overall expenditure incurred on all the above Rural Domestic Water Supply Schemes during the year reached the amount of £412,206. The biggest expenditure incurred in one district was £321,591 for Limassol.

Lists showing in detail all 38 schemes undertaken for construction, are shown on Table V—6 that follows.

Construction of Xyliatos dam within the Pitsilia Intergrated Rural Development Project started at the end of March 1980. This rockfill type dam will cost approx £1 million and the capacity of the reservoir will be 1.22 MCM. The photograph shows progress in the excavation of the right abutment. WDD Photo 77EN-18 (14.1.81).

TABLE V–6

RURAL DOMESTIC WATER SUPPLY SCHEMES APPROVED FOR EXECUTION IN 1980

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
NICOSIA DISTRICT				
	(a) Carry Over Schemes			
1	Anayia Phase B	17 500	15 252	Completed
2	Ayii Trimithias (Supplementary WS from BH 06/77)	6 472	4 386	Completed
3	Ayios Epiphanios (Orini)	7 627	2 170	Completed
4	Pitsilia Regional Scheme Part B1	9 000	—	Scheme will be revised
5	Tseri (Phase B)	5 185	3 742	Completed
6	Psomolophou	1 498	2 169	Completed
	(b) New Schemes			
7	Astromeritis	15 700	8 651	In progress
8	Ayios Ioannis - Aredhiou	16 300	12 542	Installation of pumping unit
9	Ayios Yeoryios (Kafk.)	15 780	—	Frozen
10	Dhali	17 000	—	Scheme revised
11	Pano & Kato Lakatamia	26 000	14 738	In progress
12	Nisou-Perakhorio A	8 800	6 058	
13	Nisou-Perakhorio B	20 200	4 405	In progress
	Total for Nicosia District	£167 062	£74 113	
LIMASSOL DISTRICT				
	(a) Carry Over Schemes			
1	Amathus	258 000	231 154	In progress
2	Kouka	4 100	4 100	Completed
3	Mathikoloni	730	619	Completed
4	Moutayiaka Regional Scheme	650	650	Completed
5	Kolossi - Erimi	2 000	1 486	Completed

TABLE V—6

RURAL DOMESTIC WATER SUPPLY SCHEMES APPROVED FOR EXECUTION IN 1980 (Continued)

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
LIMASSOL DISTRICT				
	(b) New Schemes			
6	Asomatos	860	838	Completed
7	Moniatis Trimiklini	2 000	280	Will be revised
8	Pakhna	1 200	—	Rejected
9	Silikou	460	349	Completed
10	Ypsonas - Pano & Kato Polemidhia	167 000	82 115	In progress
	Total for Limassol District	£437 000	£321 591	
FAMAGUSTA DISTRICT				
	(a) Carry Over Schemes			
1	Ayia Napa (Makronisos) and Ayios Epiphanios Tourist Development	16 500	—	Frozen
2	Dherinia	285	153	Completed
3	Liopetri	498	112	Completed
4	Paralimni (Protaras)	100 000	—	Frozen
5	Paralimni (Ayia Napa)	325	—	Completed
	(b) New Schemes			
6	Phrenaros	7 500	4 586	In progress
	Total for Famagusta District	£125 108	£4 851	
LARNACA DISTRICT				
	(a) Carry Over Schemes			
1	Odhou	672	995	Completed
2	Ormidhia	2 000	704	Completed
3	Athienou	1 792	1 792	Completed

TABLE V—6

RURAL DOMESTIC WATER SUPPLY SCHEMES APPROVED FOR EXECUTION IN 1980 (Continued)

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
LARNACA DISTRICT				
	(b) New Schemes			
4	Kalavasos	31 000	—	Scheme revised
5	Pyrga	3 500	1 822	In progress
6	Xylophagou	34 000	—	Not started re-voted for 1981
	Total for Larnaca District	£ 72 964	£ 5 313	
PAPHOS DISTRICT				
	(a) Carry Over Schemes			
1	Nata Additional WS Scheme	7 400	4 584	Completed
2	Peristerona - Additional supply from new BH	3 680	982	Completed
	(b) New Schemes			
3	Kedhares (Extension of distribution system)	800	772	Completed
4	Miliou	10 220	—	Not started re-voted for 1981
	Total for Paphos District	£22 100	£6 338	

MINOR IRRIGATION WORKS

The construction programme for 1980 included 28 Minor Irrigation Schemes of an estimated cost of £381,179 and were split in the four free districts of the island. (See summary on p. 102).

The overall expenditure incurred on all the above Minor Irrigation Works during the year reached the amount of £271,252.

The biggest expenditure incurred in one district was £245,312 for Nicosia.

Lists showing in detail all 28 schemes undertaken for construction are shown on Table V—7 that follows:

SUMMARY OF MINOR IRRIGATION WORKS

Ser No	District	No of schemes	Amount approved for 1980 £	Expenditure incurred in 1980 £
1	Nicosia	19	346 841	245 312
2	Limassol	6	11 887	8 882
3	Larnaca	1	333	332
4	Paphos	2	22 118	16 726
	Total	28	£381 179	£271 252

TABLE V.—7

MINOR IRRIGATION SCHEMES APPROVED FOR EXECUTION IN 1980

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
NICOSIA DISTRICT				
	(a) Carry Over Schemes			
1	Akaki (Kamena)	11 500	10 360	Completed
2	Akaki - Meniko (Riatiko)	16 580	16 637	Completed
3	Ay. Ioannis (Mal.) Pitsillis	2 850	143	Scheme will be revised
4	Kambos - (Potamos Kaloyirou)	54 817	44 885	In progress
5	Meniko (Litharkes)	12 988	13 057	Completed
6	Moutoullas - Phase A and B	600	588	Completed
7	Orounda (Limni)	5 587	5 642	Completed
8	Pera (Orini) (Phassera)	24 000	9 588	In progress
9	Peristerona - Recharge Works	35 630	27 922	Completed
10	Phlasou - Katydhata (Karydhis) £66,000	18 029	17 720	Completed
11	Chakistra (Yephiri) Phase B Phase B	39 684	35 440	In progress
12	Yerakies (Xeros) Phase B	58 430	46 290	In progress
13	Paleometokho — Ayii Trimithias Recharge	1 079	1 079	Completed

TABLE V—7

MINOR IRRIGATION SCHEMES APPROVED FOR EXECUTION IN 1980

NICOSIA DISTRICT (Continued)

	(b) New Schemes			
14	Astromeritis	10 500	—	Frozen
15	Dhali Phase B	3 667	3 760	Completed
16	Yialias-Potamia Recharge Scheme	25 000	—	
17	Nisou (Pumping scheme) (Frangos)	13 000	12 201	Completed
18	Pedhoulas (Lakkoto)	2 400	—	Rejected
19	Peristerona	10 500	—	Frozen
	Total for Nicosia District	£346 841	£245 312	

LIMASSOL DISTRICT

	(a) Carry Over Schemes			
1	Ayios Theodhoros (Agros) (Kouphes)	455	—	Revised
2	Prodhromos (Kyparissi)	1 612	317	Revised
	(b) New Schemes			
3	Mathikoloni (Esso Pervolia)	820	759	Completed
4	Phini (Mylos Irr. Div,)	7 300	7 223	Completed
5	Tris Elies "Milarka"	700	682	Completed
6	Vasa Kilaniou	1 000	218	In progress
	Total for Limassol District	£11 887	£8 882	

LARNACA DISTRICT

1	Kalavasos (Syrmata Kopetra)	333	332	Completed
	Total for Larnaca District	£ 333	£ 332	

PAPHOS DISTRICT

1	Yialia—Ayia Marina	16 818	16 726	Completed
2	Kelokedhara — Extension of irrigation division (P. Ziripillis)	5 300	—	For 1981
	Total for Paphos District	£22 118	£16 726	

MAJOR IRRIGATION WORKS

The 1980 construction programme included 10 major irrigation schemes of a total estimated cost of £185,465.

The overall expenditure incurred during the year reached the amount of £138, 901. Details of all 10 major irrigation schemes included in the 1980 construction programme are given on Table V—8.

TOWN WATER SUPPLY SCHEMES

During the year the Department had to deal with 5 town water supply schemes of an estimated cost of £2,015,479.

The overall expenditure incurred on all these schemes during the year reached the amount of £1,961,160. The biggest expenditure incurred on one project alone was £1,616,356 on the Vasilikos Pendaskinos, Nicosia Water Supply Phase A.

A list showing the 5 Town Water Supply Schemes that were undertaken for construction by the Department during the year is given on Table V—9.

NEW LAKATAMIA RESERVOIR

As it was mentioned and in the report for the year 1979 the works for the construction of the New Lakatamia Reservoir commenced in October 1978. The construction of the above works continued for the whole year of 1980 and it is expected that this project of an estimated cost of £680,000 will be completed by the month of October 1981.

It is a reinforced concrete reservoir with free standing cantilevered walls with the roof designed as flat slab.

The total capacity of the New Lakatamia Reservoir is 40,750 m^3.

The various stages of construction until the end of the year 1980 were as follows.

Mass excavation

Mass excavation was increased from 30,000 m^3 to 37,000 m^3 due to the way we decided to work for the outside works i.e. chambers and drainage pipes. Almost the whole excavation was done by machinery.

Limited space excavation

The limited space excavation was mainly carried out by hand and with the use of pneumatic drills and in some cases with digger with stone breaker. The whole work was done by the end of the year 1980. 2250 m^3 were excavated.

Concreting

Total quantity of concrete 1:1 . 5:3 was reduced to 6740 m^3 instead of 7520 m^3 which was at the beginning due to the alterations of the original design.

Until the end of the year 1980, 5720 m^3 were concreted. Almost 85% of the whole work was done.

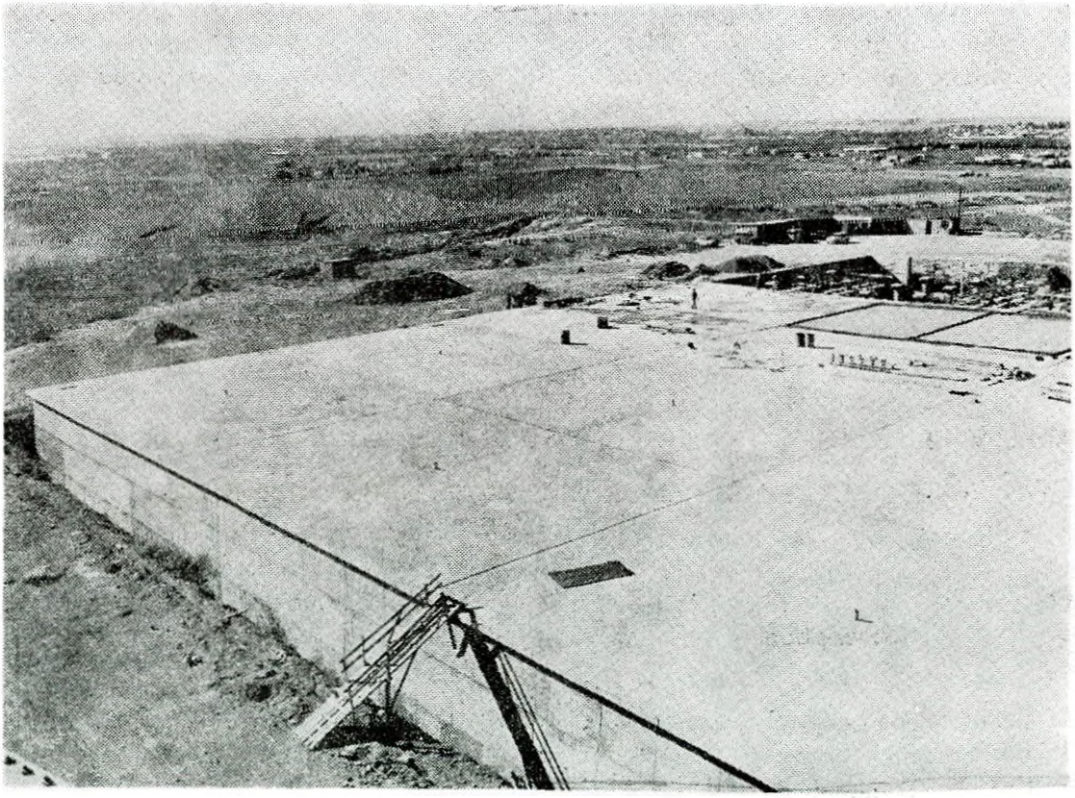
Reinforcement

The preparation of steel reinforcement for all items of the project is carried out at the site.

As far as the fixing of the reinforcement is concerned the rate of progress until the end of 1980 can be considered satisfactory. Total quantity of reinforcement to be used for the project is about 715 tons. Until the end of the year 1980, 640 tons of reinforcement was already used.

General Remarks

the New Lakatamia Reservoir until the end of 1980 was satisfactory and according to programme. About 85% of the actual work has been done. The whole project is anticipated to be completed by the month of October of 1981. The overall progress of the works of



Partial view of the new Lakatamia reservoir — Nicosia Water Supply. Construction of the 40,750 m³ capacity reservoir started in 1978 and will be completed towards the end of 1981 at a total cost of approx £735,000.
WDD Photo C23-10 (26.11.80).

TABLE V—8

MAJOR IRRIGATION SCHEMES UNDERTAKEN FOR EXECUTION IN 1980

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
1	Khrysokhou valley	125 000	97 408	
2	Pissouri Irrigation Works	34 366	33 926	
3	Trakhoni Extension	7 800	2 854	
4	Ay. Theodhoros (Larnaca)	1 000	846	
5	Pomos (Nea Dhimmata)	6 500	6 134	
6	Lefkara dam	390	24	
7	Purchase of Diesel Bus (VPP)	2 500	2 500	
8	ARI (VPP)	2 800	917	
9	Palekhori Kambi (comp.)	552	—	Completed
10	Lymbia dam (comp.)	4 557	—	Completed
	Total	£185 465	£138 901	

VPP=Vasilikos - Pendaskinos Project

TABLE V—9

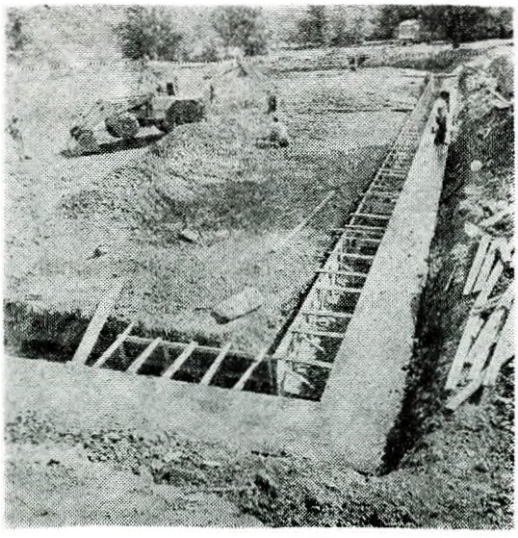
TOWN WATER SUPPLY SCHEMES UNDERTAKEN FOR EXECUTION IN 1980

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
1	Lakatamia Reservoir	267 742	267 742	In progress
2	Peristerona - Akaki - Orounda	30 750	29 919	Completed
3	Kokkini Trimithia Boreholes			
	(a) Borehole 2/76	4 500	788	
	(b) Borehole 46/78	722	475	In progress
	(c) Borehole 91/76	3 000	1 830	
4	Kato Paphos WS	45 000	44 050	Completed

TABLE V—9

TOWN WATER SUPPLY SCHEMES UNDERTAKEN FOR EXECUTION IN 1980 (Continued)

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
5	Vasilikos Pendaskinos — Nicosia Water Supply			
	(a) Electricity and telephones	53 964	53 964	
	(b) Land acquisition	—	—	
	(c) WDD Administration	62 356	62 356	
	(d) Dhypotamos Pumping Station	75 800	63 384	
	(e) C39/78/38 Civil Engineering Works	214 694	214 694	
	(f) C39/78/39 Mechanical and Electrical Works	75 800	45 658	
	(g) C39/78/40 Steel Pipes (Ph Epiphaniou)	482 196	482 196	
	(h) C39/78/41 AC Pipes (CPI) ...	611 696	610 810	
	(i) C39/78/42			
	(a) Valves (A Mousson)	47 913	45 863	
	(b) Valves (J Blakeborough)...	39 346	37 431	
	Total	£2 015 479	£1 961 160	



Work commenced also in 1980 on the Stavrovouni Balancing reservoir, 7,500 m³ capacity within the Nicosia water supply component of the Vasilikos - Pendaskinos Project. Water pumped here from Dhypotamos pumping station will gravitate to the new Lakatamia reservoir. Eventually some 5 MCM of water per year wil be allocated to Nicosia from the VPP. WDD Photo C10-7 (26.9.80).

NICOSIA WATER SUPPLY DHYPOTAMOS PUMPING STATION

Dhypotamos Pumping Station forms part of Vasilikos - Pendaskinos Project —Nicosia Water Supply—first phase.

The station was designed by Lemon & Blizard Consulting Engineers, Southampton, UK and the construction of the civil engineering works has been undertaken by the Division of Construction.

This Pumping Station is being constructed just downstream of the proposed Dhypotamos dam about 3.2 kilometers north of Skarinou bridge (Limassol—Nicosia main road).

The estimated cost for the civil engineering works was £83,100 and the date of commencement was January 1980.

During 1980 the work executed was about 70% of the total and the actual cost was 78% of the estimated total. The increase results from the rise on wages and the increase in the cost of materials and plant.

The above Pumping Station with its five pumps being installed by Mather & Platt Ltd, UK will be used temporarily during the project first phase to boost a variable quantity of water from Khirokitia Water Treatment Plant to Stavrovouni Reservoir and from there water will be conveyed to Lakatamia Reservoir by gravity. In future when the Dhypotamos Dam and the New Nicosia Water Treatment Plant are constructed, this pumping station will be used to boost the water from the Dam to the Treatment Plant.

Nicosia Water Supply—First Phase

Messrs Joannou and Paraskevaides started work on this Contract on 31st April 1980. The project is designed to augment water supplies to Nicosia and the overall estimated cost is about £3 million. The untreated water originates from Lefkara dam whence it flows by existing gravity pipework to the Khirokitia Water Treatment plant. J & P's Contract starts at a point downstream of Khirokitia from where they have laid about 3 km of class 25,500 mm dia AC pipes up the Pendaskinos valley to the new Dhypotamos station, which is being built by the Water Development Department.

J & P's Contract continues with further steel and AC pipelaying initially across country to the Nicosia—Limassol road which it then follows closely most of the way to Laxia ultimately going across country again to the new Lakatamia Reservoir. The contract also includes a 7500 m^3 balancing reservoir at the high point below Stavrovouni which is designed to store the six hours or so demand during the period when the Dhypotamos pumps are not running. This takes advantage of the beneficial water pumping tariff code which limits the pump operation to about 18 hrs per day. There are two further structures in the contract: a break pressure tank on the Nisou ridge which limits the pressure in the gravity section downstream of it enabling AC pipes to be used instead of steel, with consequent cost saving; and a small inlet chamber on the Lakatamia Reservoir site which automatically regulates/shuts down flow in the gravity pipe-

line to maintain surge pressures within acceptable limits.

By the end of the year J & P had laid about 30% of the pipeline and started work on the Reservoir. An amount of £214,694 was paid to the Contractor in the year 1980.

The main pipeline materials were supplied to J & P under separate contracts as follows:

AC pipes —Cyprus Pipes Industries,
Steel pipes—Corinth Pipeworks,
Valves —Pont-a-Mousson, France
—Blakeborough & Son, UK

The pumps for Dhypotamos Pumping Station are supplied and installed by Mather and Platt (Exports) Ltd, UK and the whole of the works were designed by Messrs Lemon and Blizard Consulting Engineers, on the basis of the WDD feasibility study. The Consulting Engineer is also responsible for supervision assisted by staff of the WDD.

PITSILIA INTEGRATED RURAL DEVELOPMENT PROJECT

Introduction

The Pitsilia Integrated Rural Development Project covers 49 villages with a total area of 60,000 hectares and a population of 21,000. The project aims at improving the living conditions of the people of Pitsilia region by developing the productive resources of the area and improving the social services such as health and education. The Project implementation period is 5 years 1978—1982.

The total investments will amount to about £9 million out of which about £5 million will be expended by the WDD for the Development of the region's water resources to irrigate 9,000 donums through the following schemes:

* Construction of a dam at Xyliatos with a capacity of 1.3 million m^3 to irrigate 2,250 donums.
* Construction of about 20 ponds with a total capacity of 1.7 million m^3 to irrigate 3,000 donums.
* Development of about 20 boreholes with a combined yield of 1 million m^3 for the irrigation of about 2,250 donums.
* Rehabilitation of existing minor irrigation schemes to irrigate 1,150 donums.

In addition to the above schemes the village domestic water supplies will be improved within the project activities.

As already stated this project was inaugurated in 1978 with an expenditure of £49,407. During 1979 the expenditure was £471,542 and in 1980 the expenditure reached the amount of £881,326.

In 1980 the construction programme for the Pitsilia Integrated Rural Development Project included 41 schemes out of which 6 schemes were for the improvement of domestic water supplies, 22 schemes were rehabilitation and 13 schemes involved the construction of the Xyliatos dam, ponds and pumping schemes from boreholes.

All the 41 schemes that were approved for execution in 1980 at an estimated cost of £1,207,669 are shown in detail on Table V—10 that follows:

TABLE V—10

PITSILIA INTERGRATED RURAL DEVELOPMENT PROJECT

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
	(i) Carry Over Schemes			
	(a) Water Supply			
1	Kyperounda	7 808	7 808	Completed
2	Zoopiyi	244	204	Completed
	(b) Rehabilitation Schemes			
3	Agridhia (Kato Leftina)	2 694	2 232	Completed
4	Ayios Ioannis (Agros) Yerambelos	1 453	793	Completed
5	Ayios Ioannis (Kato Mylos) Angoulos—Dhipotamia	14 224	3 441	Scheme revised
6	Kalokhorio—Marammenos	8 550	8 223	Completed
7	Kambi (Pharmaka) Kokkinoya—Pera Pervolia	7 953	7 953	Completed
8	Khandria (Panayia)	207	147	Completed
9	Kyperounda (Appis - Avlaki - Palazidhes)	571	256	Completed
10	Ayios Pavlos "Dhimma tou Steraka"	4 800	4 973	Completed
	(ii) New Schemes			
	(a) Water Supply Schemes			
11	Palekhori (Orini)	32 500	23 942	In progress
12	Pelendria	4 700	3 880	In progress
13	Ayia Marina (Xyliatou)	8 500	6 712	In progress
14	Phterikoudhi	500	3	In progress
	(b) Rehabilitation Schemes			
15	Dhymes (Hji Pelendros)	3 200	3 200	Completed
16	Melini (Mallouris)	2 500	1 933	Completed
17	Kato Amiandos—Pelendria (Kardama—Hji Fisouni)	5 700	5 135	Completed

TABLE V—10

PITSILIA INTERGRATED RURAL DEVELOPMENT PROJECT (Continued)

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
18	Pharmakas (Koskinas)	4 400	—	In progress
19	Ayios Ioannis (Agros) - (Makheras)	6 000	3 445	In progress
20	Ayios Ioannis (Agros) - (Spilios - Kouphorovo)	1 400	889	In progress
21	Spilia	22 650	8 256	In progress
22	Dhymes (Kambos - Kardhama) ...	5 000	—	
23	Athrakos (Kalimera)	3 250	3 120	Completed
24	Louvaras Irrigation (Paralonia)	2 400	853	In progress
25	Askas Irrigation (Themelios)	117	111	Completed
26	Ayios Ioannis Agrou (Oper. Ext.)	1 600	1 491	Completed
27	Pelendria (Potamoulia)	321	124	Completed
28	Potamitissa	4 426	3 258	In progress
	(c) Pond and Boreholes Schemes			
29	Akapnou—Ephtagonia Pond	60 000	57 467	
30	Ayios Theodhoros B/H 105/76	22 245	8 352	In progress
31	Ephtagonia Pond No 1	14 595	12 495	In progress
	Ephtagonia Pond No 2	45 000	25 982	In progress
	Ephtagonia Pond No 3	45 000	6 154	In progress
32	Arakapas Pond	30 000	4 973	In progress
33	Kato Mylos Pond	45 000	16 364	In progress
34	Arakapas B/H Scheme 106/76—107/76	22 500	7 346	In progress
35	Ayii Vavatsinias Pond	60 710	51 857	In progress
	Ayii Vavatsinias Dam	83 055	70 176	In progress
	Ayii Vavatsinias Irrigation	18 572	15 546	In progress
36	Khandria Pond	50 033	16 227	In progress
37	Melini Pond	58 372	51 480	Completed
	Melini Irrigation	6 940	4 736	Completed
38	Pelendria Pond	49 693	33 387	In progress
39	Pelendria Distribution System	21 204	19 040	
	Xyliatos Dam—General Constructions Co.	252 470	251 934	Completed
	Xyliatos Dam—Access Road	6 100	6 100	Completed
	Xyliatos Dam—Supervision etc ...	16 500	14 044	Completed
	Xyliatos Dam—Consultancy	2 581	1 573	

TABLE V—10

PITSILIA INTERGRATED RURAL DEVELOPMENT PROJECT (Continued)

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
40	Kyperounda Pond	23 500	6 407	In progress
41	Purchase of Membrane	78 763	76 112	
	Test Pumping	22 379	19 545	
	Purchase of two electrosubmersible pumps	2 400	1 827	
	Purchase of four pumps 2 for Kalokhorio Irrigation 1 for Pelendria Irrigation 1 for Potamitissa Irrigation	12 389		
	Total	£1 207 669	£881 326	

XYLIATOS DAM CONSTRUCTION

Contract No. 39/79/35

Following the evaluation of the tenders, the construction of Xyliatos Dam was awarded to General Construction Co Ltd for the sum of £894,626. The Contract Agreement was signed on the 21st February 1980 and proceedings with the construction of the works commenced at the end of the following month. The whole of the works should be completed within 30 months and by the end of the year 1980 the following progress was made.

General

A small gravity dam was built, about 500 metres upstream of the damsite and within the reservoir, which was to store water, required for the construction of the works during the dry seasons. Temporary access roads required by the contractor for the execution of the works were constructed within the site.

In the meantime, office accomodation was erected using pre-fabricated units, for use by the Engineer's and Employer's staff on site. A laboratory for soils and materials testing, store rooms for materials and explosives a workshop and mess rooms for workmen were also erected. Two generators were installed on site for the supply of electricity.

Diversion Tunnel

Excavation of the tunnel started in the middle of May 1980. This was carried

out by controlled blasting and was completed by the end of September 1980 with a delay of 2 1/2 months from the original programme of works. The final length of the tunnel was 110.7 m and of the culvert 20.3 m. Concreting of the tunnel invert began in early October, to be followed by concreting of tunnel lining about a month later.

The concrete produced was mixed on site using a concrete mixer with a weigh device, after concrete trial mixes were prepared and tested in the laboratory. By the end of December 1980, about 55% of tunnel concreting was completed.

Embankment

Soft excavation over the area of embankment started in early May 1980. In mid June, rock excavation of the cut-off trench started from the right abutment. Later on the cut-off excavation of the left abutment commenced, along with the excavation of the grout cap on the right abutment.

A small key trench was excavated for the coffer-dam and its construction, which started in early November 1980, was still under way at the end of the year, having reached an elevation of 508 metres and the final elevation being at 511 metres. Clay material for the coffer-dam only was taken from borrow areas within the reservoir after grading, compaction and permeability tests carried out in October had shown that the material was suitable.

Spillway

Excavation works on spillway started in mid June, with the soft excavation being completed by the end of July 1980. By the end of the year, the contractor completed 80% of the estimated total rock excavation.

Grouting Works

At the beginning of December, Colcrete Ltd, the sub-contractor specialist in drilling and grouting works, started core drilling and water testing of the five water test holes. This operation was 2 1/2 months behind schedule due to delays in cut-off excavation.

Interim Measurement

The amount of work certified by the Resident Engineer up to the end of December 1980 was £202,501 with the contractor having received £253,822 including the advance payment.

CONSTRUCTION OF PONDS

The works on four ponds which commenced in 1979 were completed in 1980. The works on another six ponds started in 1980 and they will be completed in 1981.

Every scheme constitutes of the pond, the diversion weir and pipeline, and the distribution system. The construction of ponds is being carried out through the employment of Contractors. The works for the distribution systems are executed directly by the Construction Division of the Department.

Data for nine of the ponds regarding construction dates, expenditure, capacity and first impoundment, are given below.

Pelendria Pond

This scheme, which is combined with a borehole will irrigate an area of 500 donums.

Capacity ..... 123,000 m^3
Contractor .... FYSCO Contracting Ltd
Commencement date ... February 1979
Completion date... ... December 1980
Estimated cost £104,315
Actual cost £119,887

The pond was filled with water during the rainy season 1980—81.

Ephtagonia Pond No 1

An area of 150 donums will be irrigated from this pond.

Capacity ..... 92,000 m^3
Contractor ..... IACOVOU BROTHERS
Commencement date ... February 1979
Completion date ..... July 1980
Estimated cost £76,650
Actual cost £82,984

The pond was filled with water during the rainy season 1980—81.

Khandria Pond

The area which will be irrigated from this pond is 100 donums.

Capacity ..... 70,000 m^3
Contractor ..... CYBARCO LTD
Commencement date ..... July 1979
Completion date ..... September 1980
Estimated cost £97,500
Actual cost £106,153

The pond was filled with water during the rainy season 1980—81.

Melini Pond No 1

The area which will be irrigated from this pond is 90 donums.

Capacity ..... 58,000 m^3
Contractor ..... IACOVOU BROTHERS
Commencement date ... November 1979
Completion date ..... October 1980
Estimated cost £66,217
Actual cost ..... Did not exceed the estimate

The pond was filled with water during the rainy season 1980—81.

Akapnou—Ephtagonia Pond

Irrigated area ..... 185 donums
Capacity ..... 132,000 m^3
Contractor ..... IACOVOU BROTHERS
Commencement date...September 1980
Contract period ..... 12 months
Estimated cost £178,663

Ephtagonia Pond No 2

Irrigated area ..... 175 donums
Capacity ..... 127,000 m^3
Contractor ..... Hadjiconstantis—Fysentzides—Charalambous
Commencement date...September 1980
Contract period ..... 10 months
Estimated cost £160,889

Ephtagonia Pond No 3

Irrigated area ..... 90 donums
Capacity ..... 65,000 m^3
Contractor ..... IACOVOU BROTHERS
Commencement date...September 1980
Contract period ..... 9 months
Estimated cost £93,314

Arakapas Pond

Irrigated area ..... 270 donums
Capacity ..... 192,000 m^3
Contractor ..... IACOVOU BROTHERS
Commencement date...September 1980
Contract period ..... 12 months
Estimated cost £174,005

Kato Mylos Pond
(Combined scheme with a borehole)

Irrigated area ..... 300 donums
Capacity ..... 104,000 m^3
Contractor ..... PHOENIX CONSTRUCTION LTD
Commencement date...September 1980
Contract period ..... 10 months
Estimated cost £133,732

Remarks

The excess of the cost in the completed ponds is mainly due to additional work not included in the original contract ie remedial works and compaction of backfill material to the membrane, after the failure of backfill material in Pelendria Pond and partly in Ephtagonia Pond No 1 in December 1979.

The cost of the ponds under construction is expected to exceed the original cost due to the appearance of springs in the pond inner slopes which means the construction of a drainage system under the membrane.

WATER SUPPLY SCHEMES TO REFUGEE HOUSING AND SELF-HOUSING ESTATES

As already mentioned in addition to its usual activities the Department during the year under review, had to respond to the urgent demand for the supply of water to refugee housing and self-housing schemes. 72 such schemes of an estimated cost of £526,757 were involved. 51 of these schemes of an estimated cost of £320,974 were related to self-housing and 21 to housing estates of an estimated cost of £205,783.

The overall expenditure incurred on the execution of all these schemes during the year reached the amount of £382,051.

It should be noted that the Department deals with these with the utmost urgency, giving them top priority over the execution of all other works. Table V—11 shows in detail all 72 refugee housing schemes undertaken for execution during 1980.

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS

During the year 1980 the Department undertook 49 schemes for construction on behalf of other Government Departments. The funds were allocated by the Ministry of the Interior, the Ministry of Commerce and Industry, the Ministry of Agriculture, the Department of Forests, the Public Works Department, the Ministry of Communications etc. Table V—12 shows all 49 schemes that were undertaken for execution in 1980. In total, on all schemes executed for other Departments the expenditure incurred during 1980 reached the amount of £238 383.

TABLE V—11

WATER SUPPLY SCHEMES TO REFUGEE HOUSING AND SELF-HOUSING ESTATES

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
	REFUGEE HOUSING ESTATES			
1	Ayios Mamas			
2	Pano Lakatamia	480	500	
3	Linopetra (Limassol)	1 056	446	
4	Ayios Ioannis (Larnaca)	11 000	—	
5	Kapsalos (Limassol)	23 046	21 463	
6	Ayios Ioannis (Limassol)	7 768	3 505	
7	Makarios III	2 190	4 882	
8	Ayii Anargyri (Larnaca)	12 816	7 580	
9	Zyyi (Larnaca)	1 103	1 017	
10	Athalassa	41 000	25 814	
11	Athalassa Investigation	400	318	
12	Kamares II	19 000	8 852	
13	Makarios III (Larnaca)	2 000	2 082	
14	Kophinou (Larnaca)	24 000	19 758	
15	Platy II	1 824	557	
16	Kokkines	39 600	32 237	
17	Kokkines	2 800	2 280	
18	Ap. Andreas	5 700	2 115	
19	Ay. Pavlos	7 200	3 587	
20	Ap. Loucas	1 300	948	
21	Zenon	1 500	1 031	
	Total	£205 783	£138 972	
	REFUGEE SELF-HOUSING ESTATES			
	(i) Nicosia District			
1	Kokkini Trimithia A	1 000	215	
2	Kokkini Trimithia B	1 000	485	
3	Meniko A	180	7	
4	Peristerona D	305	254	
5	Agrokipia	854	274	
6	Tseri	120	3	

TABLE V—11

WATER SUPPLY SCHEMES TO REFUGEE HOUSING AND SELF-HOUSING ESTATES (Continued)

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
7	Yeri C	28 803	41 485	
8	Tseri D	4 533	3 672	
9	Yeri D	14 098	12 871	
10	Peristerona E	6 200	8 607	
11	Yeri E	4 383	4 383	
12	Yeri Z	9 610	8 928	
13	Anayia B	1 500	210	
14	Pera Orinis B	1 700	838	
15	Dhali C	2 900	1 562	
16	Ayii Trimithias	1 300	923	
17	Tseri F	5 200	567	
18	Yeri H	20 258	5 758	
19	Akaki E	800	239	
20	Peristerona Z	3 000	471	
	Total	£107 744	£91 752	
	(ii) Famagusta District			
1	Phrenaros	240	256	
2	Sotira C	7 845	7 123	
3	Sotira A	7 840	2 449	
4	Sotira B	5 250	1 613	
5	Dherinia C	3 200	—	
	Total	£24 375	£11 441	
	(iii) Limassol District			
1	Pano Polemidhia A	376	—	
2	Kolossi B	1 400	1 137	
3	Kato Polemidhia A	3 000	593	
4	Moutayiaka A	140	21	
5	Trakhoni B	5 000	5 258	
6	Pano Polemidhia C	5 221	5 275	
7	Ay. Phyla	19 300	19 335	

TABLE V—11

WATER SUPPLY SCHEMES TO REFUGEE HOUSING AND SELF-HOUSING ESTATES (Continued)

8	Kolossi C	200	269
9	Kandou A	4 300	2 579
10	Episkopi C	5 000	3 425
11	Moutayiaka B	20 000	17 890
12	Pano Polemidhia D	10 000	11 430
	Total	£73 937	£67 212

(iv) Larnaca District

1	Kiti B	265	267
2	Kophinou B	4 400	710
3	Dhromolaxia D	4 089	368
4	Livadhia D	800	330
5	Meneou A	38 965	25 419
6	Tersephanou C	1 900	3 007
7	Kalokhorio E	11 939	9 744
8	Pervolia C	5 000	5 040
9	Livadhia E	10 000	7 032
10	Dhromolaxia E	7 500	—
11	Kellia	6 000	3 545
12	Klavdhia	3 000	—
13	Menoyia	300	281
14	Dhekelia A	20 760	16 931
	Total	£114 918	£72 674

SUMMARY OF ALL DISTRICTS

1	**Housing Estates**	205 783	138 972
2	**Self Housing Estates**		
	(i) Nicosia District	107 744	91 752
	(ii) Famagusta District	24 375	11 441
	(iii) Limassol District	73 937	67 212
	(iv) Larnaca District	114 918	72 674
	Total	£526 757	£382 051

TABLE V—12

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
1	Geological (test pumping)	520	330	
2	Troodos Forest (Installation of fire hydrants)	3 531	3 434	
3	Lazania WS (new storage tank—D.O. funds)	2 200	2 172	
4	Apsiou (Forest Department — installation of fire hydrants)	400	140	
5	Omodhos (Geological Department)	200	212	
6	Geological (test pumpings)	4 800	4 790	
7	Trakhoni Livestock WS (Agriculture Department)	4 700	3 275	
8	Akaki Livestock WS (new WS—funds)	200	76	
9	Yeri Livestock (new WS—Department of Agriculture)	3 800	3 342	
10	Kolossi Livestock (new WS—Department of Agriculture)	200	72	
11	Geological (test pumping)	340	203	
12	Ayios Athanasios Industrial Area (new WS)	10 000	3 160	
13	Dhromolaxia Livestock WS (Department of Agriculture)	14 400	14 111	
14	Palopanayiotis Dam M/ce	3 000	2 617	
15	Kandou Livestock WS (Department of Agriculture)	1 300	1 219	
16	Fire Services (fire hydrants)	1 600	1 573	
17	Xylotymbou Livestock (new WS—Department of Agriculture)	2 000	2 106	
18	Saittas - Karvounas (Public Works Department — relocation of pipes)	18 000	17 193	
19	Clearing of B/H	200	199	
20	Peristerona—Akaki (cleaning of T/C boreholes)	2 350	1 463	
21	Plataniskia WS (T/C properties)	228	203	

TABLE V—12

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS (Continued)

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
22	Anthoupolis (ETA) WS Scheme ...	800	800	
23	Repair Offices Hydrants	300	173	
24	T/C Properties WS	300	742	
25	Astromeritis WS (Additional supply—DO Funds)	2 000	2 000	
26	Klavdhia WS (T/C Properties) ...	950	927	
27	Kophinou Livestock WS (Department of Agriculture)	200	220	
28	Anthoupolis (Imp. of villages WS)	5 000	5 000	
29	Polemidhia Imp. (Kapsalia) Irrigation (D.O. Funds)	400	251	
30	Moutayiaka WS (T/C Properties)	680	581	
31	P. Polemidhia Livestock WS (Department of Agriculture)	4 000	3 505	
32	Kiti Dam Maintenance (cleaning of Irrigation channel)	300	300	
33	P. Lakatamia (Anthoupolis WS) ...	32 500	30 683	
34	Peristerona—Akaki (PWD funds—relocation of pipes)	1 500	940	
35	Evdhimou (T/C properties)	1 240	1 065	
36	Menoyia WS (T/C properties)	720	720	
37	Melousha—Tremetoushia WS	2 000	1 282	
38	Dhali Irrigation (D.O. funds)	733	733	
39	Ypsonas—Polemidhia WS (Ministry of Interior)	22 000	11 086	
40	Cl. Assistant	2 800	2 700	
41	New Nicosia—Limassol Road (Public Works Department funds—relocation of water pipes)	144 214	107 540	
42	Ayia Marina Xyliatou WS (Public Works Department)	150	150	
43	Peristerona Irrigation (Relocation of RCC channels)	2 150	1 753	

TABLE V—12

SCHEMES UNDERTAKEN FOR CONSTRUCTION FOR OTHER GOVERNMENT DEPARTMENTS (Continued)

Ser No	Description	Amount allocated for 1980 £	Expenditure incurred in 1980 £	Remarks
44	Perivolia Irrigation (Relocation of RCC channels)	1 700	1 218	
45	Platanistasa—K Moni (Public Works Department—relocation of pipes)	100	100	
46	Linopetra School WS (Ministry of Education)	500	366	
47	Zyyi WS to National Guard (Ministry of Interior funds)	550	609	
48	School of the Retarted Children WS (Ministry of Education)	3 949	308	
49	New Lambousa School WS (Ministry of Education)	8 000	741	
	Total	£314 705	£238 383	

V/1 PAPHOS IRRIGATION PROJECT

by
K Spanos
Executive Engineer I
Deputy Project Manager

General

The activities of the Paphos Irrigation Project have continued during the year 1980 in two fields (a) the construction of the uncompleted works and (b) the operation of every part of the project works which was substantially completed and taken over by the Water Development Department.

By the end of the year a substantial part of the 1st phase (3,500 ha) of the Project as regards the distribution systems and their pumping stations was completed and put into operation in order to supply water to the farmers for irrigating either permanent plantations or seasonal crops.

During the year 1980 the execution of 4 contracts was continued from the previous year i.e. (1) The construction of Pumping Stations and the Western Conveyor and Remote Indication. (2) The Installation of Irrigation Networks and Construction of Reservoirs for Eastern Sectors. (3) The Supply of Valves for the Networks of Eastern Sectors and (4) The Construction of Asprokremmos Dam.

During the same year the contracts for 3 lots of the tenders for the supplies for Irrigation Networks for Western Sectors have been awarded. Also tenders have been invited for the last 3 contracts of the project (1) Supply of Turbine, Generators and Valves for the Asprokremmos Power Station. (2) Construction of Farm Access Roads

and (3) Installation of the Irrigation Networks and Construction of Reservoirs for the Western Sectors.

A brief description of the progress performed in each of the above contracts during the year 1980 is given under the forthcoming headings and also shown on the progress chart page 124.

The total expenditure by the Project during the year 1980 has reached the amount of £4,939,837 which brought the total amount spent for the Project since its start to the sum of £16,007,460 which is about 70% of the total estimated cost that will be reached to complete the Project construction works which is of the order of £23 million.

For the supervision of the contract works under execution and the operation of the completed ones the following number of staff of the Department were occupied at the end of the reporting year.

Technical Staff

1 Executive Engineer I
Project Manager
1 Executive Engineer I, DPM
3 Executive Engineers II, (monthly)
3 Executive Engineers II
(Daily or on Contract)
30 Technicians II (monthly or daily)
2 Ass. Chief Foremen
3 Foremen

43 No. total technical staff

Administrative Staff

1 Administrative Officer
1 Accounting Officer
3 Clerical Assistants
2 Secretary - Typists
1 Telephonist
2 Messengers

10 No total administrative staff

In addition to the above staff the Project engaged from time to time a considerable number of hourly paid staff on regular or temporary basis and of various trades to assist in the various activities of the above staff.

The two Consulting Engineering Firms "SOGREAH" and Sir M. MacDonald and Partners who are responsible for the supervision of the contract works continued their contribution in Engineering Staff with 2 Resident Engineers assisted by 3 expatriate Civil Engineers.

Finally, mention is made to the beneficial contribution in Engineering Staff from FAO with the appointment to the Project of 2 Associate Experts.

PROGRESS OF WORKS
Contract Works in progress from previous year:

There have been 4 contracts under which works were continued from the previous year during the year 1980. Details on each one of them are given herebelow:

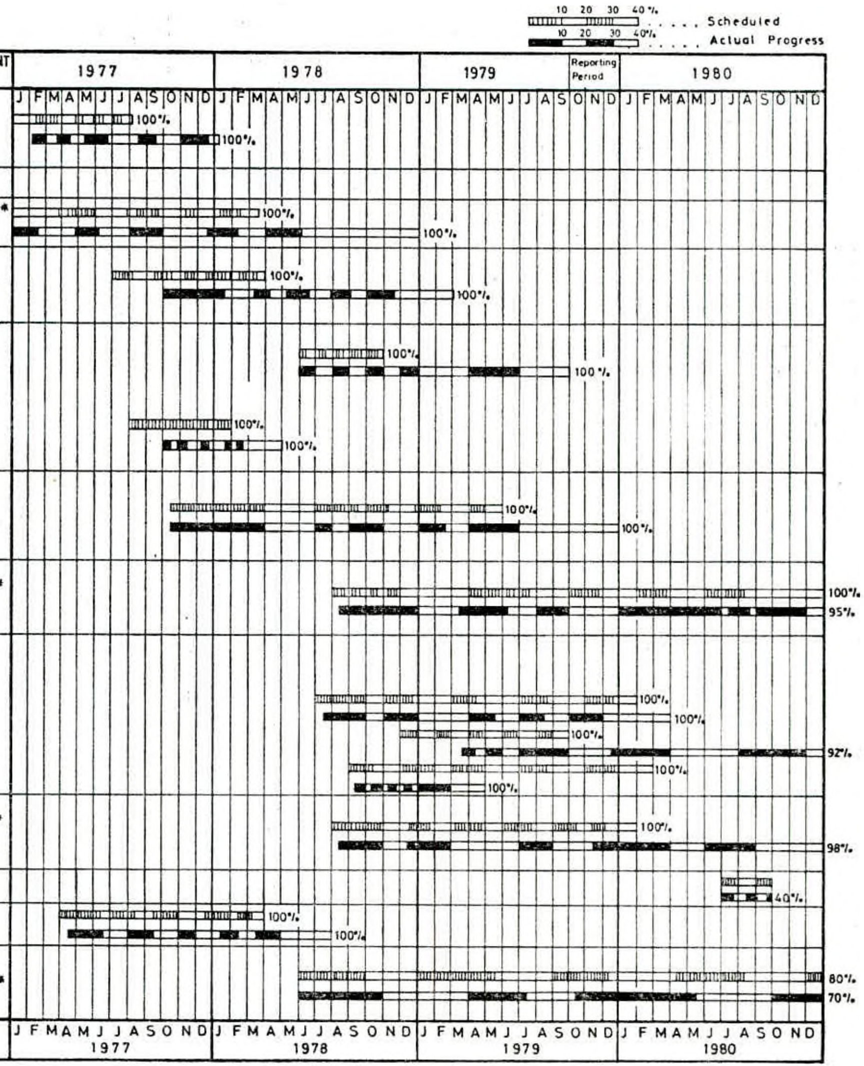
1. Construction of Pumping Stations, Western Conveyor and Remote Indication—Main Contract No. 6C 39/77/37

Contractor: Costain Civil Engineering Ltd, of UK

This Contract started in August 1978 and as it was reported in the previous

PAPHOS IRRIGATION PROJECT
PROGRESS CHART FOR WORKS UNDER CONTRACT

LOT No.	DESCRIPTION OF WORKS	CONTRACT SUM £	GROSS PAYMNT TO 31.12.80 £
S 20 S 21 S 22	Supply of Laboratory Equipment Survey Equipment and Vehicles	66,602	67,083
D 1	Drilling, Casing, Testing of B. Hs.	82,000	81,914
1 C 1 S	Main Canal Construction	992,826	908,240 *
2	Supply and installation of Well Pumps	142,372	134,718
	SUPPLIES FOR WELLFIELD CONVEYANCE SYSTEM		
3 S1	1 Canaletti	66,850	59,272
3 S2 3 S3	2 A. C. Pipes with Fittings and Valves	208,402	216,534
4 C1 & 4 C2	Installation of Wellfield Conveyance System and Eastern Main Pipeline	162,889	241,342
6 C	Main Contract—Supply and Installation of Pumping Stations Western Conveyor and Remote Indication	2,606,603	3,191,677 *
	SUPPLIES FOR DISTRIBUTION NETWORK OF EASTERN AREA		
S 5.1	1 A.C.Pipes and Fittings	1,267,257	1,261,353
S 52	2 Valves	113,868	98,528
S 53	3 Hydrants	251,052	242,321
7 C1 7 C2	Installation of Irrigation Network and Construction of Reservoirs for Eastern Area	1,640,984	1,645,478 *
8 S1	Supplies for distr. network western area 1AC pipes and fittings	456,215	190,670
10	Central Offices Temporary Buildings	40,413 (31,185)	71,598
	ASPROKREMMOS DAM		
12	1 Dam Construction	6,743,837	6,157,361 *



Note: * Including adjustment of cost due to variation of prices

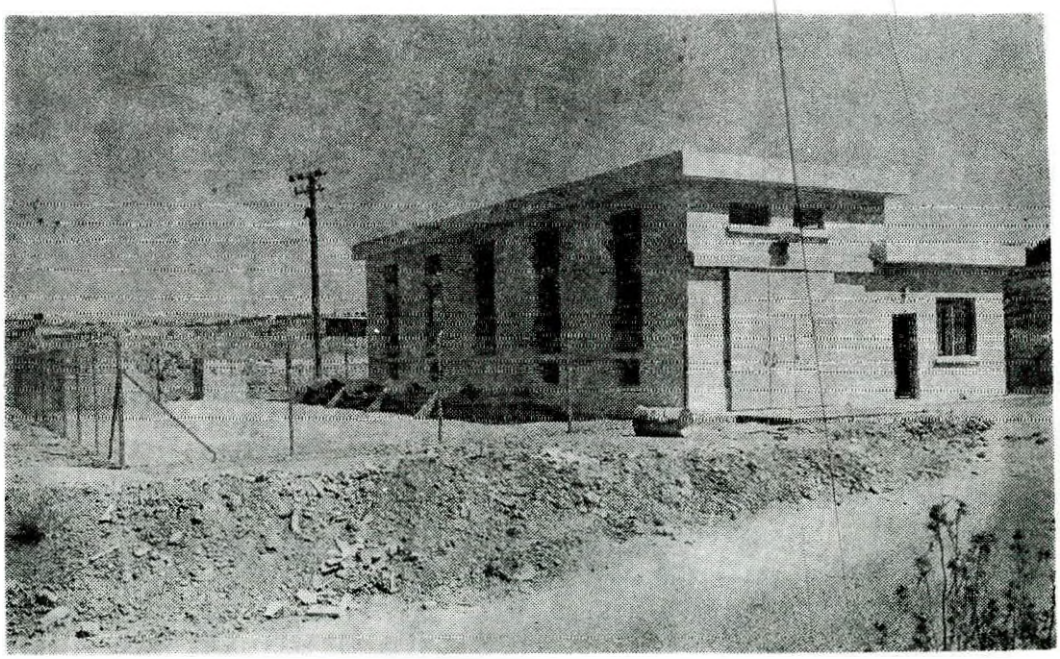
annual reports it includes the construction of 14 Pumping Stations, the supply and installation of their pumping units and their control systems including a remote indication on a central panel and the supply and installation of a 23 km long pipeline for the Western Conveyor. The contract completion was fixed at the end of the year 1980. This however could not be achieved by the contractor and his subcontractors due to the very slow progress in the civil works and the late delivery of all the electromechanical equipment as has already been mentioned in the annual report of 1979. The Main Contractor has expressed his intention to claim for extension of time in completing his works due to various reasons such as late issue of certain drawings and other instructions and additional works but this matter was left in abeyance until full details and justifications will be submitted by the Contractor.

At the end of the year 1980 the contractor has reached the following stage of completion with the works involved.

PUMPING STATIONS OF EASTERN AREA:

Kouklia West and Koulia East

Both stations have been completed, tested and commissioned by the Contractor during the period June—July—August. They were the first pumping stations which were handed over to the Department and put on automatic ope-



Construction of Kouklia East Pumpinng Station with a nominal discharge of 1,200 m³/hr and 225 kw output is completed. It supplies water with pressure to an area of about 335 ha. WDD Photo Cl-6 (7.8.80).

ration for supplyin water to the distribution networks o the two sectors of Kouklia. The Conactor continued, according to the lis given to him by the Resident Enginee to work on these stations in order o repair all minor defects which shou be put right during the maintenanceperiod of one year after which fina taking over will take place.

Akhelia P S

The civil works were completed by the end of the yearexcept some minor repairs which should be carried out during the maintenance period. Although the electromechanical equipment has been installed during the first half of the year and he electricity power was available for their testing from the month of May the Contractor has been obliged to postpone this work till the end of the year due t unexpected accidental flooding caused by leakages in the piping system of the station's basement where th pumping units were installed. A lorg delay was then incurred for the removal of all motors and cables in order o be dried up and checked thoroughly in a laboratory in Nicosia. Final testing of the pumping units and their panels started in December and had to be continued in the following year.

Timi and Mandria P S

The civil works for both stations have been completed by the end of the year. Although generally all their electromechanical equipment have been also installed, their testing was only partially completed due to the repairs required to be done on some parts which were found defective. Both were expected to be finally commissioned and handed for automatic operation before the irrigation season of 1981 would start.

Koloni and Ayia Varvara P S

The civil works were nearly completed for both stations and some of the finishings were still under preparation. Electromechanical equipment were fully installed and by the end of the year the Contractor completed also all formalities for the connection of the electricity supply to the panels and testing of the panels and motors was programmed for the beginning of the year 1981 so that final commissioning would take place ahead of the irrigation season of 1981.

Main Pumping Station

The civil works for this station have been completed during the year except the landscaping, its fencing and painting of some metal work and some necessary repairs.

By the end of the year the contractor had installed all the mechanical parts and about 95% of their electrical components. Power was made available to the station before the end of the year and it was anticipated that testings should be carried out for Yeroskipos units, Paphos units and main lift during the first half of the year 1981.

Mandria Extension and Koloni Extension

The civil works and installation of electromechanical equipment were by about 80% completed by the end of the year.

PUMPING STATIONS OF WESTERN AREA

Kissonerga I and II, Emba South, Emba North

Generally the work on the above four stations has been well advanced by the end of the year and about 95% of the civil and electromechanical works have been completed. As the above stations will not be required to be operated the following year, their final commissioning will follow the completion of the Eastern Area Pumping Stations.

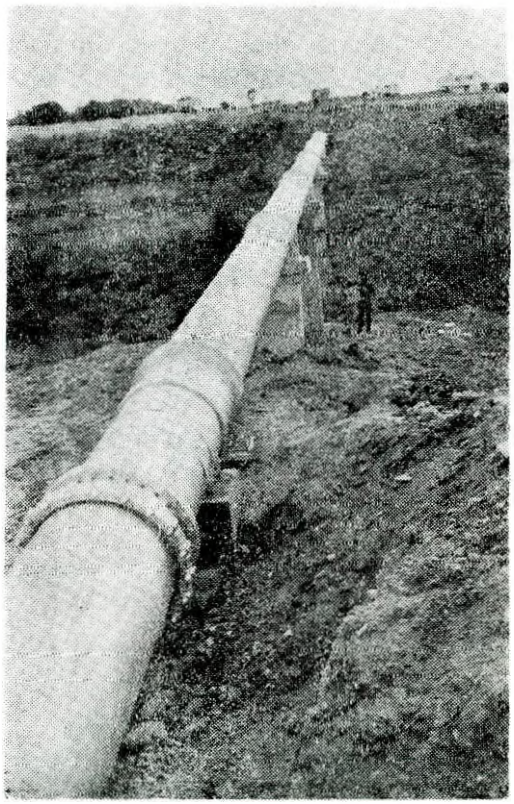
Western Conveyor

The sub-contractor for the installation of the ductile iron pipes and AC pipes of the Western Conveyor continued the works on full capacity from the previous year and achieved completion of all excavations and pipelaying (22,260 metres in total) of diametres between 900 and 400 by the end of March 1980 and testing by the end of May 1980. Despite many unexpected difficulties which the sub-contractor has met, like considerable increases in rock, shortage of water for tests and very rainy winter (Jan.—March), he managed to complete the installation of the pipeline (except on line structures) in 50 working weeks with an average production of 90 metres per day fully completed.

The on line structures like the chambers for air valves, washouts and sluice valves and the head breakers have been undertaken by the sub-contractor for civil works who has been unable to start before August 1980. Eventually their progress has been very slow and continued until the end of the year when still a lot of finishing work remained uncompleted.

Remote Indication

The lines which are required for the connection of all Pumping Stations with the Central Control Room over the Project Offices have been installed during the year 1980 by CY.TA. The sub-contractor however has not started installation of the required equipment



Construction of an overhead crossing of the Western Main Conveyor with a stream north of Paphos town. The crossing is made up of steel pipe 900 mm diameter. WDD Photo 74 EN-20 (11. 12.80).

during this year due to the late delivery of the equipment from UK.

The overall completion of the works by the end of the year 1980 is estimated at 95%. The uncompleted part of the work, although of small percentage, is of high importance because it concerns the testing and final commissioning of many electromechanical parts and completion of the remote indication system.

The total payments to the Contractor for all his works carried out during the year 1980 under the above Contract amounted to £1,013,104 which brought the cumulative amount since the beginning up to date to £3,191,677. The reason for exceeding the original contract sum of £2,606,603 is because of the additional sums paid due to the variation of prices since the time of tender opening back in January 1978 up to date.

2. Installation of Irrigation Network and Construction of Reservoirs for Eastern Sectors—Contract No C7 39/77/38—39

Contractor: SOCEA of France

This Contract started in October 1978 and it was due for completion by the end of March 1980 following the extension of time of about 3 months given by the Resident Engineer mainly due to the heavy rains of Nov—Dec 1979 and the late delivery of certain quantities of pipe fittings at the beginning of the works. The Contractor however was obliged to slow down all his activities considerably during the months of January, February and March due to adverse weather conditions.

His total production in pipelaying during the first three months of the year was only about 23 km. By the end of May 1980 the contractor has managed to complete all pipelaying work amounting to 388 km of AC pipes but still had to do some hydrants and farm riser connections in the sectors of Timi, Mandria and Ayia Varvara and to complete the installation of many concrete protection pipes over hydrants, valves and farm risers and many road crossings in nearly all the sectors. This work was continued together with other finishing works up to the end of the year and throughout the maintenance period of the works.

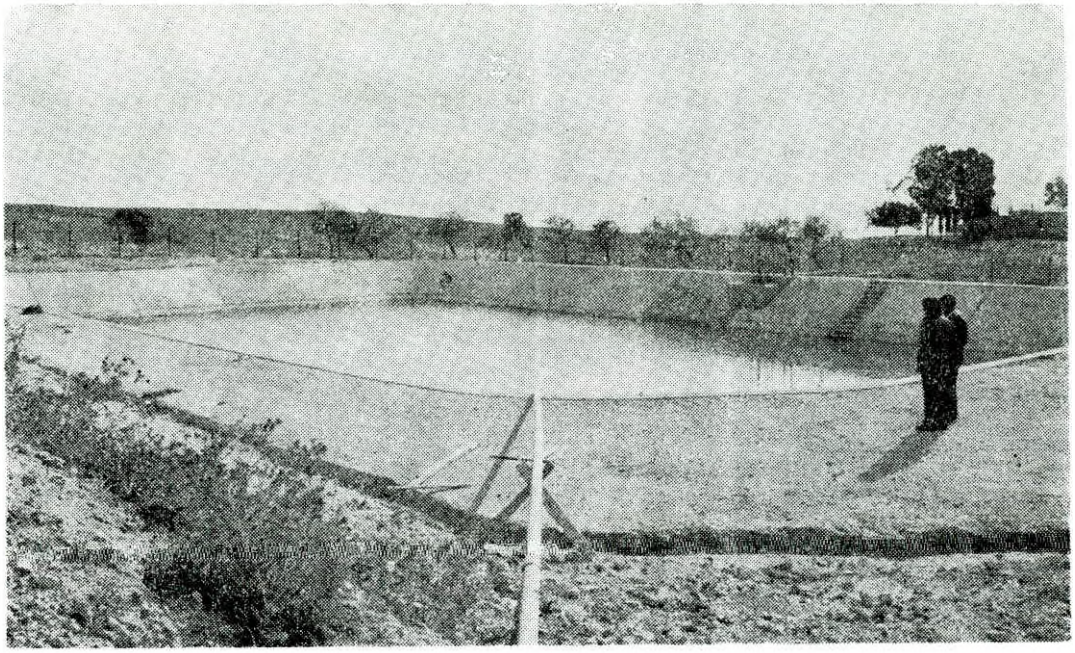
Construction of the balancing reservoirs, 3 elevated and 3 on ground, has been very slow and finally they were all completed by the end of July 1980. In the storage reservoir of Ayia Varvara, although it has been concreted during the previous year the filling of its joints on the concrete lining with guttaterna was left for the dry period and it was finally completed in October 1980.

Before final acceptance of the distribution system of each sector the Contractor was required to perform successfully a general watertightness test of all the networks under full static pressure. The procedure which was involved in order to fill all the networks and reduce the losses of water from it below the acceptable limits which were of the order of 3 to 4% of the total volume within 24 hrs was proved to be

rather long and many difficulties were encountered in repairing pipe breakages and leakages from the connections.

The first general test was carried out during May in the sector of Kouklia west. The Contractor has then proceeded with the networks of Kouklia East and Akhelia. The last one was interrupted in June due to leakages from the non return valve of its pumping station back to the main canal. Finally the first 2 sectors of Kouklia East and West were provisionally accepted by July and used for the irrigation of the area during the dry season of 1980.

The Contractor has continued with the general testing of the remaining sectors of Koloni, Mandria, Timi, Paphos, Yeroskipos and Ayia Varvara until the end of the year. The networks of the last 3 sectors were continued also during the first months of the year 1981.



Construction of a storage reservoir 3,000 m³ capacity for distribution network of Ayia Varvara sector is completed. The reservoir is filled for the purpose of carrying out its watertightness test and of the distribution network covering an area of about 250 ha. WDD Photo 74 EN 31 (11.12.80).

The results with regard to the losses were variable and in two cases where they varied between 4% and 6% the contractor was asked to go through again with the aim to reduce them down to the acceptable limits.

It is anticipated that successful completion of the general tests on all the sectors in the Eastern Area will be reached before farmers would start using the systems during the dry season of 1981.

The installations of all the Irrigation Networks with their reservoirs were considered as substantially completed before the end of the year 1980, although the Contractor will continue working in the area for completing the repairs of many structures and for repairing any breakages on the systems due to their operation throughout the maintenance period of one year.

The total payments to the Contractor for all the installation and construction works carried out during the year 1980 amounted to £484,299 bringing the cumulative payment upto date at £1,557, 964 including additional payments for variations of prices amounting to £372, 931.

3. Supplies for Irrigation Networks of Eastern Area

Lot 5S2: Supply of Valves — Contract No 39/77/32

Due to the difficulties met by the supplier Messrs Caramondani Bros Ltd with the valve manufacturers as briefed in the annual report of 1979 the supplier had a balance of 3,250 CI valves of 80 mm dia out of the total contract quantity of about 7,250 pieces to supply during the year 1980. Following the close-down of the Greek factory Chytiria Volou the supplier made arrangements with other manufacturers, INTECO of France. The first shipment of 1,500 pieces of valves were received during the months of June and July. With this quantity the contractor for the installation works was able to complete all remaining works. By the end of September the supplier delivered a further 750 pieces from France which were received by WDD for use in the Western Area. The remaining 1,000 pieces were expected to arrive early in 1981. With regard to quality the valves which were received from INTECO were proved better than those supplied from Volos and the previous ones from India. The total amount paid for the above deliveries during the year 1980 was £28,376 which brings the cumulative payments under the above supply contract to the sum of £98,529.

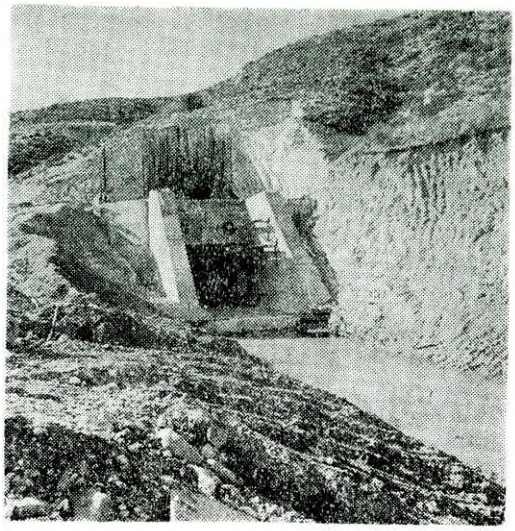
4. Asprokremmos Dam — Contract No C2 39/77/26

Contractor: "Joint Venture" of J & P and MEDCON

Construction works on the Dam were continued from the previous year throughout the whole year of 1980 with the following progress achieved on each of the items given below:

Diversion Tunnel — Intake Tower

The diversion tunnel remained operational throughout the wet months of the year 1980. When the river flow was reduced to its normal summer flow temporary diversion of the flow was provided through a plastic pipe over the cofferdam in order to allow work on the intake tower base and the completion of the tunnel outlet structure. Both structures were successfully completed during the dry period so that concreting work could proceed on the intake tower and the spillway flip bucket, which is placed over the tunnel outlet, during the wet season 1980—81.



Asprokremmos Dam — construction of the base of the intake tower where the water control gates and the irrigation discharge pipes will be installed. WDD Photo C26-7 (11.12.80).

The contractor has also managed to erect the formwork for the front section of the stilling basin and proceed with its concreting before the end of the year.

Contact grouting behind the concrete lining of the tunnel was also completed during the dry season. Installation of irrigation pipes in the tunnel, however, was decided to be postponed until the year 1981 as it was doubtful whether it could be completed before the on coming winter.

Drainage Galleries

Concreting in the left abutment drainage gallery was continued from the previous year. The work was first concentrated on its access gallery and staircase which was completed by March. The right abutment access gallery and the staircase was then also concreted during the next couple of months. To enable concreting of the drainage galleries to proceed in better and dry conditions the Contractor has placed first a sub-invert slab in the whole length of the L/A gallery. The gallery of more than 350 m long was then concrete lined. The Contractor has then proceeded with the trimming of the right abutment drainage gallery and by the end of the year a start was made on its concreting.

Cap Gallery

The cap gallery which was constructed over the diaphragm concrete wall during the previous year was to be connected with the access galleries of the two abutments so as to have a connection with the drainage galleries of both abutments. A long delay however in completing the two connecting sections of the cap gallery into the abutments has caused difficulties in the clay core placing. Finally the cap gallery was completed at both sides by May 1980.

Embankment

Following completion of the cofferdam in October 1979, filling of the main embankment continued on the upstream area by making steps on the granular material up to the top of the cofferdam. In order to facilitate drainage for dewatering purposes of the upstream side of cap gallery some filter arrangement was provided by the Contractor in the open trench. Before, however, placing the clay core slushed aggre-

gates were placed over the filter of the open trench in January. The clay core has started with 0.5 m layer at the bottom of the trench. In the d/s side of the cap gallery clay was placed over its whole length. By March the clay core was brought up to the top of the cap gallery in about 60% of its whole length (chain. 185—300) towards the left abutment in order to enable the sub-contractor Colcrete to start the drilling for the alluvial grouting. Due to further problems with the dewatering of the upstream side, placing of clay core continued in the key trench until it was finally filled completely by June.

Asprokremmos Dam—General view of the dam construction works. The clay core in the middle has reached the top of the cap gallery. Alluvial grouting u/s of cut-off wall is nearing completion. Construction of the main embankment d/s side in progress. WDD Photo C26-4 (11.12.80).

In the meantime the Contractor has started cleaning and preparation on the upper level of the left abutment in order to allow fill placement in this area so as to keep at least some of the plant brought to the site for the embankment construction in operation. Most of the rock foundation in the L/A key trench was cleaned and dental concrete has been placed where needed by end of August. The three foundation piezometers were also installed and clay placing and compacting in the wing embankment was started in September and at the elevation of about 60.0 m. By mid October the elevation reached 65.0 m where the second set of embankment piezometers were installed. By the end of the year the Contractor reached the elevation of about 70 m.

Finally a start has been made on the placement of the blanket drains to the river valley section. The progress until the end of the year has been good and reached 75% completion. It was estimated that by the end of December about 15% of the total volume of 1.82 MCM of the embankment has been placed.

Alluvial Grouting

As it was explained in the annual report of 1979 it has been decided that in addition to the grouting of zone "A", which covers the upper layer of the alluvials upstream and downstream the cut-off wall, the sub-contractor would also have to grout zones "B" and "C" upstream of the cut-off wall to its full depth as remedial works in order to minimise the risk of leakages through the vertical joints between the wall panels and the contact zone between the wall and the bedrock.

The aim of the alluvial grouting work was to reduce the alluvium strata permeabilities to the order of 10^{-4} m/sec. Radial distance between grouting holes was fixed at 1.4 m which are first grouted with bentonite-cement of 5% and then with 10% chemical grout. The Subcontractor for geotechnical work, Colcrete, has made a start on the drilling of holes in March immediately after the first section of clay platform was made available on the d/s side by the Main Contractor. The original program for this work provided only 17 weeks for treating only 8.8 km of holes. With the revised quantities involved the amount of work was 3.5 times more and in order to avoid long delays in completing the dam it was agreed with the Contractor to follow an accelerated program which would allow completion of grouting works in 32 weeks based on the estimated amount of 25 km of grout holes. The saving of time due to the accelerated programme was 22 weeks. For this accelerated programme Colcrete has brought to the site new staff and equipment.

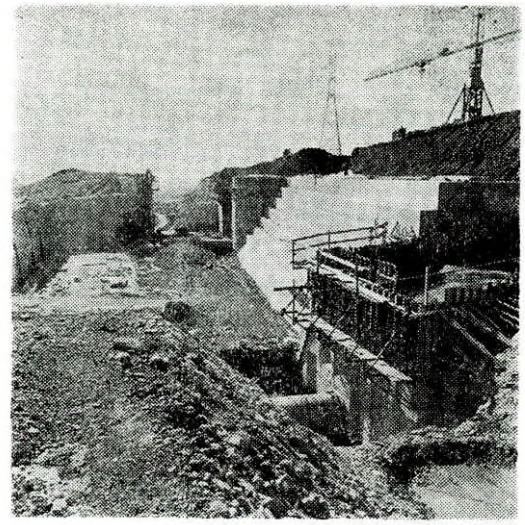
Drilling of the holes has progressed satisfactorily at the rate of about 500 holes per month and by the beginning of November all grout holes (2,200 No of total length of about 32.5 km) have been drilled. Cement- bentonite grouting was following up quite well on both u/s and d/s sides and it was fully completed by mid-December. Chemical

grouting was at the same time progressed satisfactorily. The d/s side was completed by the end of August in order to allow a continuation on the embankment work. Only a small quantity remained incomplete which was planned to receive chemical grout treatment within the month of January of 1981. A start was made in testing the downstream area with the perforated rod water test method with satisfactory results.

All other grouting work with the exception of the drainage galleries and minor items was completed by the end of the year 1980. At the end of December 1980 the costs of remedial work on contract rates were Zone B £41,911, Zone C £137,027, Zone D £49,043. Before starting of works negotiations have been carried out between the Contractor, W D D and the Consultants in order to reach a settlement with regard to the contribution of each party towards the costs of the remedial works. A proposal for such settlement has been put forward to the Council of Ministers for approval.

Spillway

Concreting of the spillway retaining mass concrete walls has been delayed due to the late completion of the crane installation which would enable the concrete pouring. Finally the crane was operational in March and a good progress has been made since then on the concreting of the retaining walls. During the hot months of summer time, temperature control problems have been alleviated with the use of plasticiser in the concrete and ice in the water, The indumat shutter system on the stepped back wall has proved successful and by the end of the year the Contractor has managed to move to the upper sections of the retaining walls and the spillweir.



Construction of the Asprokremmos Spillway mass concrete retaining walls in progress. WDD Photo C18-11 (13. 11.80).

Following the completion of the flip bucket soffit during the dry period concreting has progressed well on the section adjacent to the tunnel portal and in the stilling basin area where the walls were completed to the inclined soffit level. A start has been made on the chute walls and work could proceed to the rest of the spillway chute during the winter season of 1981. By the end of December about 65% of the spillway concrete work has been completed which in total would take about 35,000 m^3 of concrete.

Power Station

Tenders have been invited for the award of the Sub-Contract on Turbine, Generator and Valves for the Power Station on the 5.8.1980. Opening of the tenders (only two were received) took place on the 6.10.1980. The recommendations for the award by WDD have been submitted to the Tender Board. Decision by the Ministerial Tender's Committee is expected early in 1981.

Finance

The amount of work certified by the Resident Engineer up to the end of December was £5,285,232 while the gross amount paid to the Contractor including the retentions and the advance payments reached the sum of £6,159,361. The total cost of the dam at full completion was estimated to exceed 9 million including the additional cost due to the variations in costs which in fact is the main reason for the increase above the original contract price.

Note: It is important to state here and with regard to the annual reports of the Department of 1978 and 1979 that inspite of slow progress in the beginning of the work the Contractor increased their output in such a way that they are now working according to schedule and they will complete the work within the contractual time plus justified extension.

NEW CONTRACTS

During the year 1980 tenders were invited for the following 3 new Contracts which were the last ones up to the full completion of the Project works.

1. Supplies for Irrigation Networks of Western Sectors

(Lot S8-1, S8-2 and S8-3)

On the 4.3.1980 the tenders for the above 3 lots of this Contract have been opened at the Tender Board. Following the evaluation of the tenders received the 3 lots were awarded to the following suppliers.

Lot S8—1: Supply of Pipes and Special Pieces. Contract No 39/77/34.

This Lot includes the supply of A C pipes of total length of about 110 km of various diametres and all their necessary pipe fittings. This Lot has been awarded to the cheapest tenderer which was "The Cyprus Pipes Industry Ltd." for the sum of £456,215 and the Agreement was signed in August. The Supplier proceeded as from October with the delivery of A C pipes and by the end of the year about 55 km have been received in the stores of the Project. It is anticipated that all required quantities will be received within the first 6 months of the year 1981 well ahead of the installation works for the Western Sectors.

Lot S8—2: Supply of Valves. Contract No 39/77/35

This Lot includes the supply of all the required air valves, sluice valves and valves for the farm risers 80 mm dia which will be used in the distribution networks of the western sectors. The contract has been awarded to Messrs Caramondani Bros Ltd for the sum of £40,824 which was the lowest offer. The manufacturers of the sluice valves

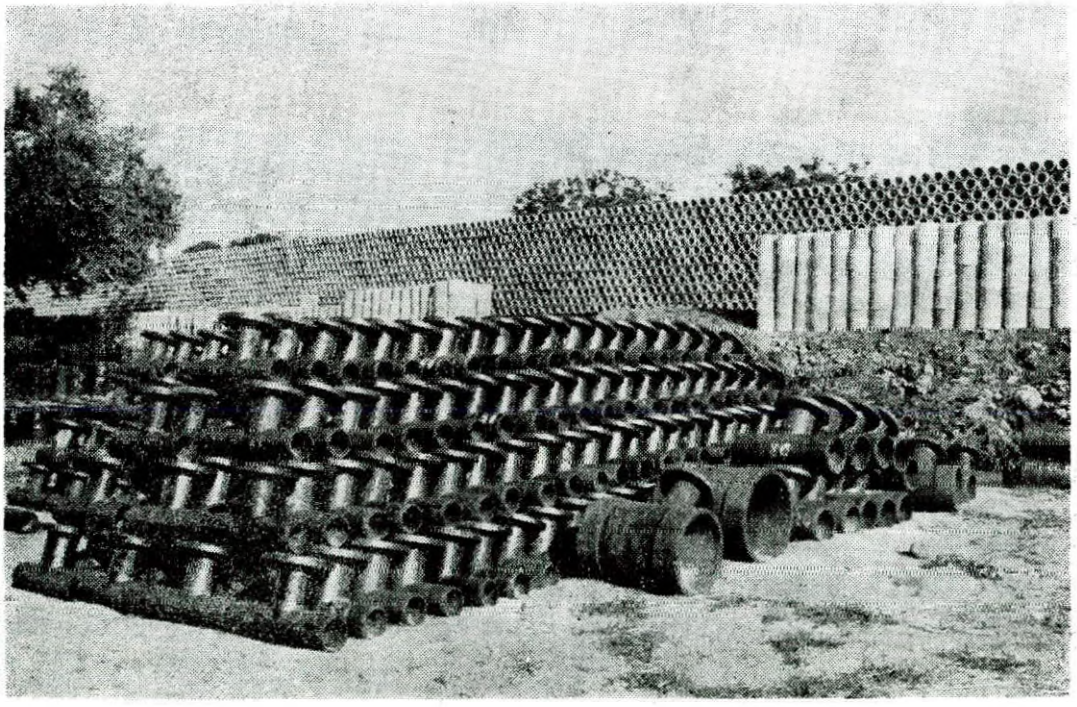
will be "INTECO" of France, of the air valves will be "ZET" of Israel and butterfly valves will be "ERHARD" of West Germany. The total number of all above valves is about 1,180 and the first deliveries are expected to arrive early in 1981.

Lot S8—3: Supply of Hydrants. Contract No 39/77/36

This Lot includes the supply of all Hydrants which are required for the distribution systems of the Western Area. The Contract has been awarded to Messrs Neophytos Demetriou for the sum of £80,385 which was the lowest offer for a total number of 268 hydrants, The hydrants will be manufactured by Schlumberger of France in cooperation with Nemitsas Industries Ltd of Cyprus. The Contract was signed in June 1980 and deliveries will be completed during the first half of the year 1981.

2. Installation of Irrigation Networks and Construction of Reservoirs for Western Sectors — Contract No C9 39/77/40

This contract includes the installation of the distribution systems over the sectors of the Western Area of total area of about 1,270 ha and the construction of 5 storage reservoirs of total capacity of 23,500 m^3. Tender do-



Delivery of A.C. pipes and C. I. fittings at the project stores for the distribution networks of the Western Project area in progress. WDD Photo 74 EN 13 (11.12.80).

cuments have been distributed only to 9 pre-qualified Contractors for this work. Opening of the tenders was fixed the 2nd February 1981.

3. Access Farm Roads of Eastern Sectors Contract No 39/79/22

This contract includes the construction of about 26 km of secondary farm access roads in the eastern sectors of the project where land consolidation was not going to be implemented. Opening of the tenders was fixed the 26th January 1981.

FINANCIAL INFORMATION

A total amount of £4,455,000 has been allocated as a daggered provision in the 1980 Development Estimates for the Paphos Irrigation Project. However, the actual commitments for the various project works during the year 1980 exceeded the above amount and a special warrant was issued to cover the additional expenditure which brought the total amount spent in 1980 to £4,939,637. The up to-date expenditure for the Project in December 1980 since the beginning of its implementation reached the sum of £16,007,460 which represents about 70% of the total estimated cost of the Project which is of the order of £23 million (excluding agriculture development). A detailed breakdown of the expenditure incurred during the year 1980 is shown on the table I—5 of page 23 of this report.

VI DIVISION OF OPERATION AND MAINTENANCE

C C Artemis
Executive Engineer I Ag. Head
TOWN WATER SUPPLIES BRANCH

by
G Charalambous
Technical Superintendent

Introduction

This branch of the division deals mainly with the administration and operation of Nicosia water supply sources, the Famagusta water supply project and a number of Government rural regional water supply schemes.

NICOSIA WATER SUPPLY

The amalgamation of the two "Areas of Supply" was approved by the Council of Ministers (Decision No 18.720) at its meeting on 17th January 1980, with effect from 1st February 1980.

According to the terms of the amalgamation this department will acquire all rights on all sources of the Nicosia Water Board and conveyors upto the reservoirs and the Nicosia Water Board will acquire all rights on the reservoirs and distribution system of greater Nicosia scheme.

As a result of the amalgamation this department will sell the water "in bulk" to the Nicosia Water Board, metered at the reservoir inlets, and the distribution of water to Nicosia and suburbs will be the responsibility of Nicosia Water Board.

The main water supply sources of Nicosia are the boreholes of Morphou—Pendayia, Peristerona—Akaki, Kokkini Trimithia, Dhali, Dhikomo, Laxia, Makedhonitissa and Sykhari adit.

The Peristerona—Akaki scheme was completed early in 1980 and was put

in full operation, with a maximum daily production of 6,000 m^3.

The total quantity of water produced from all sources during 1980 reached the figure of 9,878,215 m^3 as follows:

* Government sources ... 7 582 011 m^3
* Water commission sources ..... 767 645 m^3
* Private sources ..... 1 528 559 m^3

Although the total availability of water for Nicosia town, for the year under review, was by 831,000 m^3 higher than that of the year 1979, still an intermittent supply had to be imposed during the summer months. The restrictions applied, provided for a supply of 14 hours in every 48 to all consumers. The water shortage problem of Nicosia will exist until the Vasilikos-Pendaskinos Project is implemented in 1985 unless in the meantime an intermediate solution is adopted.

New schemes

Vasilikos-Pendaskinos Project — Phase I — which provides for the laying of a pipeline from Skarinou area to Lakatamia service reservoir at Nicosia and a pumping station on Pendaskinos river downstream of the proposed Dhypotamos dam, is expected to be completed by the end of the year 1981. This pipeline will convey to Nicosia, in the first instance, treated water from Khirokitia Treatment Plant to ameliorate Nicosia water supply. This pipeline will ultimately convey, to Nicosia, 5 MCM of water per annum on completion of the Vasilikos-Pendaskinos Project.

New Lakatamia Service Reservoir

Work for the construction of New Lakatamia service reservoir continued during the year 1980. The capacity of this reservoir is 40,750 m^3 and is expected to be completed by the end of the year 1981.

Statement showing expenditure and revenue on Nicosia water supply—operation and maintenance of sources — for the year 1980 is given on table VI—1a.

TABLE VI—1a

NICOSIA WATER SUPPLY

Expenditure and revenue account for 1980

Expenditure

	£
General Pumping and Maintenance charges:	
Wages	55 016
Electricity and fuel	36 745
Materials and others	8 288
Morphou Bay Scheme	157 472
Peristerona	
Wages	3 481
Electricity and fuel	28 806
Miscellaneous expenses	1 412
Tseri Scheme	
Wages	10 540
Electricity and fuel	31 807
Maintenance expenses	872
Purchase of water	37 644
Collection fees	21 889
Total	£393 972

Revenue

Sale of water	£
In bulk to N W B	74 228
To consumers (for January only)	20 000
Connection fees	—
Usage of pipelines (by N W B)	983
Other Revenue	70 982
Total	£166 193

Famagusta Water Supply Scheme

This scheme is providing water to Famagusta and Larnaca towns as well as to several villages and refugee camps in the aforesaid districts. The scheme provides both underground water being pumped from Vasilikos pumping scheme and boreholes in the areas of Khirokitia, Psematismenos and Alethriko villages and surface water from Lefkara dam, the latter being treated at Khirokitia Treatment Plant.

As long as demands in water by the communities served are met by the pumping of the various underground sources, the treatment plant remains idle, during which period maintenance work is carried out. Normally operation of the treatment plant starts late in spring. During 1980 the treatment plant was put into commission on the 12th May, 1980. By that time the water impounded into Lefkara dam was 5,704. 000 m^3 representing 41% of the dam capacity.

The total amount of water pumped and/or treated from all sources of this project was 3,679,999 m^3 (including losses) and the quantity was distributed as follows:-

Famagusta town	1 016 750 m^3
Larnaca water board	796 040
Regional village water supplies	1 237 678
Local irrigators	46 837
Refugee camps	185 400
Losses	397 294
Total	3 679 999 m^3

Statement showing expenditure and revenue of the Famagusta Water Supply Project for the year 1980 is shown on table VI—2a

TABLE VI—2a

FAMAGUSTA WATER SUPPLY SCHEME

Expenditure and revenue account for 1980

Pumping and maintenance charges

	£
Wages	23 616
Electricity	65 148
Materials and others	3 861
Total	£92 625

Khirokitia and Lefkara Installations

Running Expenses	£
Wages	24 352
Electricity	3 925
Materials and others	12 065
Total	£40 342

Khirokitia regional WS scheme

Running Expenses	£
Wages	—
Electricity	6 705
Total	6 705
Grand Total	£139 672

Revenue

Amount collected from sale of water in 1980	£
1 771 051 m^3 of water @ 50 mils/m^3	88 552
111 217 m^3 of water @ 30 mils/m^3	3 336
95 085 m^3 of water @ 20 mils/m^3	1 902
Total amount collected	£93 790
Amount outstanding	63 838*
Total	£157 628

* Includes an amount of £50,837 representing the value of 1,016,750 m^3 of water @ 50 mils/m^3 supplied to Famagusta area occupied by Turks.

Outstanding accounts upto 31.12.80

	£
Upto 31.12.1979	340 245
For the year 1980	63 837
	£404 082 **
Less amount collected in 1980 from outstanding account of previous years	61 567
Total	£342 515

** Includes an amount of £298 938 representing the value of 5 978 769 m^3 of water @ 50 mils/m^3 supplied to Famagusta area occupied by Turks during the years 1974-1980.

Notes on expenditure and revenue account FWS for 1980

a) Expenditure under the heading "pumping and maintenance charges" refers to the following sources:-

* Borehole No. 16/67 in Psematismenos area
* Borehole No. 11/69, 4/69 in Khirokitia area
* Boreholes No. 35/73, 45/73 in Alethriko area
* and Vasilikos subsurface dam pumping scheme.

The total quantity produced by these sources during 1980 was 1,573,300 m^3.

The cost of pumping and maintenance was therefore 58.9 mils/m^3.

b) Expenditure under the heading "Khirokitia and Lefkara installations—running expenses" refers to the following installations:-

* Lefkara dam
* Khirokitia treatment works

The total quantity of water treated during the year reached 2,106,700 m^3 and the unit running cost was 19.15 mils/m^3.

c) Expenditure under the heading "Khirokitia regional water supply scheme" refers to the running expenses of two boosting stations pumping treated water to Pano Lefkara, Kato Lefkara, Kato Dhrys and Vavla villages.

The total quantity of water boosted during the year was 61,000 m^3.

Water supply to Government residences and institutions

A regular supply of water for domestic use and irrigation to all Government residences and institutions was maintained throughout the year from existing sources. The sources used for ir-

rigation, being located within inhabited areas of the town are liable to contamination and, therefore, it is not recommended that this water is used for drinking pusposes.

Technical advice

This branch offerred technical advice to several Government and Semi-Government Organizations on water supply matters. This applies mainly to Water Boards by attending regurarly their meetings and the various appropriate authorities dealing with parcellation of land, building permits etc.

FACTS ABOUT EACH OF THE TOWN WATER BOARDS

Nicosia Water Board

Shortage of water is the basic problem of this Water Board entailing unpleasant experiences in their task. Particulars are given below:-

* The total quantity of water consumed as registered by area meters was 9,152,909 m^3 (including Nicosia Water Commission).
* The total maximum consumption (including Nicosia Water Commission) was 43,720 m^3 on 21.7.80 (for 24 hour supply).
* The total number of consumers on 31.12.80 was 39,450 (including 5,269 Turks).
* Extension of distribution system was 2,750 m.
* The total number of hydrants installed during 1980 was 6, in the Greater Nicosia W S Scheme area.

Limassol Water Board

The water demand could be met by existing sources and a regular supply was maintained. The contract on the study for the improvements of the existing distribution system and or recommendations for new works for a satisfactory supply until the year 2000 was signed in May, 1980 and the respective report is expected to be completed early next year. Additional data is recorded as under:-

* Total quantity of water supplied for all sources ... 7 340 414 m^3
* Total quantity of water used ..... 7 214 542 m^3
* Total maximum summer consumtion in one day (on 2.8.1980) ..... 28 239 m^3
* Total number of consumers as at 31.12.80 26 416No
* Extension of distribution system ..... 11 506 m
* Total length of distribution system as at 31.12.80 was ..... 329 111 m
* Total number of fire hydrants installed in 1980 31 No.
* Total number of fire hydrants installed as at 31.12.1980 ..... 1 155 No.

No water supply restrictions were imposed during 1980.

Famagusta Water Board

Cyprus Government has since Turkish occupation of Famagusta town been supplying water, free of charge, to meet requirements of the Turkish people and the troops in the area.

Larnaca Water Board

Thanks to the supplementation offered from Famagusta Water Supply Project existing sources could meet this town's water demand and a regular supply was possible. More information as below:-

* Water supplied during the year 1980 ..... 2 666 270 m^3
* Water consumed during the year 1980 registered by area meters ..... 2 593 540 m^3
* Maximum daily summer consumption in 1980 ... 10 000 m^3
* Total number of consumers at 31.12.80 (1979, 10,578) ..... 11 776 No.
* Extension of distribution system during 1980 ..... 12 362 m
* The total length of distribution system is not available
* Hydrants installed during the year 1980 ..... 49 No.
* Total number of hydrants installed within water supply area 583

Paphos Water Supply

The water supply of this town comes under the jurisdiction of the Municipality. Existing sources could meet water demands and the supply was regular. During the year under review, a total quantity of 1,153,934 m^3 was pumped to supply 4,413 consumers by 31.12. 1980.

IRRIGATION BRANCH

by
N Tsiourtis
Executive Engineer I

Introduction

This Branch includes the Sections dealing with:

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

Definitions

Government Waterworks: These are the projects constructed under the Government Waterworks Law Cap. 341. These projects are listed in Table VI—1.

Contributory Waterworks. These are projects constructed under the irrigation Division Law Cap. 342. A list of these projects is given in Table VI—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 Waterworks Committees established according to the provisions of the relevant Law. The Waterworks committees are usually composed of the following:

Chairman

District Officer of the district in which the project is 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;

  sell the water at the nominal rates approved by the Government and see that the fees and charges are collected.

The Committees have their own budgets, approved by the Minister of Finance.

The Water selling rates approved by the Council of Ministers are shown on Table VI—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 gives technical advice both to the District Officer and to the Committee. The cost of the operation of these projects is borne in total by the beneficiaries.

3 Government Recharge Waterworks:

These are managed directly by the Water Development Department. (See Table VI—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 procedures are as follows:

A Government Waterworks: The maintenance of these projects is carried out by the Water Development Department being the Government Agency for waterworks and the costs are borne in full by the Government. By the term maintenance we mean routine dam and pipeline maintenance, valves and watermeters 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.

Water Development Data

Cyprus is an Island and all available water resources are those that result from overall precipitation. The total precipitation in an average year is estimated at 4,600 MCM, where 1,270 MCM/annum are lost in the form of evaporation, 900 MCM/a are lost in the form of evapotranspiration from cultivated crops, 1,480 MCM/a are lost in the form of evapotranspiration from forest pasture and grass and irrigated crops. The annual surface runoff is estimated at 600 MCM and the groundwater and springs another 350 MCM. As it is seen from the above only 950 MCM or 21% of the total precipitation are available for development both surface and groundwater. The groundwater resources being easier to develop are at present overpumped. The annual extraction from the boreholes is estimated at 370 MCM and the total springs yield is around 30 MCM. Out of these quantities 300 MCM are used for irrigation where the rest 100 MCM are used for domestic and industrial uses.

The surface water resources being much more expensive to 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 started a construction program to develop as much as possible more surface water resources. Many projects were constructed which increased the water storage capacity of dams to 64.1 MCM, 45.4 MCM for irrigation or domestic water supply and the rest 17.7 MCM for recharge purposes.

Details on the projects and the rate of storage development are given in Drg. No. AG/IR/27 "Cyprus Dam Projects" page 14 and "Progress in Dam Construction" page 16.

Summary of Management, Operation and Maintenance Data

The overall average precipitation during the hydrological year under review was 582 mm or 109% of the 51 year average of the Government controlled area, where the total volume of water available in the dams in the Government controlled area amounted to 36.495

MCM. From this quantity 16.526 MCM was used for irrigation, 2.210 MCM was used for domestic water supplies, 6.579 MCM was used for recharge and 5.087 MCM seeped through or below the dams and another 2.732 MCM was lost as evaporation. The rest 3.361 MCM remained in the dams for over year storage or lost as overflow. Projects in the Turkish occupied area are not included here as we cannot collect the necessary information.

The total area commanded by the irrigation projects is estimated at 106,933 donums where an estimated area of 29,724 donums has been irrigated, planted with citrus, bananas, deciduous, vegetables, potatoes etc.

Maintenance works totalling £21,725 were carried out on seventeen projects. These include routine maintenance on the dam structures and the distribution systems. For the Government waterworks (irrigation and recharge works) a total of £18,878 were spent where the rest £2,847 were spent on the contributory projects.

A Government Waterworks

Summary of Management, Operation and Maintenance Data. In the year under review, the total quantity available from government irrigation projects reached the figure of 34.408 MCM. From this total, a quantity of 23.609 MCM or 68.6% was utilized, 14.820 MCM for irrigation, 2.210 MCM for the domestic water supply and 6.579 MCM for recharge purposes. The rest of the water remained in storage or lost in the form of overflow. In the same period 2.587 MCM was lost in the form of evaporation where another 5.087 MCM were lost as seepage or deep percolation (see Table VI—1).

The irrigation water was used to irrigate fully or partly 27,109 donums of land planted with citrus, bananas, vines, deciduous, vegetables, potatoes, cereals and olives (see Table VI—2).

The gross income from the sale of water amounted to £103,059 being the income from the sale of water at the rates shown on Table VI—3. The operational expenses amounted to £84,496 being the cost for the payment of the watermen, the bill collectors etc. which amounted to 7.19 mils/m^3 of water sold or 3.58 mils/m^3 of water utilized. The maintenance expenses on government projects amounted to £18,563 i.e. 1.58 mils/m^3 of water sold or 0.79 mils/m^3 of water utilized. The total annual operation and maintenance expences amounted to £103,059 which amounts to 8.77 mils/m^3 sold or 4.37 mils/m^3 utilized.

Evaporation losses from the reservoirs amounted to 2.587 MCM of 6.8% of the total storage capacity available. The seepage losses were estimated at 5.087 MCM or 13.4% of the total storage mostly from the Polemidhia and Yermasoyia dams.

The overall water utilization and land utilization indexes are 68.6% and 37.5% respectively. Of the 14.820 MCM used for irrigation 11.748 MCM was sold at the nominal rates, (79.3%) where the rest 3.072 MCM, (20.7%) was given free of charge as water right or overflows.

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

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

Table VI—8 gives data on the operation and maintenance for the last two years.

B Contributory Irrigation Projects

In general there are 24 contributory irrigation projects with total capacity of 7.318 MCM commanding an area of 34,658 donums. Ten projects of total capacity of 5.204 MCM or 71% of the total capacity of contributory schemes, commanding an area of 26,020 donums are situated in the Turkish occupied area and on which no data is collected. From the rest of the projects the total water collected amounted to 2.087 MCM out of which 1.706 MCM was used for the irrigation of 2,615 donums where the rest was lost in the form of evaporation (see Table VI—6).

C Recharge Works

On the island there are about 33 recharge works of total capacity 17.738 MCM. Out of these projects 20 of the total papacity 15.694 MCM or 88.5% 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 more information on projects in the government control areas see Table VI—7 and VI—10.

COST OF OPERATION ON SOME GOVERNMENT PROJECTS

The operational cost of a number of important projects are shown on Table VI—9. This Table shows the running costs (O+M and power) and the unit cost of water.

TABLE VI—2
CROPS AND AREAS IRRIGATED BY GOVERNMENT IRRIGATION PROJECTS

Ser. No.	Crop	Area in Donums
1	Citrus	8 135
2	Bananas	1 317
3	Vines	8 178
4	Deciduous	659
5	Vegetables	7 795
6	Potatoes	515
7	Cereals	490
8	Olives	20
	Total	27 109

TABLE VI—3
GOVERNMENT IRRIGATION PROJECTS AND APPROVED WATER CHARGES IN MILS/M³

		Overflow	Vegetables	Vines	Deciduous	Citrus	Flat Rate
1 Argaka	Free		10	15	15	15	—
2 Ayia Marina	5		—	—	—	—	10
3 Kalopanayiotis	—		—	—	—	—	18
4 Kiti	—		—	—	—	—	15
5 Lefkara	—		—	—	—	—	10
6 Mavrokolymbos	—		10	15	15	15	—
7 Pomos	5		—	—	—	—	10
8 Polemidhia	3		8,10	15	15	15	—
9 Yermasoyia	3		7,10	15	15	15	—
10 Athalassa	—		—	—	—	—	Free
11 Paphos	See report						
12 Khapotami	—		—	—	—	—	Free

TABLE VI—1. GOVERNMENT IRRIGATION PROJECTS — DATA FOR 1980

No.	Project	Capacity m^3x10^3	Area Commanded donums	Water Available* for Utilization m^3x10^3	Water used for irrigation m^3x10^3	Water used for D.W.S. m^3x10^3	Water used for recharge m^3x10^3	Total Quantity used m^3x10^3	Evaporation Losses m^3x10^3	Seepage Losses m^3x10^3	Area Irrigated Donums	Water Utilized index %	Land Utilized index %
1	Argaka	99	2 340	1 405	1 153	Nil	Nil	1 153	93	7	1 188	82.0	50.8
2	Ayia Marina	300	1 500	731	383	Nil	Nil	383	27	54	292	52.4	19.5
3	Kalopanayiotis	363	435	573	197	Nil	Nil	197	34	100	435	34.4	100.0
4	Kiti	1 610	6 200	462	313	Nil	143	456	202	2 903	582	98.7	9.4
5	Lefkara**	13 850	615	5 816	68	2 210	Nil	2 278	499	34	135	39.2	22.0
6	Mavrokolymbos	2 180	3 355	1 333	1 307	Nil	Nil	1 307	72	Nil	2 060	98.0	61.4
7	Pomos	860	2 850	1 162	1 064	Nil	Nil	1 064	45	331	592	91.6	20.8
8	Polemidhia	3 430	15 440	21 248	8 657	Nil	6 436	15 093	1 594	1 665	15 440	71.0	100.0
9	Yermasoyia	13 500											
10	Athalassa	791	310	250	250	Nil	Nil	250	21	Nil	250	100.0	80.6
11	Paphos	—	35 000	1 080	1 080	Nil	Nil	1 080	—	—	1 900	100.0	5.4
12	Khapotami	—	4 235	348	348	Nil	Nil	348	—	—	4 235	100.0	100.0
	Total	37 874	72 280	34 408	14 820	2 210	6 579	23 609	2 587	5 087	27 109	68.6	37.5

* This is the water that possibly may be utilized: storage + overflow or seepage that may be utilized after deducting evaporation and seepage losses.

** Water allocated mainly for domestic water supply.

TABLE VI—4. DATA ON MANAGEMENT, OPERATION AND MAINTENANCE OF GOVERNMENT IRRIGATION PROJECTS

Ser. No.	Project	Dam Reservoir Capacity $m^3 \times 10^3$	Area Command. Donums	Water Available* $m^3 \times 10^3$	Water used $m^3 \times 10^3$	Water sold $m^3 \times 10^3$	Area Irrigated Donums	Gross Income	Expenditure			Income Net
									Oper.	Maint.	Total	
								£	£	£	£	£
1	Argaka	990	2 340	1 405	1 153	697	1 118	9 482	3 417	598	4 015	5 467
2	Ayia Marina	300	1 500	731	383	383	292	3 378	2 779	401	3 180	198
3	Kalopanayiotis	363	435	573	197	197	435	3 540	2 631	444	3 075	465
4	Kiti	1 610	6 200	462	456	313	582	4 692	1 772	893	2 665	2 027
5	Lefkara	13 850	615	5 816	2 278	68	135	676	**	400	400	276
6	Mavrokolymbos	2 180	3 355	1 333	1 307	1 207	2 060	19 842	10 390	2 541	12 931	6 911
7	Pomos	860	2 850	1 162	1 064	1 065	592	9 882	5 389	928	6 317	3 565
8	Polemidhia	3 430	11 050	21 248	15 093	6 738	15 440	102 214	51 420	7 720	59 140	43 074
9	Yermasoyia	13 500										
10	Athalassa	791	310	250	250	—	250	Nil	—	—	—	—
11	Paphos	—	35 000	1 080	1 080	1 080	1 900	15 712	6 698	4 638	11 336	4 376
12	Khapotami	—	4 235	348	348	—	4 235	Nil	—	—	—	—
	Total	37 874	72 280	34 408	23 609	11 748	27 109	169 418	84 496	18 563	103 059	68 159

* Including storage + overflow or seepage that may be utilized after deducting evaporation and seepage losses.

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

TABLE VI–5. DATA ON WATER USE FOR THE LAST 10 YEARS FOR THE GOVERNMENT PROJECTS

No.	Description	Unit	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
1	Capacity	1000 m^3	23 420	23 420	2 340	37 890	37 890	37 890	37 890	38 061	37 874	37 874
2	Water available	"	5 352	3 777	1 858	6 367	27 612	28 000	32 003	27 380	28 282	34 408
3	Water utilized for irrigation	"	NA	NA	NA	NA	7 776	8 388	9 704	9 457	10 847	27 109
4	Water used for DWS	"	NIL	NIL	NIL	NIL	1 000	1 365	2 058	2 856	2 936	2 210
5	Water used for recharge	"	NA	NA	NA	NA	NA	6 016	3 323	1 982	1 623	6 579
6	Total Water used ...	"	NA	NA	NA	NA	8 776	15 769	15 085	14 295	15 426	23 609
7	Evapor. losses	"	NA	NA	NA	NA	2 854	2 570	2 662	2 683	2 409	2 587
8	Seepage losses	"	NA	NA	NA	NA	NA	428	359	3 367	1 024	5 087
9	Water sold	"	2 467	2 757	11 137	26 138	60 600	73 747	93 485	8 447	12 642	11 748
10	Gross income	£	26 891	29 891	971	2 544	5 522	6 624	7 999	101 367	128 281	169 418
11	Operation cost	£	7 688	7 282	6 450	11 048	12 619	18 627	34 500	33 592	55 197	84 496
12	Maintenance cost ..	£	3 342	4 849	4 278	4 603	3 174	4 496	8 059	8 165	7 202	18 563
13	Total expenditure ...	£	11 030	12 131	10 728	15 651	15 793	23 123	42 559	41 757	62 399	103 059
14	Net income	£	15 861	17 260	409	10 487	44 808	50 264	50 926	59 610	65 882	68 159
15	Area irrigated	Donums	NA	NA	NA	NA	12 458	17 376	15 459	14 905	20 084	27 109

TABLE VI–6. DATA ON CONTRIBUTORY IRRIGATION WORKS

Ser. No.	Project	Capacity m^3x10^3	Area Commanded Donums	Water available for utilisation m^3x10^3	Water used for irrigation m^3x10^3	Water used for DWS m^3x10^3	Water used for recharge m^3x10^3	Total quantity used m^3x10^3	Evaporation losses m^3x10^3	Seepage losses m^3x10^3	Area irrigated Dons
1	Arakapas	130	200	130	120	—	—	120	10	—	171
2	Palekhori	640	1 000	640	580	—	—	580	44	—	828
3	Prodhromos	110	170	110	105	—	—	105	5	—	120
4*	Morphou	2 000	6 740	—	—	—	—	—	—	—	—
5*	Lefka Marathasa	360	1 300	—	—	—	—	—	—	—	—
6*	Geunyeli	1 000	850	—	—	—	—	—	—	—	—
7*	Kanli	1 100	4 000	—	—	—	—	—	—	—	—
8*	Mia Milea	330	1 300	—	—	—	—	—	—	—	—
9*	Ovgos	250	6 370	—	—	—	—	—	—	—	—
10*	Lefka Kafizes	110	770	—	—	—	—	—	—	—	—
11	Pyrgos	270	1 600	270	245	—	—	245	25	—	307
12	Trimiklini	330	650	330	304	—	—	304	26	—	400
13	Lythrodhonda (Upper)	32	115	32	29	—	—	29	3	—	105
14	Kalokhorio (Klirou)	81	1 350	81	73	—	—	73	8	—	300
15	Akrounda	22	60	22	20	—	—	20	2	—	29
16*	Galini	22	1 300	—	—	—	—	—	—	—	—
17*	Petra (Upper)	22	4 690	—	—	—	—	—	—	—	—
18*	Petra (Lower)	32	—	—	—	—	—	—	—	—	—
19	Lythrodhonda (Lower)	32	115	32	29	—	—	29	3	—	105
20	Kandou	38	563	38	35	—	—	35	3	—	46
21	Perapedhi	55	195	55	50	—	—	50	5	—	71
22	Agros	72	300	67	62	—	—	62	5	—	53
23	Kyperounda	60	80	60	54	—	—	54	6	—	80
24	Lymbia	220	940	220	—	—	—	—	—	—	—
	Total	7 318	34 658	2 087	1 706	—	—	1 706	145	—	2 615

* Project in Turkish occupied areas

TABLE VI—7

RECHARGE WATERWORKS DATA

Ser. No.	Project	Capacity m^3x10^3	Water avail. m^3x10^3	Water use for rechar. m^3x10^3	Water lost in evapor. m^3x10^3
1*	Kouklia	4 545	—	—	—
2*	Ayios Loucas	455	—	—	—
3	Sotira	45	10	9	1.0
4	Panayia (F) ...	45	10	9	1.0
5	Paralimni	115	20	18	2.0
6	Ayia Napa	55	10	9	1.0
7	Famagusta Antiflood	50	—	—	—
8	Phrenaros	115	15	13.5	1.5
9	Dherinia	23	5	4.1	0.5
10	Phrenaros	45	5	4.5	0.5
11	Avgorou	68	5	4.5	0.5
12*	Kondea	82	—	—	—
13	Xylophagou ...	86	5	4.5	0.5
14	Sotira	32	5	4.5	0.5
15*	Lysi	77	—	—	—
16*	Ayios Yeorgios (K) ..	68	—	—	—
17*	Ay. Epiktitos ..	34	—	—	—
18*	Akanthou	45	—	—	—
19	Akhna	40	—	—	—
20	Xylotymbou ...	50	—	—	—
21*	Syngrasis	1 115	—	—	—
22*	Ayios Yeorgios (F) ..	90	—	—	—
23*	Famagusta Recharge	165	—	—	—
24*	Ayios Nicolaos (F) ..	1 365	—	—	—
25	Paralimni Lake	1 365	—	—	—
26*	Ayios Loucas Lake ..	4 545	—	—	—
27*	Makrasyka	195	—	—	—
28*	Akhna Mesania	90	—	—	—
29	Vrysoulles (F)	140	—	—	—
30*	Morphou Recharge	130	—	—	—
31*	Morphou Protopapas ...	90	—	—	—
32	Ormidhia	100	—	—	—
33*	Masari	2 273	—	—	—
	Total	17 738	90	72.6	9.0

* Projects in Turkish occupied area.

TABLE VI—8

DATA ON MANAGEMENT AND OPERATION OF GOVERNMENT IRRIGATION PROJECTS FOR THE LAST TWO YEARS

Item No.	Data	Unit	1979	1980	% change on 1979
1	Capacity	1000 m^3	37 874	37 874	Nil
2	Water available...	"	28 282	34 408	+21.7
3	Water utilized for irrigation	"	10 847	14 820	+36.6
4	Water utilized for DWS	"	2 936	2 210	—24.7
5	Water utilized for recharge	"	1 623	6 579	+305.4
6	Total water used	"	15 426	23 609	+53.0
7	Evaporation losses	"	2 409	2 587	+7.4
8	Seepage losses...	"	1 024	5 087	+396.8
9	Water sold	"	12 642	11 748	—7.1
10	Gross income	£	128 281	169 418	+32.1
11	Operation cost ...	£	55 197	84 496	+53.1
12	Maintenance cost	£	7 202	18 563	+157.7
13	Total expenses ...	£	62 399	103 059	+65.2
14	Net income	£	65 882	68 159	+3.5
15	Area irrigated ...	donums	20 084	27 109	+35.0
16	Area commanded	dounms	33 045	72 280	+118.7

TABLE VI—9. GOVERNMENT IRRIGATION PROJECTS — COST OF WATER

Ser. No.	Project	Water sold m^3	Total water utilized m^3	Operation Maintenance cost £	Power cost £	Total annual cost £	Cost of water mils/m^3 Sold water	Cost of water mils/m^3 Total utilized
1	Argaka	696 861	1 152 661	4 015	—	4 015	5.76	3.48
2	Ayia Marina	382 884	382 884	3 180	—	3 180	8.30	8.30
3	Kalopanayiotis	196 685	196 685	3 075	—	3 075	15.63	15.63
4	Kiti	312 800	455 800	2 665	—	2 665	8.52	5.85
5	Mavrokolymbos	1 206 636	1 306 636	10 133	2 798	12 931	10.72	9.90
6	Pomos	1 064 469	1 064 469	6 317	—	6 317	5.93	5.93
7	Polemidhia	7 830 597	8 657 097	44 622	14 518	59 140	7.55	6.83
8	Yermasoyia							
9	Paphos	1 080 244	1 080 244	7 374	3 959	11 333	10.49	10.49
	Total	12 771 176	14 296 476	81 381	21 275	102 656	8.04	7.18

TABLE VI—10
CONTRIBUTORY IRRIGATION WORKS—MAINTENANCE COSTS

Ser. No.	Project	Maintenance cost Govt Contrib. £	I D Contrib. £	Total cost £
1	Arakapas	—	—	—
2	Palekhori	345	175	518
3	Prodhromos	309	155	464
4	Pyrgos	463	232	695
5	Trimiklini	—	—	—
6	Lythrodhonda Upper	—	—	—
7	Kalokhorio (Klirou)	119	59	178
8	Akrounda	—	—	—
9	Lythrodhonda Lower	—	—	—
10	Kandou	—	—	—
11	Perapedhi	—	—	—
12	Agros	306	153	459
13	Kyperounda	—	—	—
14	Lymbia	151	—	151
15	Lefka Kafizes ..	43	—	43
16	Pakhyammos ..	339	—	339
	Total	£2 075	£772	£2 847

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 (312 ha). Irrigation in the Project area started early in January and lasted until early in December, 1980. An area of 1,188 donums was irrigated by utilizing about 1.153 MCM of water.

The area irrigated was planted with citrus, bananas, vines, deciduous, vegetables, cereals and potatoes. Out of the 1.153 MCM of water utilized, 696,861 m^3 were sold to the farmers at the nominal rate and the remaining 455,800 m^3 were taken from the overflow, free of charge. The gross income from the sale of water was £9,482. The expenditure of management was £3,417 where that of maintenance amounted to £598. Net income to the Project was £5,467.

Project Hydrology

The project hydrologic data, as recorded during the year, are tabulated on Table VI—11. The dam reservoir was filled to spillway crest on January 4th and overflow continued until April 30th 1980. During this period a total quantity of 7,493,055 m^3 had overspilled. The minimum level of water in storage ever reached was in November with total quantity in storage around 225,000 m^3.

TABLE VI—11
ARGADA DAM—HYDROLOGY FOR 1980

Item No.	Description	Qty m^3	% Storage Capacity
1	Initial amount in storage	925 500	93.48
2	Inflow during the year	7 616 073	769.30
3	Total release	696 861	70.39
4	Leakages	5 602	0.57
5	Evaporation	93 430	9.44
6	Overflow	7 493 055	756.87
7	Final amount in storage	252 625	25.52
8	Minimum quantity in storage (Nov.)	225 000	22.73
9	Storage capacity	990 000	100.00

Water Utilization and Crops Irrigated

The project is built for irrigation purposes and as such, a quantity of 1.153 MCM of water was utilized for the irrigation of 1,188 donums of land planted with various crops as indicated in Table VI—13.

Table VI—12 shows the utilization of the project water and Table VI—13 shows the crops irrigated.

TABLE VI—12
ARGAKA DAM—WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage Capacity
1	Water used for irrigation	1 152 661	116.43
2	Water used for recharge	Nil	Nil
3	Total water utilized	1 252 661	116.43

TABLE VI—13
ARGADA DAM—CROPS IRRIGATED

Ser. No.	Crop	Area Donums
1	Citrus	315
2	Bananas	280
3	Vines	35
4	Deciduous	28
5	Vegetables	195
6	Potatoes	15
7	Cereals	320
	Total	1 188

Water Sale, Income, Operation and Maintenance Costs

The water released for irrigation was 696,861 m^3. The total quantity utilized for irrigation, water realeased from the dam reservoir and overflow amounted

to 1,152,661 m^3. Out of this 696,861 m^3 was sold to the farmers at the nominal rates and the rest 455,800 m^3 was given free of charge because of water rights. From the sale of water a total of £9,482 was collected. For the operation of the project an amount of £3,417 was paid to the water men and bill cellectors where for the maintenance of the project another £598 was spent.

Net income for the benefit of the project is £5,467. All the data concerning water sale, operation and management costs are shown on Table VI—14.

TABLE VI—14
ARGAKA DAM — INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates	696 861	9 482
2	Water sold at reduced rates	Nil	Nil
3	Water given free of charge	455 800	Nil
4	Total quantity utilized and gross income	1 152 661	9 482
5	Operation cost ...	—	3 417
6	Maintenance cost	—	598
7	Net income	—	5 467

Project Performance for the last two Years

Table VI—15 shows the performance of the project for the last two years. As shown there was an increase in the total volume of water used for irrigation by 23.71% where the area irrigated was reduced by 31.53%. The reduction of the area was due to the increase of the area under permanent crops (citrus and bananas).

Generally, the water utilization could be considered as satisfactory, although certain increase may be expected in the future.

TABLE VI—15
ARGAKA DAM—DATA ON PROJECT FOR THE LAST TWO YEARS

Item No.	Data	Unit	1979	1980	% change on 1979
1	Capacity	1000 m^3	990	990	Nil
2	Water available in storage	"	1 596	1 405	—11.97
3	Water utilized for irrigation ...	"	932	1 153	+23.71
4	Water sold	"	705	697	—1.13
5	Water given free	"	227	456	+100.88
6	Water used for recharge ...	"	100	Nil	—100.00
7	Gross income...	£	9 354	9 482	+1.37
8	Operation cost	£	2 676	3 417	+27.69
9	Maintenance cost	£	725	598	—17.52
10	Total expenses	£	3 401	4 015	+18.05
11	Net income ...	£	5 963	5 467	—8.32
12	Area irrigated	donums	1 735	1 188	—31.53

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 canal at the terminal of which tertiary pipes branch-off to distribute water to each individual plot. Irrigation in the project area started late in March 1980 and continued throughout the year, until early in November. An area of 292 donums was irrigated by utilizing about 0.383 MCM. The area irrigated was planted with

bananas, vines, deciduous, vegetables and cereals. The water utilized was sold to farmers at the approved rates. Out of the 0.383 MCM utilized, 0.311 MCM were released from the dam and sold to the farmers at nominal rates, whereas the remaining 72,180 m^3 were taken from the overflow and were paid at reduced rates. The total gross income from the sale of water amounted to £3,378. The expenditure for the operation was £2,779 and that for maintenance £401. Net income to the project was £198.

Project Hydrology

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

The dam was overflowing from February 5th 1980 to June 3rd 1980. Minimum quantity of water ever stored during the year under review, was 57,318 m^3 and this occurred in November 1980.

TABLE VI—16
AYIA MARINA DAM—HYDROLOGY FOR 1980

Item No.	Description	Qty m^3	% Storage Capacity
1	Initial amount in storage	135 000	45.00
2	Inflow during the year	465 459	155.15
3	Total release	310 704	103.57
4	Leakages	53 961	17.99
5	Evaporation	26 742	8.91
6	Overflow	139 052	46.35
7	Final amount in storage	70 000	23.33
8	Minimum quantity in storage (Nov) ...	57 318	19.11
9	Storage capacity ..	300 000	100.00

TABLE VI—17
AYIA MARINA DAM—WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage Capacity
1	Water used for irrigation	382 884	127.63
2	Water used for recharge	Nil	Nil
3	Total water utilized	382 884	127.63

Water Utilization and Crops Irrigated

During the year under review, a total quantity of 382,884 m^3 of water was utilized for the irrigation of approximately 292 donums planted with various crops. Details about the water utilization and the crops irrigated and their extent are shown on Table VI—17 and VI—18.

Further to the water utilized for irrigation, a small quantity from the overspilled water recharged the small aquifer downstream the dam. Water is pumped from this aquifer for irrigation of areas not within the project area.

Water Sale, Income, Operation and Maintenance Costs

From the sale of 382,884 m^3 of water, the gross income to the project, amounted to £3,378. Management and operation expenses being the wages of the water man and that of the dam attendant, amounted to £2,779. Maintenance costs on the dam and the distribution system was £401. Net income to the project is £198. Details regarding sale of water income and costs are given on Table VI—19.

TABLE VI—18
AYIA MARINA DAM
CROPS IRRIGATED

Ser. No.	CROP	Area Donums
1	Citrus	60
2	Bananas	22
3	Vines	10
4	Deciduous	11
5	Vegetables	139
6	Potatoes	25
7	Cereals	25
	Total	292

TABLE VI—19
AYIA MARINA DAM — INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates	310 704	3 107
2	Water sold at reduced rates	72 180	361
3	Water given free of charge	Nil	Nil
4	Total quantity utilized and gross income	382 884	3 468
5	Operation cost	—	2 779
6	Maintenance cost	—	401
7	Net income	—	288

Project Operation Data for the last two years

Table VI—20 shows data on the operation of the project for the last two years. The water utilization shows an increase by **59.58%** where the income showed an increase by 235.59%. The operation expenditure showed an increase by 28.78%.

The area under irrigation was decreased by 17 dons or by 5.5%.

Generally, the utilization of water in the project area is satisfactory.

TABLE VI—**20**

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

Item No.	Data	Unit	1979	1980	% change on 1979
1	Capacity	1000 m^3	300	300	Nil
2	Water available in storage	"	366	731	+99.73
3	Water utilized for irrigation	"	240	383	+59.58
4	Water sold	"	240	383	+59.58
5	Water given free	"	Nil	Nil	Nil
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	£	2 387	3 468	+45.28
8	Operation cost	£	2 158	2 779	+28.78
9	Maintenance cost	£	288	401	+39.24
10	Total expenses	£	2 446	3 180	+30.01
11	Net income	£	59	288	+388.14
12	Area irrigated	donums	309	292	—5.50

KALOPANAYIOTIS PROJECT

The Kalopanayiotis irrigation project consists of a dam reservoir of capacity 363,000 m^3 and a distribution system of closed conduits commanding an area of approximately 435 donums. Irrigation in the project area, started early in May, 1980 and continued throughout the year, until November, 1980. During this period, a total quantity of 196,685 m^3 of water was used for the irrigation of an area of approx. 435 donums planted mainly with deciduous. All the water was sold to the farmers at a fixed rate of 18 mils/m^3, and the gross income was £3,540. The operation expenses were £2,631 where the maintenance cost spent on routine works and emergency repairs, was

£444. Net income to the project was £465.

Project Hydrology

The project hydrologic data, as recorded during the year under review, are tabulated in Table VI—21. The dam scouring gate was opened on January 23rd, 1980 and the reservoir emptied by February 15th 1980. The scouring gate was closed in March, 13th 1980 and by April 24th the reservoir was filled to spillway crest. Overflow over the spillway crest lasted from April the 24th to June the 20th 1980.

The smallest quantity ever remained in the reservoir during the irrigation season, was 128,000 m^3 and occurred in October 1980.

TABLE VI—21
KALOPANAYIOTIS DAM
HYDROLOGY FOR 1980

Item No.	Description	Qty m^3	% Storage Capacity
1	Initial amount in storage	363 000	100 00
2	Inflow during the year	6 000 000*	1 652.89
3	Total release	196 685	54.18
4	Leakages	100 000	27.55
5	Evaporation	34 368	9.47
6	Overflow	501 156	138.06
7	Final amount	249 000	68.60
8	Minimum quant. in storage (Oct.)	128 000	35.26
9	Storage capacity	363 000	100.00
10	Flow through scouring gate	5 281 791**	1 455.04

* Roughly estimated

** The dam scouring gate was opened from 23.1 to 15.2.1980.

TABLE VI—22
KALOPANAYIOTIS DAM — WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage Capacity
1	Water used for irrigation	196 685	54.18
2	Water used for recharge	Nil	Nil
3	Total water utilized	196 685	54.18

Water Utilization

During the year under review, a total quantity of 196,685 m^3 of water was utilized for the irrigation of 435 donums of deciduous plantations in the project area. The plantations are mainly apple trees, pear trees and peach trees. Part of the water utilized was taken from the seepage collected downstream in a collection weir. See Table VI—22 for water utilization.

Water Sale, Income, Operation and Maintenance costs

From the sale of water the gross income during the year under review, was £3,540. Operation expenses, including attendant and waterman wages and travelling costs, amounted to £2,631. Maintenance expenses were £444. Net income to the project amounted to £465. Details on these are shown on Tables VI—24 and VI—25.

TABLE VI—23
KALOPANAYIOTIS DAM
CROPS IRRIGATED

Ser. No.	Crop	Area Donums
1	Citrus	—
2	Bananas	—

3	Vines	—
4	Deciduous	435
5	Vegetables	—
6	Potatoes	—
7	Cereals	—
	Total	435

TABLE VI—24

KALOPANAYIOTIS DAM
INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates	196 685	3 540
2	Water sold at reduced rates	Nil	Nil
3	Water given free	Nil	Nil
4	Total quantity utilized and gross income	196 685	3 540
5	Operation cost	—	2 631
6	Maintenance cost	—	444
7	Net income	—	465

TABLE VI—25

KALOPANAYIOTIS DAM — DATA ON PROJECT FOR THE LAST TWO YEARS

Item No.	Data	Unit	1979	1980	% change on 1979
1	Capacity	1000 m^3	363	363	Nil
2	Water available in storage	"	450	573	+27.33
3	Water utilized for irrigation	"	176	197	+11.93
4	Water sold	"	176	197	+11.93
5	Water given free .	"	Nil	Nil	Nil
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	£	3 168	3 540	+11.74
8	Operation cost ...	£	2 100	2 631	+25.29
9	Maintenance cost	£	579	444	—23.32
10	Total expenses ...	£	2 679	3 075	+14.78
11	Net income	£	489	465	—4.91
12	Area irrigated	donums	435	435	Nil

Project Operation Data for the last two years

Table VI—25 shows the operation data for the last two years. The amount of water utilized for irrigation, has increased by 11.93% 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 increase in water demand.

The operational costs were up by 25.29%. The water utilization in the project area seems satisfactory although further increase of the quantity utilized is expected.

KITI DAM

The Kiti Dam irrigation project consists of a dam reservoir of storage capacity 1,610,000 m^3 and a distribution system, made of open canals commanding an area of approximately 6,200 donums in the Kiti, Perivolia and Tersephanou villages Irrigation in the project area started in mid March and ended in August 1980. A total of 312,800 m^3 of water were sold at a rate of 15 mils/m^3 for the irrigation of approximately 582 donums of citrus, deciduous and seasonal crops mainly potatoes, carrots and ladies fingers. The gross income amounted to £4,692 whereas the operation expenses were £1,772.

The maintenance expenses of the dam and distribution system were of the order of £893. The project presents a profit of £2,027. The dam was empty by the end of October and was completely dry until December, 1980. A total quantity of 3,319 MCM has been flowing into the reservoir out of which

143,000 m^3 were released from scouring gate for recharge purposes, 312,800 m^3 were released for irrigation and the rest 2,863 MCM was lost mostly in deep percolation and to a smaller extend in evaporation.

Project Hydrology

The project hydrologic data as recorded during the year under review are shown in Table VI—26.

Inflow to the reservoir occurred in January—July in intermitent periods. Maximum amount in storage ever reached was 1,450,000 m^3 in February, 1980.

Water from the reservoir was lost, either in the form of evaporation or seeped through the Meneou and Bekir Pasha chains of wells to recharge the aquifers south and east of the reservoir.

The dam scouring gate was opened in January 22nd—24th and in the period February to March, 1980, for the release of water for recharge purposes.

TABLE VI—26

KITI DAM—HYDROLOGY FOR 1980

Item No.	Description	Qty m^3	% Storage Capacity
1	Initial amount in storage	248 000	15.40
2	Inflow during the year	312 800	19.43
3	Total release		
4	Leakages & Deep	3 319 406	206.17
	Percolation	2 903 292	180.20
5	Evaporation	202 314	12.57
6	Overflow	Nil	Nil
7	Final amount in storage	6 000	0.37
8	Minimum quantity in storage (Nov.) .	Nil	Nil
9	Storage capacity	1 610 000	100.00
10	Flow through scouring gate	143 000	8.88

TABLE VI—27

KITI DAM—WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage Capacity
1	Water used for irrigation	312 800	19.43
2	Water used for recharge	143 000	8.88
3	Total water utilized	455 800	28.31

Water Utilization and Crops Irrigated

Irrigation in the project area, lasted from March 17th to August 12th 1980 and a total quantity of 312,800 m^3 of water was utilized. This quantity irrigated approximately 582 donums of seasonal early crops as shown on Tables VI—27 and VI—28.

TABLE VI—28

KITI DAM—CROPS IRRIGATED

Ser. No.	Crop	Area Donums
1	Citrus	154
2	Bananas	—
3	Vines	—
4	Deciduous	5
5	Vegetables	248
6	Potatoes	175
7	Cereals	—
	Total	582

Water Sale, Operation and Maintenance Cost

From the sale of water, the gross income amounted to £4,692, where the operation cost was £1.772. The maintenance cost was £893. The project presents a profit of £2,027. Details regarding water sale and cost, are shown on Table VI—29.

Table VI—29.

KITI DAM—INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates	312 800	4 692
2	Water sold at reduced rates	Nil	Nil
3	Water given free ...	143 000*	Nil
4	Total quantity utilized and gross income	455 800	4 692
5	Operation cost	—	1 772
6	Maintenance cost	—	893
7	Net income	—	2 027

* For recharge purposes

Project Operation Data for the Last Two Year

Table VI—30 shows data on the operation of the project for the last two years. There can be no comparison of the data since the water inflow to the reservoir is not steady and dependable. However, comparison of the figures of the last two years, shows that the amount of water in storage has considerably increased because of the great amount of rainfall occurred during the year. Water utilization was done satisfactorily in contrast to the last year where no water utilization had been done. An area of 582 donums was irrigated while in the last year, no irrigation had taken place. The operation cost was £1,772 while in the last year there were no operation expenses. The maintenance cost was increased by 88%. However, in this year a profit of £2,027, was presented, compared to the last year, where there was a loss of £475.

TABLE VI—30
KITI DAM—DATA ON PROJECT FOR THE LAST TWO YEARS

Item No.	Data	Unit	1979	1980	% change on 1979
1	Capacity	1000 m^3	1 610	1 610	Nil
2	Water available in storage	"	332	456	+37.35
3	Water utilized for irrigation	"	Nil	313	—
4	Water sold	"	Nil	313	—
5	Water given free ...	"	Nil	143	—
6	Water used for recharge	"	130	143	+10.00
7	Gross income	£	Nil	4 692	—
8	Operation cost	£	Nil	1 772	—
9	Maintenance cost ..	£	475	893	+88.00
10	Total expenses	£	475	2 665	+461.05
11	Net income	£	—475	2 027	—
12	Area irrigated	donums	Nil	582	—

LEFKARA DAM

The Lefkara dam project is a dual purpose project, mainly for the supply of Domestic Water to Famagusta town and parlty for the irrigation for agricultural land downstream the dam. The dam consists of (a) a dam reservoir whose capacity is 13.85 MCM (the largest in Cyprus), (b) a distribution system (piped) for the supply of irrigation water to an area of approximately 615

donums, (c) a feeder pipeline, (d) a domestic water treatment plant near Khirokitia and (f) a pipeline to Famagusta town.

As a result of the Turkish invasion and the occupation of the Famagusta town, the reserved water for Famagusta has been utilized to supply water to the Larnaca and Famagusta towns, other villages and refugee camps en route to Famagusta, whose population has been greatly increased or created 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 £676. Maintenance works were carried out at a total cost of £400.

Project Hydrology

The project hydrologic data as recorded during the year under review are tabulated in Table VI—31.

The water in the dam reservoir did not reach spillway crest but remained much lower with quantity in storage around 5,815.667 m^3 or 41.99% of the total capacity. The average inflow to the dam reservoir during the year, was estimated to be 3,404,664 m^3. The minimum water level reached, occurred in January with minimum quantity in storage, estimated at 2,944,129 m^3.

TABLE VI—31

LEFKARA DAM—HYDROLOGY FOR 1980

Item No.	Description	Qty m^3	% Storage Capacity
1	Initial amount in storage	2 944 129	21.26
2	Inflow during the year	3 404 664	24.58
3	Total release	2 277 667	16.44
4	Leakages	34 000	0.24
5	Evaporation	499 126	3.60
6	Overflow	Nil	Nil
7	Final amount in storage	3 547 000	25.61
8	Minimum quantity in storage (Jan) .	2 944 129	21.26
9	Storage capacity	13 850 000	100.00

Water Utilization

As stated before the Project was constructed mainly for the supply of domestic water and to a less extent to provide irrigation water for an area of 615 donums downstream the dam structure. The water utilization for the two main categories of use is as shown on Table VI—32.

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 135 donums of land has been irrigated by using 67,627 m^3 of water. The area was planted with citrus and vegetables as shown on Table VI—33.

TABLE VI—32
LEFKARA DAM—WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage Capacity
1	Water used for domestic WS	2 210 167	15.89
2	Water used for irrigation	67 627	0.49
3	Water lost in pipe breakage	Nil	Nil
4	Total water utilized	2 277 667	16.44

TABLE VI—33

LEFKARA DAM—IRRIGATED CROPS

Ser. No.	Crop	Area Donums
1	Citrus	85
2	Vegetables	50
	Total	135

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 10 mils/m^3 and the total expected income from the sale of irrigation water amounted to £676.

Project Operation Data for the Last Two Year

From the table it is shown that the quantity of water used for irrigation has increased by 19.30% and domestic water supply has descreased by 25.03%.

TABLE VI—34

LEFKARA DAM—PROJECT OPERATION DATA FOR THE LAST TWO YEARS

Ser. No.	Description	Unit	1979	1980	% change on 1979
1	Capacity	1000 m^3	13 850	13 850	Nil
2	Water available	"	6 338	5 816	—8.24
3	Water utilized for irrigation	"	57	68	+19.30
4	Water utilized for domestic WS	"	2 936	2 201	—25.03
5	Total water utilized	"	2 993	2 278	—23.89
6	Inflow (estimated) .	"	1 937	3 405	+75.79
7	Area irrigated	donums	100	135	+35.00

MAVROKOLYMBOS 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 approximately 3,555 donums.

Irrigation in the project area commenced early in January 1980 and continued throughout the year and was terminated late in November.

During this period a total quantity of 1 306 636 m^3 of water was utilized for the irrigation of 2,060 donums of bananas, vines and vegetables under cover and in the open. Of the 1,406,636 m^3 utilized 920,525 m^3 was sold at nominal rates and 286,111 m^3 at increased rates 25 mils/m^3 because it was pumped from the boreholes in the Potima Chiflik aquifer. The rest 100,000 m^3 was

given free of charge to the Potima Chiflik farmers as water rights.

The total gross income from the sale of water amounted to £19,842 where the operation cost, amounted to £10, 390. The maintenance expenses were £2,541, thus reducing net project income to £6,911.

Project Hydrology

The project hydrologic data including borehole data as recorded during the year under review are tabulated on Table VI—35.

TABLE VI—35
MAVROKOLYMBOS DAM
HYDROLOGY FOR 1980

Item No.	Description	Qty m^3	% Storage Capacity
1	Initial amount in storage	245 000	11.24
2	Inflow during the year	1 160 742	53.24
3	Total release	1 239 266	56.86
4	Leakages	Nil	Nil
5	Evaporation	72 476	3.32
6	Overflow	Nil	Nil
7	Final amount in storage	94 000	4.31
8	Minimum quantity in storage (Oct.) .	88 000	4.04
9	Storage capacity .	2 180 000	100.00
10	Quantity of water pumped from boreholes	67 370	3.08

Water Utilization and Crops Irrigated

During the irrigation season a total of 1,305,636 m^3 of water was utilized for the irrigation of 2,060 donums of various crops as shown on Table VI—37.

TABLE VI—36

MAVROKOLYMBOS DAM—WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage Capacity
1	Water used for irrigation	1 306 636	59.94
2	Water used for recharge	Nil	Nil
3	Total water utilized	1 306 636	59.94
4	Water taken from dam	1 239 266	56.86
5	Water taken from B/Hs	67 370	3.08

TABLE VI—37

MAVROKOLYMBOS DAM—CROPS IRRIGATED

Ser. No.	Crop	Area Donums
1	Citrus	100
2	Bananas	700
3	Vines	40
4	Deciduous	20
5	Vegetables	900
6	Potatoes	300
7	Cereals	—
	Total	2060

Water Sale, Income, Operation and Maintenance Costs

From the sale of water the gross income is £19,842. The water sold from the dam reservoir was at nominal rates

10 and 15 mils/m^3. A quantity of 286, 111 m^3 was sold at 25 mils/m^3, because it was utilized during the period of operation of the boreholes. The operation expenses amounted to £10,390 where the maintenance works costs were £2,541. Operation and Maintenance costs include also the operation and maintenance expenses of the boreholes. Net income to the project was £6,911. Details regarding the income expenditure and operation costs are shown on Table VI—38.

TABLE VI—38
MAYROKOLYMBOS DAM—INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates	920 525	12 689
2	Water sold at increased rates...	286 111*	7 153
3	Water given free of charge...	100 000	Nil
4	Total quantity utilized and gross income	1 306 636	19 842
5	Operation cost ...	—	10 390
6	Maintenance cost	—	2 541
7	Net income	—	6 911

* This is because it was utilized during the period of operation of the boreholes.

Project performance for the last two Years

Table VI—39 shows data on the operation of the project for the last two years. There is an increase in the quantity of water available which resulted to increase in area irrigated by 94.34%. The operation expenses are lower because of water being taken mainly from the dam instead of the boreholes as in 1979. The net income to the project was of the order of £7,856 and it is considered satisfactory enough compared to that of the last year, where there was a loss of £755.

TABLE VI—39

MAVROKOLYMBOS DAM—DATA ON PROJECT FOR THE LAST TWO YEARS

Item No.	Data	Unit	1979	1980	% change on 1979
1	Capacity	1000 m^3	2 180	2 180	Nil
2	Water available in storage	"	591	1 333	+125.55
3	Water utilized for irrigation	"	553	1 307	+136.35
4	Water sold	"	503	1 207	+139.96
5	Water given free .	"	40	100	+150.00
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	£	11 991	19 842	+65.47
8	Operation cost ...	£	11 867	10 390	—12.44
9	Maintenance cost	£	755	2 541	+236.56
10	Total expenses ...	£	12 746	12 931	+1.45
11	Net income	£	—755	6 911	—
12	Area irrigated	donums	1 060	2 060	+94.34

POMOS PROJECT

The Pomos irrigation project constists of a dam reservoir of maximum capacity at spillway crest of 860,000 m^3 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 mid March 1980 and continued throughout the year until late in December 1980.

An area of 592 donums of land planted

with citrus, bananas and vegetables was irrigated by utilizing 1,064,469 m^3 of water. From the total water utilized 911,985 m^3 were taken directly from the dam reservoir whereas the remaining 152,484 m^3 were taken from the overflow occuring in the period January the 15th—April the 30th 1980.

The total gross income from the sale of water amounted to £9,882. The expenditure for the maintenance was £928 whereas the operation and management costs were £5,389. Net income to the project for the year under review was £3,565.

Project Hydrology

The project hydrologic data as recorded during the year are tabulated in table VI—40.
The reservoir was filled to spillway crest on January the 15th and overflow occurred during the period January the 15th to April 30th 1980. Minimum water level in the reservoir occurred in November with water in storage in the order of 22,272 m^3.

TABLE VI—40
POMOS DAM—HYDROLOGY FOR 1980

Item No.	Description	Qty m^3	% Storage Capacity
1	Initial amount in storage	186 363	21.67
2	Inflow during the year	6 179 205	718.51
3	Total release	911 985	106.04
4	Leakages	311 482	38.54
5	Evaporation	44 718	5.20
6	Overflow	4 980 793	579.16
7	Final amount in storage	96 590	11.23
8	Minimum quantity in storage (Nov.)	22 272	2.59
9	Storage capacity	860 000	100.00

Water Utilization and Crops Irrigated

The 1,064,469 m^3 of water were utilized for the irrigation of 592 donums within the project area. Details about the water utilized and the crops irrigated are shown on Tables VI—41 and VI—42.

TABLE VI—41
POMOS DAM—WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage Capacity
1	Water used for irrigation	1 064 469	123.78
2	Water used for recharge	Nil	Nil
3	Total water utilized	1 064 469	123.78

TABLE VI—42
POMOS DAM—CROPS IRRIGATED

Item No.	Crop	Area donums
1	Citrus	165
2	Bananas	315
3	Vines	2
4	Deciduous	30
5	Vegetables	25
6	Potatoes	—
7	Cereals	55
	Total	592

Water Sale, Income, Operation and Maintenance Costs

From the sale of water (see details on

Table VI—43) the total gross income amounted to £9,882 whereas the operation and management costs were £5,389. Maintenance works on the dam and distribution system were £928. Net income to the project for the year under review amounted to £3,565.

TABLE VI—43
POMOS DAM—INCOME AND EXPENDITURE DATA

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates	611 985	9 120
2	Water sold at reduced rates	152 985*	762
3	Water given free of charge	Nil	Nil
4	Total quantity utilized and gross income	1 064 469	9 882
5	Operation cost	—	5 389
6	Maintenance cost	—	928
7	Net income	—	3 565

* This is because it was taken from the overflow.

Project Performance Data for the Last Two Years

Table VI—44 shows data regarding hydrologic, 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 1980 over the previous year.

The quantity of water utilized for irrigation has increased by 53.54% while the gross income has risen by 42.62%. The area irrigated was decreased by 22.61% and this was mainly due to the decrease of the area under seasonal crops and increase in area of high volume demanding crops.

The operational costs were decreased by 3.34% while the maintenance cost by 15.87%. Total expenses were down by £361 or by 5.41%. However the total net income increased by £3,314.

Generally the project water has been utilized satisfactorily.

TABLE VI—44

POMOS DAM—DATA ON PROJECT FOR THE LAST TWO YEARS

Item No.	Data	Unit	1979	1980	% change on 1979
1	Capacity	1000 m^3	860	860	Nil
2	Water available in storage	"	1 028	1 162	+13.04
3	Water utilized for irrigation	"	693	1 064	+53.54
4	Water sold	"	693	912	+31.60
5	Water given free ...	"	Nil	153	—
6	Water used for recharge	"	Nil	Nil	Nil
7	Gross income	£	6 929	9 882	+42.62
8	Operation cost	£	5 575	5 389	—3.34
9	Maintenance cost ..	£	1 103	928	—15.87
10	Total expenses	£	6 678	6 317	—5.41
11	Net income	£	251	3 565	—
12	Area irrigated	donums	765	592	—22.61

YERMASOYIA - POLEMIDHIA PROJECT

The Yermasoyia—Polemidhia Irrigation Project consists of the Yermasoyia dam, the reservoir of which has a capacity of 13.5 MCM and the Polemidhia dam with reservoir capacity in the order of 3.43 MCM. The distribution system of the project consists of closed

conduits now commanding an area of about 15,440 donums.

Irrigation in the project area started early in January 1980 and continued throughout the year until late in December 1980. A total quantity of 8,657,097 m^3 of water was utilized from both dams (7,730,497 m^3 from Yermasoyia and 926,600 m^3 from the Polemidhia dam and 926,600 m^3 from the Polemidhia dam) for the irrigation of 15,440 donums (partial or full) in the Zakaki, Phasouri, Akrounda—Phinikaria areas and Yermasoyia and Polemidhia Irrigation Divisions. Of the 8,657,097 m^3 of water 826,500 m^3 was given free of charge as water rights to the Yermasoyia and .Polemidhia Irrigation Divisions (304,167 m^3 for Kato Polemidhia, 522,333 m^3 for the Yermasoyia Irrigation Division) and 1,092,885 m^3 was given at reduced rates at overflow and leakages. The rest 6,737,712 m^3 was sold at the nominal rates. Overflow occurred from both dams. Yermasoyia dam overflowed in the period February 22nd to May 14th and Polemidhia February 23rd to April 15th. The total quantity from the overflow was 14,481,000 m^3 (12,920,000 m^3 from Yermasoyia and 1,561,000 m^3 from Polemidhia). All of this water recharged the Yermasoyia and Garyllis aquifers downstream the dam structures. These aquifers are pumped for the supply of domestic water to the Limassol Town, the Moutayiaka Regional domestic water supply scheme and for irrigation in the Zakaki area.

Total gross income from the sale of water amounted to £102,214 where the operating costs including power expenses amounted to £51,420. The maintenance works carried out by the WDD were of the order of £7,720.

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 to the Polemidhia dam during the year under review totalled 3,881,900 m^3 representing 113.17% of the reservoir capacity. The reservoir filled to spillway crest and overflow took place over two months from February 23rd to April 15th 1980. Leakages occurred through the dam and part of these were intercepted downstream for irrigation purposes. Releases from the dam reservoir were only 154,600 m^3 where the total water utilized for irrigation and recharge amounted to 3,362,500 m^3. As it is seen most of the leakage water was intercepted for irrigation. (See Table VI—45).

TABLE VI—45

POLEMIDHIA DAM—HYDROLOGY FOR 1980

Item No.	Description	Qty m^3	% Storage Capacity
1	Initial amount in storage	940 000	27.41
2	Inflow during the year	3 881 900	113.17
3	Total release	154 600	4.51
4	Leakages	1 646 900	48.01

5	Evaporation	294 400	6.65
6	Overflow	1 561 000	45.51
7	Final amount in storage	1 165 000	33.97
8	Minimum quantity in storage (Jan.) ..	940 000	27.40
9	Storage capacity .	3 430 000	100.00

YERMASOYIA DAM

The inflow to the dam during the year under review was estimated at 19,788 MCM mostly occurring in the months of January to July and in December. Out of this inflow 12,920 MCM overspilled and recharged the aquifer downstream. Overflow took place over a period of three months February to May 1980. (See Table VI—46).

TABLE VI—46
YERMASOYIA DAM—HYDROLOGY FOR 1980

Item No.	Description	Qty m^3	% Storage Capacity
1	Initial amount in storage	7 942 000	58.82
2	Inflow during the year	19 788 357	146.58
3	Total release	7 730 497	57.26
4	Leakages	18 360	0.14
5	Evaporation	1 299 500	9.62
6	Overflow	12 920 000	95.70
7	Final amount in storage	5 762 000	42.68
8	Minimum quantity in storage (Dec.)..	5 681 000	42.08
9	Storage capacity .	13 500 000	100.00

Water Utilization from both Dams

Details regarding water utilization from both dams separately and in combine are shown on Tables VI—47, VI—48 and VI—50. In summary during the year under review a total quantity of 15,092, 997 m^3 of water was utilized for irrigation and recharge purposes. Out of this quantity 8,657,097 m^3 was utilized for the irrigation (fully or in part) of 15,440 donums as indicated in Table VI—49. The rest 6,435,900 m^3 was utilized to recharge the Garyllis and Yermasoyia downstream of both dams.

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 VI—51.

TABLE VI—47
POLEMIDHIA DAM
WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage Capacity
1	Water used for irrigation	926 600	27.01
2	Water used for recharge	2 435 900	71.02
3	Total water utilized	3 362 500	98.03

TABLE VI—48
YERMASOYIA DAM
WATER UTILIZATION

Item No.	Description	Qty m^3	% Storage Capacity
1	Water used for irrigation	7 730 497	57.26
2	Water used for recharge	4 000 000	29.63
3	Total water utilized	11 730 497	86.89

TABLE VI—49
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 VI—50
YERMASOYIA - POLEMIDHIA
PROJECT—WATER UTILIZATION

Ser. No.	Description	Qty m^3	% Storage Capacity
1	Water used for irrigation (Y & P)	8 657 097	51.13
2	Water used for recharge	6 435 900	38.01
3	Total water utilized	15 092 997	89.14

From the sale of water the total gross income was £102,214. The operation cost, including power cost totalled £51,420 where the maintenance costs spent on routine works was £7,720. Details regarding income and expenditure are shown on Table VI—51.

Project Operation Data for the last two Years

Table VI—52 gives details regarding the operation for the last two years. The last column shows the fluctuations of the various data of the Project Operation. Although there is an increase in water utilization and water sales the net return are reduced. This is due to the fact that operational costs have increased considerably.

TABLE VI—51

YERMASOYIA - POLEMIDHIA
PROJECT
INCOME & EXPENDITURE DATA

Ser. No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates	6 737 712	94 580
2	Water sold at reduced rates*	1 092 885	7 634
3	Water given free of charge as water rights to:		
	—Yermasoyia Irrig. Division	522 333	Nil
	—Polemidhia Irrig. Division	304 167	Nil
4	Total quantity/ income	8 657 097	102 214
5	Operation cost	—	36 902
6	Power cost	—	14 518
7	Maintenance cost (Yermasoyia & Polemidhia)	—	7 720
8	Total cost	—	59 140
9	Net income	—	43 074

* Reduced Rates 8 mils/m^3 for the supply of water to Polemidhia Irrigation Division (472,500 m^3), 7 mils/m^3 for the supply of water to the Yermasoyia Irrig. Division (498,300 m^3) and 3 mils/m^3 for the overflow (122,076 m^3).

TABLE VI—52

YERMASOYIA - POLEMIDHIA PROJECT — DATA ON PROJECT FOR THE LAST TWO YEARS

Ser. No.	Description	Unit	1979	1980	% change on 1979
1	Capacity	1 000 m³	16 930	16 930	Nil
2	Water available	"	17 318	21 248	+22.69
3	Water utilized for irrigation	"	7 935	8 657	+9.10
4	Water sold	"	7 322	7 831	+6.95
5	Water given free	"	613	826	+34.75
6	Water used for recharge	"	1 393	6 436	+362.24
7	Total quantity used	"	9 328	15 093	+61.80
8	Gross income	£	93 882	102 214	+8.87
9	Operation cost	£	24 430	36 902	+51.05
10	Power cost	£	6 391	14 518	+127.16
11	Maintenance cost	£	3 153	7 720	+144.85
12	Total expenditure	£	33 974	59 140	+74.07
13	Net income	£	59 908	43 074	−28.10
14	Area irrigated	Donums	15 440	15 440	Nil

PAPHOS IRRIGATION PROJECT

The Paphos Irrigation Project is the largest and most important project of its kind ever undertaken in Cyprus.

Construction of the civil works commenced in 1976 and it is expected to be completed by the end of 1981.

The Project will consist 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 this is the first project on the island to operate on the "on demand" mode. Since the dam is not yet completed the water quantity for irrigation is very limited this being the water pumped from the 24 boreholes.

Irrigation in the project area started in May 1980 and was completed late in November 1980. During this period a quantity of 1.080 MCM of water was utilized for the irrigation of 1900 donums of land and for the construction works of the Asprokremmos dam and the distribution. In brief the water was utilized as shown on Table VI—53. The crops irrigated were mainly vegetables.

TABLE VI—53

PAPHOS IRRIGATION PROJECT WATER UTILIZATION

Item No.	Description	Qty
1	Water used for irrigation m³	436 238
2	Water used for recharge m³	Nil
3	Water used by Anatoliko Industry m³	336 020
4	Water given to Construction Contractors m³	307 936
	Total water utilized m³	1 080 244

The operation and maintenance of the project is the responsibility of the WDD. From the sale of water with prices fixed at 15 mils/m³ for irrigation, 20 mils/m³ for industrial uses and at other prices for construction purposes

the incomes for 1980 is around £15,712. The operation expenses, a breakdown of which is shown below, amounted to £6,698, where the maintenance expenses totaled £4,638. The net income of the project is £4,376.

TABLE VI—54
PAPHOS IRRIGATION PROJECT
INCOME AND EXPENDITURE

Item No.	Description	Qty m^3	Amount £
1	Water sold at nominal rates ..... (a) 15 mils/m^3 (436,238 m^3) (b) 20 mils/m^3 (336,020 m^3)	772 308	13 265
2	Water sold at reduced rates	307 936	2 447
3	Total water utilized and gross income ..	1 080 244	15 712
4	Operation cost (Power cost £3,959)	—	6 698
5	Maintenance cost (main canal)	—	4 638
6	Net income	—	4 376

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.

Irrigation in the project started early in April and was continued until the end of October 1980. During the period a total quantity of 0.250 MCM of water was used for the irrigation of 250 donums planted with cereals (90 donums) and vegetables (160 donums). The water is not charged.

KHAPOTAMI PROJECT

The Kha-Potami irrigation project consists of a diversion weir and a diversion pipeline capable of diverting a flow of 500 cubic meter/hour when the Kha-Potami river is flowing in the months January—June. The project is supplying water in bulk during the winter, spring and early summer months, to the Pissouri and Alektora Irrigation Division. The area commanded by both irrigation divisions is around 4,235 donums, 3,000 donums in the Pissouri Irrigation Division and 1,235 donums in the Alektora Irrigation Division in both cases the area to be irrigated is planted totally with vines.

Based on the existing water resources for each of the two irrigation divisions and having in mind the area served by each irrigation division water is allocated as follows:

* If the works divert only 225 m^3/hr the water will be given in total to the Pissouri Irrigation Division.

* If the works divert more than 225 m^3/hr but less than 325 m^3/hr this 225 m^3/hr will be diverted to the Pissouri Irrigation Division and the remaining to the Alektora Irrigation Division.

* If the works divert a flow of more than 325 m^3/hr then the water will be allocated as follows:-

a. 225 m^3/hr to Pissouri Irrigation Division.
b. 100 m^3/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 1980 and was completed in June 1980 when the river flow diminished. For the diversion of water a pump was used to pump water from the river because the pipeline was not yet completed. In this period a total of 348,000 cubic meters of water were diverted and utilized by both irrigation divisions. The water was utilized for the supplementary irrigation of 4,235 donums of land planted with vines.

VII SMALL PROJECTS PLANNING DIVISION

by
C Andreou
Senior Water Engineer
Head of the Division

Introduction:

The Small Projects Planning Division is dealing especially, with the rural domestic water supplies, and the planning and design of small irrigation schemes. Other activities of the Division, is the rehabilitation of water-supply and irrigation schemes within the Pitsilia Integrated Rural Develpoment Project, water supply schemes of touristic and livestock areas, encroachment in rivers and streams, quarrying in river beds, and the capital aid from the Federal Republic of Germany.

By the end of 1980 the staff of the Division was consisting of the following Officers:-

One Senior Water Engineer—Head of the Division
One Executive Engineer Class I
One Technical Superintendent
One Senior Technician
Five Technicians "A"
Three Technicians "B"
One hourly paid Technician
One Secretary—Typist.

VILLAGE WATER SUPPLIES

The general village water supply situation during 1980 is described in table VII—1 and VII—2. There are no villages in Cyprus without piped water.

With the completion of 1 house to house supply systems during 1980 only 59 out of a total number of 619 villages remain with public fountains i.e. 1.96% of the total village population.

Out of 560 villages with house to house supply systems 539 enjoyed a per capita daily rate of over 90 litres (20 gallons).

Water Supply Schemes

A total number of 64 new schemes were prepared and submitted to the District Officers during 1980, at a total estimated cost of £1,143.636 as shown on table VII—3.

Another 58 schemes were in the course of preparation by the end of the year as per table VII—4.

Beside the above mentioned schemes, a total number of 26 projects have been prepared, concerning the water supply of the housing of displaced persons (Self-Housing and Government Housing Estates), at a total estimated cost of £415,673 as per table VII—3a.

These schemes have been submitted to the Director of Town Planning and Housing.

In the above mentioned schemes prepared by this Division, a certain number of projects concerning the domestic water supply for livestock areas, and touristic areas, is included.

In cases where there are no established water-boards, the Division is dealing also with the design of town water supply schemes.

TABLE VII—2 WATER SUPPLY SITUATION AT THE END OF 1980

District	Satisfactory piped supply supply rate 90 litres/head/day & over							Unsatisfactory piped supply supply rate below 90 litres/head/day							Total No. of villag.	Total popu-lation
	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	137	81.07	111 765	89.92	8	4.73	1 069	0.86	17	10.06	10 602	8.53	7	4.14	860	0.69	169	12 429
Kyrenia	39	82.98	30 786	93.50	2	4.26	59	0.18	1	2.13	540	1.64	5	10.63	1 542	4.68	47	3 292
Famagusta ...	82	83.68	82 644	92.12	3	3.06	444	0.50	6	6.12	5 695	6.34	7	7.14	934	1.04	98	8 971
Limassol	103	90.35	71 923	97.05	3	2.63	40	0.05	5	4.39	2 021	2.73	3	2.63	124	0.17	114	7 410
Paphos	100	75.76	45 726	88.45	13	9.85	2 202	4.26	14	10.61	3 222	6.24	5	3.78	545	1.05	132	5 169
Larnaca	47	79.66	34 072	84.06	2	3.39	156	0.38	9	15.25	6 166	15.21	1	1.69	140	0.35	59	4 053
Total	508	82.07	376 916	91.20	31	5.01	3 970	0.96	52	8.40	28 246	6.84	28	4.52	4 145	1.00	619	41 327

TABLE VII—1 VILLAGE WATER SUPPLIES

Year	Villages with House-to-House distribution system				Villages with public fountains			Villages without a piped supply			
	Schemes completed	Total No. of villages	Villages %	Population %	Total No. of villages	Villages %	Population %	Total No. of villages	Villages %	Population %	Total No. of villages
1960	—	90	14.33	—	441	70.23	—	97	15.44	—	628
1961	41	131	20.86	—	428	68.19	—	69	10.95	—	628
1962	59	190	30.25	—	380	60.55	—	58	9.20	—	628
1963	67	257	40.90	—	324	51.60	—	47	7.50	—	628
1964	39	296	47.13	66.71	323	51.43	32.29	9	7.44	1.00	628
1965	5	301	47.93	68.86	321	51.11	30.44	6	0.96	0.70	628
1966	7	308	49.05	69.81	316	50.31	29.95	4	0.64	0.24	628
1967	11	319	50.80	71.40	307	48.88	28.46	2	0.32	0.14	628
1968	27	346	55.10	75.72	282	44.90	24.28	—	—	—	628
1969	14	360	57.32	78.60	268	42.68	21.40	—	—	—	628
1970	32	392	62.42	83.23	236	37.58	16.77	—	—	—	628
1971	16	408	64.95	85.42	220	35.05	14.58	—	—	—	628
1972	29	437	69.60	88.70	191	30.40	11.30	—	—	—	628
1973	67	504	81.40	95.10	115	18.60	4.90	—	—	—	619
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

Brief description of Important Water Supply Schemes prepared during 1980

Pera Khorio - Nisou: A scheme has been prepared in order to provide supplementary water supply to both villages as well as improvements on the distribution system, at a total estimated cost of £33,200.

Ayios Athanasios: A new scheme has been prepared for the implementation of a house-to-house supply, at a total estimated cost of £78,500.

Ayios Athanasios Industrial Area: This scheme provides the domestic water supply to the newly established industrial area, at a total estimated cost of £56,800.

Kiti (Perivolia - Tersephanou - Dhromolaxia - Meneou): A scheme has been prepared in order to provide additional water supply to the above villages from B/H No 16/79 at a total estimated cost of £60,000.

Xylophaghou: This scheme has been prepared in order to provide supplementary water supply as well as improvements on the distribution system at a total estimated cost of £39,000.

Kalavasos: This scheme provides additional water supply from B/H No. 101/79 at a total estimated cost of £60,000.

Aradhippou: The scheme prepared, constists of improvements and extensions within the village boundaries at a total estimated cost of £62,000.

Tsadha-Kili: This scheme provides additional water supply from B/H No. 13/78 to the above villages, at a total estimated cost of £60,200.

Paphos Airport: This scheme provides domestic water supply to the new Paphos Airport, at a total estimated cost of £61,000.

Argaka-Magounda: The scheme prepared is for the replacement of the main pipeline, at a total estimated cost of £41,000.

TABLE VII—3

VILLAGE WATER SUPPLY SCHEMES PREPARED IN 1980 AND SUBMITTED TO DISTRICT OFFICERS

Ser. No.	Village & nature of scheme	Est. Cost
	NICOSIA DISTRICT	£
1	Alambra—Extensions	9 700
2	Astromeritis—Additional WS	15 700
3	Yeri—Main conveyor—Improvements	2 400
4	Klirou-Mitsero-Kalokhorio-Malounda—Additional WS ..	18 600
5	Korakou—Extensions	1 450
6	Lakatamia—Additional WS ..	22 000
7	Nisou - P. Khorion—Extensions	3 700
8	Lakatamia—Extension in P. Lakatamia	1 800
9	Dheftera—Additional supply from B/H 4/79	19 000
10	Dhenia - Mammari—Additional supply from B/H 90/79	24 000
11	Kokkini Trimithia—WS to building sites	12 500
12	Christos Steliou Ioannou Foundation—WS to foundation building in Strovolos	3 500
13	Ayii Trimithias—Extensions ..	2 400
14	Pera Khorion - Nisou—Additional supply	33 200

15	Meniko—Additional supply ..	26 000
16	Kalopanayiotis - Moutoullas - Nikos - Yerakies—Additional supply of water	22 371
17	Lythrodhonda—Pumping from B/H 92A/79	6 000
18	Alambra—WS to livestock area	15 000
19	Pakhyammos—Development of spring	1 100
20	Lakatamia—Extensions	1 000
21	Forest Department—Installation of hydrants	5 750
	Total	247 171

LIMASSOL DISTRICT		£
1	Ayios Athanasios—New scheme	78 500
2	Industrial area of Ayios Athanasios—WS scheme ...	56 800
3	Akrotiri—Extensions	8 400
4	Monagri (Lania - Dhoros)—WS of elementary school ...	4 000
5	Trakhoni—WS of building sites	14 000
6	Prodhromos—Additional supply	10 000
7	Korphi—Improvements	1 100
8	Trimiklini—Replacement of Dist. Pipelines	20 500
9	Ayios Athanasios—Construction of Tank at "Sphalaggiotissa"	2 000
10	Erimi—Improvements	18 500
11	Klonari—Improvements to the WS well	300
12	Prastio—Improvements to the WS springs	600
13	Evdhimou—WS to livestock area	9 400
	Total	224 100

LARNACA DISTRICT		£
1	Mari—WS of livestock area	3 500
2	Dhomolaxia—WS of livestock area	22 000
3	Kiti (Perivolia-Tersephanou-Dhromolaxia-Meneou)—Additional WS from B/H 16/79	60 000
4	Xylophaghou—Improvements and Additional supply	39 000
5	Tersephanou—WS of building sites	11 000
6	Anglisidhes—Additional supply from B/H 3/70	16 000
7	Alaminos—WS to building sites	5 500
8	Kophinou—Extensions of WS system of Livestock area ...	1 200
9	Dhromolaxia—WS to additional livestock units	1 100
10	Kalavasos—Additional WS from B/H 101/79	60 000
11	Aradhippou—Improvements and Extensions	62 000
12	Mosphiloti—WS of Military camp	1 400
13	Skarinou—Extensions	8 500
	Total	291 200

PAPHOS DISTRICT		£
1	Higher Villages—Additional supply from B/H 64/79	27 700
2	Kritou Terra—Improvements of Dist. scheme	2 325
3	Mesa Khorion—New storage tank & pipeline	7 500
4	Xeropiyi—Additinal supply from B/H 93/78	16 900
5	Paphos beach—WS of Paphos beach (KOT)	19 200

6	Mesoyi—Construction of storage reservoir	8 100
7	Miliou—House to house WS	10 220
8	Peyia—WS of fishermen housing	450
9	Tsada-Kili—Additional supply from B/H 13/78	60 200
10	Paphos—Two alternatives for WS of Paphos beach (A)	18 360
	(Yeroskipos) (B)	9 600
11	Paphos—WS of Paphos airport	61 100
12	Argaka-Magounda—Replacement of main pipeline	41 000
13	Emba—WS to Government building plots	14 100
14	Letymbou—Replacement of main conveyor	6 960
15	Stavrokonnou—Improvements	2 050
	Total	303 665

FAMAGUSTA DISTRICT

		£
1	Paralimni—Improvements - New main line	14 500
2	Paralimni—WS to hotels of displaced "hotel owners"	15 000
3	Liopetri—Additional supply from B/H 655	29 000
4	Liopetri—Alternative additional supply scheme	10 000
5	Famagusta WS Scheme—Pumping to Khirokitia reservoir	7 000
	Total	75 500

SUMMARY OF TABLE VII—3

District	No of schemes	Est. Cost £
Nicosia	21	247 171
Limassol	13	224 100
Larnaca	13	291 200
Paphos	15	303 665
Famagusta	5	75 500

TABLE VII—3A

WATER SUPPLY SCHEMES FOR GOVERNMENT OR SELF-HOUSING ESTATES PREPARED AND SUBMITTED IN 1980

Ser No.	Village	Est. Cost £
	NICOSIA DISTRICT	
1	Ayios Pavlos	6 500
2	Athalassa	41 000
3	Peristerona (E)	9 500
4	Dhali (Y)	3 000
5	Pera (B)	1 700
6	Anayia (B)	1 500
7	Lakatamia - Arkhangelos Michael	24 500
8	Dheftera - Khrysospiliotissa	15 000
9	Yeri (E & Z)	12 000
10	Ayii Trimithias (E & Z)	1 300
11	Tseri (E)	5 200
12	Laxia - Apostolos Loukas	9 300
13	Akaki (E)	800
14	Yeri (H)	32 500
15	Peristerona (Z)	4 100
16	Laxia - Apostolos Andreas	28 000
17	Nisou	1 300
	Total	197 200
	LARNACA DISTRICT	
1	Moutayiaka	20 000
2	Episkopi	11 000
3	Kandou	4 300
4	Makarios III	17 373
5	Pano Polemidhia	17 500
6	Trakhoni	23 300
	Total	93 473
	LIMASSOL DISTRICT	
1	Ayios Ioannis	10 000
2	Kamares	20 000

3	Dhromolaxia	7 500
4	Klavdhia (A)	3 000
5	Kellia (A)	6 000
6	Dhekelia (A)	37 000
7	Livadhia	4 000
8	Livadhia (Z)	8 000
9	Ormidhia	1 800
10	Menoyia (A)	300
	Total	97 600

PAPHOS DISTRICT

1	Paphos (Mouttallos)	4 200

FAMAGUSTA DISTRICT

1	Sotira	20 000
2	Dherinia	3 200
	Total	23 200

TABLE VII—4

VILLAGE WATER SUPPLY SCHEMES PENDING DURING 1980

Ser. No. — Village and Nature of Scheme

NICOSIA DISTRICT

1 Klirou—Additional supply
2 Ayios Yeoryios—Alternative scheme from spring
3 Kalo Khorio—Improvements
4 Pera Politiko—Additional supply
5 Kalliana—Additional supply from Arnaoutou spring
6 Linou—Replacement of main conveyor
7 Lymbia—Additional supply
8 Aredhiou—Improvement of Distribution system
9 Laxia—Industrial area
10 Sha—Improvements
11 Pera—Extensions
12 Astromeritis—Extensions
13 Dhali—Additional supply
14 Argates—Additional supply

LIMASSOL DISTRICT

1 Ayios Thomas—Additional supply
2 Akrounda—Development of spring - Extensions
3 Anoyira—Improvements
4 Apsiou—Additional supply
5 Kellaki—Extensions
6 Kilani—New storage tank-pipelines
7 Ladies Mile—New scheme
8 Moni—Additional supply
9 Moutayiaka—Livestock area
10 Kato Platres—Additional supply
11 Omodhos—Additional supply
12 Prastio—Livestock area
13 Prastio (Kellaki)—Additional supply
14 Sotira—New main conveyor
15 Troodos—New scheme
16 Phini—Additional supply to Troodhitissa
17 Dhoros—Construction of reservoir
18 Palodhia — Extensions and replacement of main pipeline
19 Phinikaria — Connection of WS system to the Moutayiaka scheme
20 Ayios Tykhonas — Construction of storage tank
21 Pendakomo—Additional supply Extensions
22 Erimi—Extensions & Improvements
23 Asgata—Additional supply

PAPHOS DISTRICT

1 Akoursos—Additional supply and house to house connection
2 Anavargos—Extensions

3 Theletra—Use of surplus WS
4 Kallepia—Amendments to scheme
5 Coral bay—
6 Pelathousa — Replacement of main line
7 Khlorakas—Extension
8 Khrysokhou—Additional supply
9 Paphos—Kiniras Housing Estate
10 Panayia—Additional supply
11 Arodhes—Additional supply

LARNACA DISTRICT

1 Alaminos—Livestock area
2 Kophinou—Additional supply
3 Xylotymbou—New scheme from B/H
4 Xylophaghou—Livestock area
5 Khirokitia—Additional supply
6 Mosphiloti—Additional supply
7 Kornos—Combined scheme
8 Psevdhas—Building plots
9 Klavdhia—Additional supply from B/H 51/80

FAMAGUSTA DISTRICT

1 Paralimni—Industrial area

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 by 1000 to 1500 donums 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 Small 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 agroeconomic 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 higher or seasonal storage, the exploitation of new boreholes and the artificial recharge of depleted aquifers.

A certain number of schemes has been designed and is under construction with full government contribution.

During 1980 a total number of 24 schemes has been prepared and submitted

TABLE VII–5. IRRIGATION SCHEMES PREPARED IN 1980 AND SUBMITTED TO DISTRICT OFFICERS

Ser. No.	Village	Division or Association	Locality	Nature of Proposed Work	Estimated Cost	Village Contr.	Irrigation Perm.	Irrigation Seas.
NICOSIA DISTRICT					£	%		
1	Kalokhorio	Division		Distribution pipes	1 800	33	—	—
2	Koutraphas	Division	Mounnes-Kalianitika	Lining of canals	8 400	33	14	110
3	Meniko	Division	Kyra tou Dhiakou	Lining of canals	10 800	33	—	250
4	Milikouri	Division	Plati	Pumping scheme	100 000	33	—	—
5	Orounda	Division	Neron Philippou	Pumping scheme	8 400	—	—	—
6	Tembria	Division	Avlakoudhin	Lining of canals	1 600	33	—	—
7	Argates	Division	Kounnapis	Improvements	11 000	33	200	60
8	Pedhieos	—	—	Lining of Pedhieos River	215 000	—	—	—
9	Potami	Division	Potamos	Pumping scheme	15 000	—	—	—
10	Pedhieos	—	Episkopio	Recharge works (Gabion)	9 300	—	—	—
11	Dhali	Division		Lining of canals	4 400	33	—	—
12	Akaki	Assoc.	Riatikon	Lining of canals	8 000	50	—	—
13	Argates	Division	Phourkismenos	Extensions	10 200	—	—	—
14	Galata-Sina Oros	Division	—	Lining of canals and pipelines	14 500	33	—	—
15	Nikitari	Division		Pumping scheme	71 000	33	—	—
16	Dhali	Assoc.	Hji Stavrinos	Pumping scheme	28 000	—	—	—
17	Chakistra	Division		Spring Development	3 000	33	—	—
				Total	£520 400			

TABLE VII—5. IRRIGATION SCHEMES PREPARED IN 1980 AND SUBMITTED TO DISTRICT OFFICERS (Cont.)

Ser. No.	Village	Division or Association	Locality	Nature of Proposed Work	Estimated Cost	Village Contr.	Irrigation Perm.	Irrigation Seas.
					£	%		
LIMASSOL DISTRICT								
1	Evdhimou	Division	—	Emergency Irrig. scheme	14 000	—	—	—
2	Lemithou	Division	Esso Livadhia	Temporary scheme	7 000	—	—	—
3	Prodhromos	Division	Prodhromos reservoir	Improvements of Diversion weir	2 500	33	—	—
4	Paleomylos	Division	Khardjis-Ay. Yeoryos	Pipe-laying	1 550	33	—	—
					£25 050			
LARNACA DISTRICT								
1	Psematismenos ...	Division	Drakondies	Improvements & extensions of Distribution system	18 500	—	—	—
PAPHOS DISTRICT								
1	Mamonia	Division	Mamonia	Extensions from B/H 4/63	5 100	33	—	—
2	Mamonia	Division	—	Replacement of conveyor	1 800	—	—	—
				Total	£ 6 900			
FAMAGUSTA DISTRICT								
1	Paralimni	—	—	Improvements of river bed	30 000	—	—	—

to the District Officers, at a total estimated cost of £600,850 as per table VII—5.

Another 63 schemes were in the course of preparation or investigation by the end of 1980 as per table VII—7.

Brief description of the most important Irrigation Schemes prepared during 1980

Pedhieos River: The scheme prepared is for the river training of Pedhieos river near the Presidential Palace and is part of a general scheme to re-line Pedhieos river. The estimated cost of this phase of the scheme is £215,000.

Nikitari: A pumping scheme from B/H No. 121/78 near Koutraphas has been prepared for the irrigation of 295 donnums of new land at a total estimated cost of £71,000.

Dhali: A Pumping scheme from "Hji Stavrinos" Irrigation Association chain of wells has been prepared at a total estimated cost of £28,000.

Paralimni: The scheme prepared is to improve the river bed at a total estimated cost of £30,000.

Pitsilia Integrated Rural Development Project

The Division is dealing with the rural domestic water supply and rehabilitation of irrigation schemes within the Pitsilia Integrated Rural Development Project.

Water Supplies. During 1980 a total number of 11 schemes were prepared as per table VII—8, at a total estimated cost of £261,350.

By the end of the year a total number of 9 schemes were at the course of preparation as shown on table VII—8a.

Rehabilitation of Irrigation schemes. The total number of schemes prepared and submitted to the co-ordinator of the Project is 14 at a total estimated cost of £76,690 as per table VII—9.

These projects are evaluated with the internal rate of return method.

By the end of the year 191 schemes were pending for investigations, as per table VII—9A.

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 agroeconomic data in the preparatory stages of the projects During 1980, 17 schemes have been considered by the committee as per tables VII—6 and VII—6A.

Capital Aid from the Federal Republic of Germany

During 1980 a total of £117,700 was reinmbursed 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 ... 4
Investment cost of projects £1 253 041
Amount which can be claimed from loan £1 253 041
Amount reinmbursed upto the end of 1980 ..... £ 16 745

Minor Projects (Over £15,000)

Total number of projects ..... nill
Investment cost of projects ..... "
Amount which can be claimed from loan ..... "
Amount reinmbursed up to the end of 1980 ..... "

Minor Projects (Up to £15,000)

Total number of projects 19
Investment cost of projects .. £261 335
Amount which can be claimed from loan £261 335
Amount reinmbursed upto the end of 1980 ..... £100 955
Total amount reinmbursed from loan up to the end of 1980 ... £117,700

Quarrying River Beds

In order to co-ordinate the activities of the Departments concerned, i.e. the District Officers, the Department of Mines and this Department and in order to bring about effective supervision and the enforcement of conditions included in the quarry licences issued by the Department of Mines or the District Officer an advisory Committee was set up in 1976.

During 1980 this committee examined 158 cases and advised the Senior Mines Officer and the District Officer accordingly.

Encroachment in Rivers - Streams

Some 111 cases for land encroachment in rivers and streams were examined and the Director of Lands and Surveys was advised accordingly.

New Nicosia - Limassol Road

During 1980 a committee was set up by several Departments to advise the Resident Engineer of the P.W.D. and the contractor on suitable places for dumping the surplus material, and also suitable areas to borrow material for the new road.

TABLE VII—6

SMALL IRRIGATION SCHEMES APPROVED BY THE INTERDEPARTMENTAL COMMITTEE IN 1980

Ser. No. Village and Scheme

1 Kato Koutraphas — Mounnes and Kalianitika ID
2 KaloKhorio (Klirou)—KaloKhorio ID
3 Meniko—Kyra tou Dhiakou (Dhisia tou Palazi) ID
4 Argates—Kounnapis IA
5 Tembria—Tembria-Sina Oros (Avlakoudhi) ID
6 Galata-Sina Oros — Galata-Sina Oros ID
7 Orounda—Orounda ID
8 Nikoklia—Nikoklia ID
9 Nikitari—Nikitari ID
10 Paleomylos—Khardjis - Ayios Georyios ID

11 Ayios Ioannis (Mal.)—Ayios Ioannis ID
12 Ayios Ioannis (Mal)—Pitsillis IA

TABLE VII—6A
SMALL IRRIGATION SCHEMES NOT APPROVED BY THE INTERDEPARTMENTAL COMMITTEE IN 1980

Ser. No. Village and Scheme

1 Ayios Therapon—Koukoutas - Kephalovrysos ID
2 Yerasa—Yerasa ID
3 Milikouri—Platis Irrigation Works
4 Potami—Potamos ID
5 Akaki—Akaki ID

TABLE VII—7
SCHEMES IN THE COURSE OF PREPARATION UNDER INVESTIGATION OR PENDING DURING 1980

Ser. No. Village and Scheme

NICOSIA DISTRICT

1 *Lythrodhonda* Kato Pervolia—Distribution pipes.
2 *Potami* Sikamies - Mosphilera—Irrigation scheme.
3 *Psomolophou*—Lining of canals.
4 *Dhenia* Neron Hodzia — Pumping scheme.
5 *Kalopanayiotis* K. Gnoudhia — Construction of irrigation tank.
6 *Mitsero* — Improvement or construction of intake.
7 *Potamia*—Reactivation of old ID
8 *Pyrgos*—Improvements.
9 *Kochati*—Lining of canals.

LIMASSOL DISTRICT

1 *Ayios Dhimitrios*—Use of borehole 58/77
2 *Ayios Mamas* — Use of borehole 53/77
3 *Arsos* — Construction of reservoir and placing of distribution pipelines.
4 *Apsiou*—Distribution of pipelines.
5 *Kilani*—Irrigation scheme.
6 *Kouka*—Use of borehole 69/74
7 *Omodhos*—Use of boreholes 92/77, 93/77, 103/77
8 *Paramali*—Design of Irrig. scheme.
9 *Parekklisha* Kambos Stratoura — New borehole and extension.
10 *Perapedhi*—Construction of storage tank.
11 *Kato Platres* Esso Livadhi - P & K Sanatsia—Creation of ID and Irrigation works.
12 *Prastio* (Evd) Plekou—Irrig. works
13 *Prodhromos* Khardji — Use of surplus water.
14 *Pyrgos* Almirovrisi-Rigena Intake — Construction of storage tank.
15 *Phini* Phini — Improvement of main canal.
16 *Ayios Dhimitrios* Kaloyiros—Extensions.

PAPHOS DISTRICT

1 *Akourdhalia Kato* Krommidi—Irrigation works.
2 *Akourdhalia Kato* Krommidi — Recharge works.
3 *Akourdhalia Pano* Krommidi — Use of borehole 93/76.
4 *Amargeti* Zimbilis—Extensions.
5 *Arodhes* K. Arodhes — Improvement of irrigation scheme.

6 *Vrecha* Kephalovryso - Zandi — Improvements.
7 *Yiolou* — Use of water.
8 *Theletra* Vellousha — Use of the spring.
9 *Kathikas* Mylos—Improvements.
10 *Kedhares* Plistra — Construction of earth reservoir.
11 *Kritou Terra* Kremiotis — Irrigation works.
12 *Kritou Terra* — Construction of reservoir.
13 *Kritou Terra* — Improvements.
14 *Lemona* — Use of the water of Anirneti Spring.
15 *Mesana*—Irrigation works from private spring.
16 *Nata*—Extensions.
17 *Nikoklia*—Use of B/H 51/72 P 39.
18 *Polemi*—Use of B/H 26/60
19 *Polemi* Maratha—Use of B/H 7/79
20 *Pyrgos* Phragma—Distribution pipelines.
21 *Skoulli* Kryos potamos — Improvements.
22 *Statos & Ayios Photios Vrecha* — Improvement of irrigation scheme of Vrecha using surplus of states Ay. Photios W S.
23 *Steni*—Use of borehole.
24 *Trakhypedhoula* — Use of Borehole 173/61
25 *Philousa* Yerontas — Distribution pipelines.
26 *Kholetria*—Extensions.
27 *Khoulou* Phillarotos—Extensions.
28 *Argaka* — Use of government borehole.
29 *Salamiou*—Use of B/H 97/79

LARNACA DISTRICT

1 *Athienou*—Use of boreholes for ir.
2 *Alaminos*—Recharge works
3 *Aradhippou*—Antiflood works.
4 *Meneou*—Recharge works.
5 *Skarinou*—Extensions.
6 *Tersephanou*—Recharge works.
7 *Khirokitia*—Extensions.
8 *Dhromolaxia*—Antiflood works.

TABLE VII—8

WATER SUPPLY SCHEMES WITHIN PITSILIA PROJECT PREPARED AND SUBMITTED IN 1980

Ser. No.	Village & Nature of scheme	Est. Cost
	NICOSIA DISTRICT	£
1	Apliki—Additional WS	1 350
2	Palekhori (M)—Additional supply from B/H 81/79	32 500
3	Palekhori (O)—Additional supply	27 500
4	Gourri—Extensions	1 600
5	Palekhori (O)—Extensions to 27th mile post	
6	Pharmakas—Additional supply from B/H 56/79	23 000
	LIMASSOL DISTRICT	
1	Sykopetra—W S of profitis Elias area	4 000
2	Ayios Theodhoros—W S of Listis locality	27 000
3	Ayios Pavlos—New scheme from Taoutis spring	6 000
4	Agros—New W S scheme ..	122 000
	Total	159 000
	LARNACA DISTRICT	
1	Ora—Additional W S	16 400

TABLE VII—9 IRRIGATION SCHEMES WITHIN PITSILIA PROJECT PREPARED IN 1980

Ser. No.	Village	Division or Association	Locality	Nature of Proposed Work	Estimated Cost	Village Contr.	Irrigation Perm.	Irrigation Seas.
					£	%		
NICOSIA DISTRICT								
1	Pharmakas	Assoc.	Ayios Yeoryios	Distribution pipelines	1 800	—	18	—
LIMASSOL DISTRICT								
1	Kato Amiandos ...	Division	Kardama-Hji Phisouni	Distribution pipelines	5 700	33	—	—
2	Kato Amiandos ...	Division	K. Amiandos-Pelendria	— do —	10 000	33	—	—
3	Ayios Theodhoros	Division	Ayios Yeoryios	— do —	3 370	33	9	—
4	Agros	Division	Sikamero	— do —	3 500	33	5	—
5	Agros	Division	Anastasia	— do —	2 150	33	69	—
6	Ayios Theodhoros	Division	Maroudhes	— do —	2 100	33	9	—
7	Ayios Ioannis	Division	Peroyia	— do —	6 700	33	—	—
8	Sykopetra	Division	Kountourka	— do —	6 600	33	33	—
9	Sykopetra	Division	Agridhia Konomidhes	— do —	2 100	33	—	—
					7 300, 3 800			
10	Pelendria	Division	Dhimma—Koripi/Kolokasi	— do —	2 400	33	34	—
11	Zoopiyi	Division	Kato Votanos	— do —	2 700	33	—	—
12	Ayios Theodhoros	Division	Kouphes	— do —	10 770	—	30	—
				Total	£69 190			
LARNACA DISTRICT								
1	Odhou	Division	Odhou "B"	Distribution pipelines	5 700	—	—	—

VIII LARNACA-FAMAGUSTA REGIONAL OFFICE

by
G Frangopoulos
Technician I—Ag. Head

General

By the end of the year the staff of the Regional Office was composed of the following officers:-

1 Executive Engineer
2 Technicians I
1 Assistant Chief Foreman
5 Technicians II
8 Regular Employees
1 Secretary Typist
1 Driver

T N Hamatsos EEI left for the United Kingdom for a one year scholarship on 1.8.1980.

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 groundwater conditions of the two districts, Famagusta and Larnaca were observed by means of 492 wells/boreholes.

The water levels (i.e. the distance from established bench marks on the top of the observation wells/boreholes to the ground water level) of 369 of them were taken twice this year i.e. in February before the irrigation period and in December after the irrigation period.

The water levels of 63 of these boreholes was taken every month and another 10 of them were taken every two months.

The water levels of 50 boreholes used for village water supplies were also taken once during the whole year.

Chemical Analyses

A total number of 590 samples were taken from Government communal or private boreholes or springs and were sent to the Government or Departmental Laboratories for chemical analysis.

Also a large number of samples (308) taken from wells and boreholes were analysed in the Regional Office for chloride content.

Boreholes Test Pumping

During the year the test pumping of 28 boreholes for village water supply and for private use were carried out.

Plotting of Boreholes

Plotting of wells/boreholes in the Famagusta - Larnaca Hydrological Area continued and the total number of wells/boreholes plotted were 227.

Questioning

The annual questionnaire was carried out in the area where the plotting was completed. A total number of 5711 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 13 applications for quarries which were sent to the District Office by the Department of Mines were examined on the spot and returned to the above Department with the comments of this office.

Southern Conveyor Project

During this year two officers were dealing, partly in different studies, concerning the Southern Conveyor Project.

The ground water levels of 100 wells/boreholes was taken in the area of South-Eastern Mesaoria and another 40 in the area of Kiti.

In addition the water levels were measured by 4 automatic recorders, situated at Kiti, Xylophaghou, Liopetri and Phrenaros and were visited once a month.

Well Sinking Permits

A total number of 768 applications for sinking, covering permits and the change of the condition of permits of wells/

boreholes were examined in the two Districts, Famagusta and Larnaca, and were presented to the General Advisory Committee for wells/boreholes of the Ministry of Agriculture and Natural Resources.

711 applications are of cases lying in the conservation areas and the other 57 in the non-conservation areas. For Famagusta District 335 applications were approved and for Larnaca District 107.

Apart from the above applications 394 cases dealing with boreholes wells were also examined direct from the Regional Office and were submitted to the District Officer of Larnaca and Famagusta.

The above applications concerned cases for the renewal of lease agreements of boreholes drilled on Government or Forest Land, or cases of cleaning or deepening of existing wells/boreholes.

From the above 223 cases were approved and 54 were not, and 117 were returned to the District Officers for further information.

INVESTIGATION AND DESIGN

Investigations

During 1980 the following investigations were carried out:

LARNACA DISTRICT

Aradhippou: Anti-flood works. Improvement and expansion of village water supply network. For the solution of water supply problems. Water supply for new division of plots.

Anaphotia: For the solution of water supply problems. Recharge works in Xeropouzos river.

Zyyi: Improvement of water supply to the army camp. Expansion of Zyyi-Tokhni Irrigation Division.

Psematismenos: For the solution of water supply problems. Improvement of Drakonties Irrigation Division.

Xylotymbou: Water supply for new division of plots.

Kalokhorio: For the solution of water supply problems.

Alaminos: For recharge works in Xeropotamos river. For the solution of water supply problems.

Khirokitia: Expansion of the Anephantis Irrigation Division.

Ayii Vavatsinias: Improvement of overflow of water supply springs.

Voroklini: Improvement of the village water supply. Investigation for the construction of a new tank for the village water supply. Water supply to the slaughter house. Investigation for drainage works.

Troulli: Water supply for new division of plots. Investigation for water supply problems.

Skarinou: Expansion of the village irrigation division. Improvement of Skarinou Station water supply.

Kalavasos: Improvement of the village water supply. Recharge works in Vasilikos river.

Menoyia: Conveyance of dirty water from the dipping tank for the sheep.

Investigation for water supply to new refugee plots.

Maroni: Expansion of the village Irrigation Division.

Kiti: Investigation for the construction of dipping tank for sheep. Improvement of village water supply. Improvement of Kiti Dam Irrigation Works.

Pyla: Investigation for improvement of village water supply.

Kellia: Investigation for water supply to new refugee camps.

Klavdhia: Investigation for water supply to new refugee camps.

Livadhia: Improvement of village water supply, and anti-flood works.

Sophtadhes: Water supply for the village stock farming area.

Pyrga: Investigations for the solution of water supply problems.

Dhromolaxia: Investigations for water supply to new refugee plots. Solution of water supply problems. Investigation for expansion of part of the two stock farming areas water supply network.

Ayios Theodhoros: Investigation for the water supply problems and the construction of a dipping tank. Expansion of the village Irrigation Division from Borehole 64/73.

Dhekelia (EAC): Investigation for water supply of the Refugee Self Housing Camp.

Alethriko: Investigation for the solution of water supply problems, and for the connection of a dipping tank with the existing water supply of the village.

Meneou: Solution of water supply problems.

Tersephanou: Investigation for the construction of recharge works in Tremithos river.

Anglisidhes: Investigation for the improvement of village water supply. Improvement for the village irrigation division Anglisidhes 2.

Perivolia: Solution for the water supply problems. Investigation for the connection of a dipping tank with the existing water supply of the village.

Mari: Solution of water supply problems.

Mazotos: Solution of water supply problems. Investigation for the connection of a dipping tank with the existing water supply of the village.

Ormidhia: Improvement of the village water supply.

Mosphiloti: Improvement of the army camp water supply and for the solution of water supply problems of the village.

Odhou: Expansion of irrigation network of Odhou 2 Irrigation Division.

Vavatsinia: Investigation for the removal of the pipeline of spring for Vavla water supply.

Psevdhas: Investigation for the improvement of village water supply.

Kophinou: Investigation for the removal of irrigation pipeline. Solution of the village water supply problems.

FAMAGUSTA DISTRICT

Akhyritou (Vrysoulles): Improvement of the Refugee Self Housing Camp water supply. Investigation for the water supply of a dipping tank.

Paralimni: Solution of water supply problems. Improvement of the river bed flowing through the village.

Liopetri: Improvement of the village water supply and expansion of the water supply network. Anti-flood works.

Dherinia: Investigation for water supply of new Refugee plots. Solution of water supply problems and water supply for new division plots. Investigation for recharge works.

Ayia Napa: Improvement of the village water supply from new boreholes. Improvement and expansion of village water supply network to Tourist Area.

TABLE VIII—1

DESIGNS SUBMITTED TO THE DIRECTOR FOR APPROVAL

Ser. No.	Village and Scheme	Est. Cost £
	A. VILLAGE WATER SUPPLY SCHEMES	
	LARNACA DISTRICT	
1	Kiti - Meneou - Perivolia - Dhromolaxia-Tersephanou—Improvement of the complex water supply	60 000
2	Anglisidhes—Improvement and expansion of village water supply	16 000
3	Aradhippou—Improvement and expansion of village water supply	62 000
4	Refugee Camp at Dhekelia EAC — House to house Scheme	37 000
5	Government Refugee Camp at Ormidhia—Improvement of W S	1 800
6	Skarinou—Pipeline extension from village to Skarinou station	8 500
7	Mosphiloti—Improvement of army camp water supply ...	1 400
8	Zenon Government Housing Estate — House to House Scheme	27 000
9	Kellia (Refugee Housing Camp) — House to House Scheme	6 000
10	Klavdhia (Refugee self Housing Camp)—House to House Scheme	3 000
11	Dhromolaxia (Refugee Self Housing Camp)—House to House Scheme	7 500
	FAMAGUSTA DISTRICT	
1	Ayia Napa—Improvement and expansion of village water supply	145 000
2	Ayia Napa—Water supply for tourist area	180 000
3	Ayia Napa—Improvement of village water supply from B/H Hydr. No. 26	23 000
4	Liopetri—Improvement and expansion of village WS ...	29 000
5	Dherinia (Refugee Self Housing)—House to House Scheme	3 200

B. IRRIGATION WORKS

LARNACA DISTRICT	£
1 Odhou—Expansion of irrigation network of Odhou 2 Irrigation Division	5 200
2 Anglisidhes—Improvement and expansion of Irrigation Division Anglisidhes 2	8 000
3 Psematismenos—Improvement and expansion of Irrigation Division Drakonties	18 000
4 Kiti—Repair of irrigation channel of Kiti Dam Irrigation network	29 000

FAMAGUSTA DISTRICT	£
1 Paralimni—Lining of river bed in RCC between the stadium road bridge and Ayia Napa by-pass bridge	30 000

C. VARIOUS SECONDARY ESTIMATE COST

1 Anaphotia—Improvement of the village water supply (central water meter)	40
2 Zyyi—Improvement of the army camp water supply (replacement of the main pumping line)	550
3 Voroklini—Slaughter house water supply	130
4 Troulli—Improvement of the village water supply (central water meter)	130
5 Menoyia—Conveyance of effluent from sheep dipping tank	600
6 Kiti—Connection of dipping tank with the existing water supply of the village	60
7 Mazotos—Connection of dipping tank with the existing water supply of the village	60
8 Alethriko—Connection of dipping tank with the existing water supply of the village	40
9 Pyrga—Improvement of spring of the village water supply	80
10 Dhromolaxia—Expansion of part of the two stock farming areas water supply network	1 100
11 Aradhippou—Replacement of the destroyed water meters of the stock farming area water supply	550
12 Anglisidhes—Improvement of spring of the village water supply	278
13 Mari—Replacement of the destroyed water meters of the village water supply ...	90
14 Ay. Theodhoros—Replacement of the destroyed water meters of the village water supply. Expansion for the irrigation of new citrus gardens from Government Borehole No. 64/73	2 300

CONSTRUCTION

During 1980 the Larnaca—Famagusta Regional Office undertook the construction of numerous works for routine water supply schemes for villages, minor irrigation schemes and water supply to Refugee housing estates. For all

construction works details see Tables under CONSTRUCTION DIVISION.

Labour Force Involved

The total number of staff employed by the Regional Office for the execution of the above works was as follows:

Monthly paid foremen	3
Hourly paid foremen	3
Regular employees	21
Casual employees	13

APPLICATION TO INSTALL PUMPING UNITS ON T/C WELLS

A total number of 2 applications were submitted to the Larnaca Regional Office for installing pumping units on T/C wells/boreholes, thus raising the total number from the year 1976 to 1980 to 140.

These applications after being examined on the spot were submitted to the Central Committee for approval.

MEETINGS

During 1980 the Regional Engineer (for the initial 7 months) and the Ag. Head (for the rest of the year) attended several meeting as representatives of the Director WDD.

IX LIMASSOL REGIONAL OFFICE

by
V Partasides
Executive Engineer
Regional Engineer

General

This Office is responsible for the activities of the District of Limassol. Its functions are divided into four main categories as follows:

- —Hydrology: Surface and groundwater measurements and studies.
- —Design of major irrigation, minor irrigation and water supply schemes.
- —Construction of major irrigation, minor irrigation and water supply schemes.
- —Maintenance of all existing irrigation and water supply schemes.

The Limassol Regional Office is manned by thirty four staff who serve in the various sections as follows:

- —*Hydrology* 9
- —*Design* 7
- —*Construction* 9
- —*Maintenance* 2
- —*Clerical* 4

For the excecution of the construction works 18 foremen and 180 workers were engaged.

HYDROLOGY

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 and at the same time water samples (24 No) were taken for suspended sediment analysis. Water samples (78 No) were also taken periodically, from all rivers, for chemical analysis. Additional current meter measurements (93 No) were taken in Amathos and Garyllis rivers, at the overflow of Yermasoyia and Polemidhia dams.

Springs and Streams

The discharge of 106 springs and streams were measured at monthly or weekly intervals for the benefit of village water supplies, Limassol water supply, the design of minor irrigation and domestic water supply projects and for hydrological observations.

A total of 894 spring discharges were taken either volumetrically or by means of the current meter. Water samples from these springs and streams were taken once during the year, for chemical analysis.

In addition the discharge of 41 springs and streams and the water level of 71 wells/boreholes were measured, within the framework of PIRDP. A total of 946 spring and stream measurements and 482 water level measurements were taken.

Groundwater Hydrology

Hydrological investigations and measurements were carried out in the Special Measures Law area of Akrotiri and the water conservation areas of Yermasoyia, Moni-Pyrgos, Paramali-Evdhimou, Pissouri-Evdhimou, Parekklisha and the rest of Limassol District.

Special Measures Law — Akrotiri Aquifer

Hydrological observation and control is exercised by means of 190 wells or boreholes strategically situated in the area.

Water level measurements are taken twice a year from the above wells or boreholes except from 135 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 intrusion in the aquifer is observed and studied by means of 55 wells or boreholes at Zakaki-Asomatos area and 23 wells or boheroles at Akrotiri

area, water samples from which are taken 3-4 times a year.

Water pumped from the aquifer for irrigation, domestic and industrial purposes is noted monthly for each individual licenced well, by means of 393 water meters, 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 their distribution system, and from Kouris river, through the irrigation intakes, up to May 1980.

Water extracted from Akrotiri Aquifer.

Purpose	Qty MCM
Irrigation	8.73
Domestic	2.27
Industrial	0.93
Total	11.93
Water supplied from dams	6.49
Total supplied for irrigation	15.22

Water Conservation Areas

The water situation within the Water Conservation Areas is also observed by means of 213 wells/boreholes, the water level of which is measured twice a year and the total of water extracted is estimated by the method of questioning.

Especially the Yermasoyia aquifer is observed more closely, by means of 20 wells/boreholes, the water level of which is measured once every month.

Salinity is also observed by taking samples for analysis twice a year.

The number of observation wells/boreholes in the Hydrological Areas, which are under control, is 213 ie 148 east of Limassol and 65 in the west.

Well Sinking Permits

Well sinking permits granted and applications to transfer water to other plots, or permits to install engines or adjustment of pumping permits were investigated as follows: Some 390 applications were investigated and permits were granted for 335 of them.

DOMESTIC WATER SUPPLIES

Limassol Water Supply

Water supply to Limassol, for domestic purposes 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 analyses. A total quantity of 7.34 MCM was supplied, 1.80 m^3 from springs and 5.54 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. 43.8 mm on 13/2/1980), water evaporation (Max. 12.8 mm on 1/7/1980), temperature (Max. 39.5° C on 1/7/7980), wind, velocity and sun reflection, at Yermasoyia dam.

Records were also kept for rainfall (Max. 65.0 mm on 13/2/1980) and water evaporation (Max. average 9.0 mm for 4 days period 1/7/1980—4/7/1980). at Polemidhia dam.

Quarry and Gravel Pit Permits

Fifteen applications for quarries and gravel pit licences, were examined and submitted to the Senior Mines Officer.

PLANNING AND DESIGN

The solution of the irrigation and water supply problems of Limassol District was the major task of this section.

Irrigation Branch

For the development of irrigation system of Limassol District, 23 cases were examined, studied and the relevant designs were prepared for the total cost of £183,684, as follows:

TABLE IX—1

IRRIGATION SCHEMES PREPARED IN 1980

Ser. No.	Village & Description	Estimate cost £
1	Kilani—Improvement of Kilani Irrigation Division	9 600
2	Vouni—Diversion of overflow of WS scheme to chain of wells	270
3	Agros—Improvement of Anastasia Irrigation Division	2 150
4	Ayios Ioannis—Improvement of Perogia Irrig. Division	6 350
5	Ayios Theodhoros—Improvement of Ayios Yeoryios proposed Irrigation Division	3 370
6	Ayios Theodhoros—Improvement of Maroudhes proposed Irrigation Division	6 000
7	Agros—Improvement of Sykameri proposed irrigation Division	3 250
8	Pano Platres—Revision of Pano Platres Irrig. Division ...	6 900
9	Evdhimou—Temporary irrig. scheme for vines plantations of the area	14 000
10	Ayios Mamas—Improvement of B/H 53/77 for proposed Irrigation Division	37 844
11	Phini—Irrigation scheme for Plot 240/1 Sh/Pl 47/2 of Phini Irrigation Division	280
12	Phini—Improvement of Vines Irrigation Division	14 400
13	Moniatis—Replacement of Irrigation Division Saittas—Moniatis pipelines from M & S Estates land	3 500
14	Dhymes—Improvement of Hji Pelendros Irrigation Division (construction of storage tank)	3 900
15	Potamitissa—Improvement of Hasanis Irrigation Division ...	3 400
16	Kato Polemidhia—Extension of Kato Polemidhia Irrigation Division	21 750
17	Ayios Dhimitrios—Improvement of Kaloyiros Irrigation Division	5 250
18	Episkopi—Irrigation scheme for Episkopi Irrig. Division ...	900

19	Ayios Therapon—Revision of Koukoutos-Kephalovrysos Irrigation scheme	12 600
20	Trimiklini—Scheme to take water from Moniatis river to Trimiklini village for winter plantations	5 000
21	Zoopiyi—Improvement of Kato Votanos proposed Irrigation Division	2 700
22	Ayios Theodhoros—Improvement of Kouphes Irrigation Division	10 770
23	Ayios Konstantinos—Improvement of Merica-Raeburn Irrigation Division	9 500
	Total	£183 684

Water Supply Branch

For the development of the water supply systems of Limassol District, 43 cases were examined and the relevant designs were prepared for a total cost of £393,216 as follows:

TABLE IX—2

DOMESTIC WATER SUPPLY SCHEMES PREPARED IN 1980

Ser. No.	Village & Description	Estimate cost £
1	Yermasoyia—Automatic system on one of the water supply boreholes	500
2	Evdhimou—Animal farm water supply	8 550
3	Erimi—Improvement of water supply scheme	18 500
4	Korphi—Improvement of water supply scheme	1 100
5	Akrotiri—Extension of distribution system	8 400
6	Moutayiaka—Refugee self-housing scheme phase B ...	21 300
7	Zakaki—Extension to plot 101/2, Sh/Pl 58/16	45
8	Ayios Athanasios—Improvement of spring and construction of a storage tank for Sfalangiotissa monastery	1 500
9	Kandou—Refugee self-housing scheme phase A ...	4 300
10	Episkopi—Refugee self-housing scheme phase B ...	12 000
11	Trakhoni—Supplementary WS for Merras locality	14 500
12	Ayios Athanasios—Extension for two houses	500
13	Trimiklini—New distribution system for the village	20 500
14	Pano Polemidhia—Refugee self-housing scheme	17 500
15	Omodhos—Improvement of B/H 92/77 and installation of water meters	26 750
16	Korphi—Improvement to distribution system	35
17	Ayios Tykhonas—Construction of high level storage tank ...	22 000
18	Pano Kividhes—Establishment of automatic system at the B/H of village water supply	500
19	Kolossi—Improvement of animal farm distribution system	200
20	Moni—Extension to plot 500 Sh/Pl 54/40	90
21	Korphi—Replacement of pipeline from plot 261 Sh/Pl 47/63	600
22	Trakhoni—Refugee self-housing scheme phase C ...	22 500
23	Paramali—Refugee self-housing scheme phase A ...	2 700
24	Moni—Extension of distribution system and construction	

of new storage tank 19 000
25 Ayios Athanasios—Supplementary supply for plots 271/2, 267/3 Sh/Pl 54/42 ... 1 200
26 Evdhimou—Supplementary of CYTA building plot 70/1 Sh/Pl 52/55 and 52/63 ..... 2 050
27 Monagroulli—Supplementary supply for plot 876 Sh/Pl 54/32 410
28 Klonari—Cleaning and protecting well for domestic purposes and installation pumping units 300
29 Episkopi—Supplementary supply for CYTA building on plot 261/7 Sh/Pl 53/61 ..... 1 100
30 Trimiklini—Replacement of pipelines from plots 648/1, 569/1, 649/1/1, 570 Sh/Pl 47/37 900
31 Yermasoyia—Supplementary supply for sea breeze buildings on plots 88/1, 87/1/2 Sh/Pl 54/52 ..... 1 070
32 Pano Platres—Supplementary supply for land division 550
33 Akrounda—Improvement of water supply by the old spring Ayiasma 96
34 Prastio Evdhimou—Protecting of Pervolia spring 600
35 Ayia Phyla—Construction of a storage tank for Polemidhia camp and distribution system 3 100
36 Vouni—Distribution system from old water supply spring to plot 626/1 Sh/Pl 47/50 ... 15 300
37 Ladies Mile Beach—Improvement of B/H EB 97/70 for domestic purpose of the area 133 000
38 Yermasoyia—Supplementary of Ser-Crico Hotel Apartments 380
39 Erimi-Kolossi—Substitution of pipeline near the B/H 220
40 Armenokhori—Extension of distribution system and repairing of water meters ... 120
41 Parekklishia—Supplementary of Polycast Panels Ltd land 8 300
42 Yermasoyia—Supplementary of Blu-Ske Lerzan Vocation buildings 470
43 Yermasoyia—New pipeline for Sea Gate buildings 480

Total £393 216

CONSTRUCTION

Construction of major irrigation projects and routine irrigation and domestic water supply schemes.

Major Irrigation Projects

Pissouri Irrigation Scheme

The Pissouri - Khapotami irrigation scheme consists of a diversion weir on Khapotami river, a main conveyor pipeline and balancing tank. The 10563 m long conveyor consists of 400, 300 and 250 mm dia AC pipes. Through this scheme an area of 3800 donums of vines will be irrigated. The scheme was completed by the end of 1980 at a cost of £200,717.

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.

Materials and Machinery

By the end of the year 1980 the following materials and machinery for minor and major irrigation and water supply projects have been used.

MEETINGS

During the year under review, the Regional Engineer attended several meetings as the representative of the Director of the Department.

TABLE IX—3
MATERIALS AND MACHINERY USED
BY LIMASSOL REGIONAL OFFICE

Materials Used	Major Projects	Minor Projects	Total
Asbestos cement pipes—m	5 274	4 544	7 818
Concrete aggregates—m^3	934	477	1 411
Cement—tonnes	139	241	420
Steel reinforcing bars—tonnes	4	10	14
Special fittings and joints—No.	1 591	9 867	11 458
Sluice valves—No.	8	1 160	1 168
Water meters—No.	—	536	536
Victaulic pipes—m	1 480	864	2 344
Galvanised iron pipes—m	18	25 852	25 870
Sand for pipe bedding—m^3	2 128	53	2 181
Steel pipes—m	6 210	588	6 798

Machinery Employed (hrs)	Major Projects	Minor Projects	Total
Concrete mixers	—	1 280	1 280
Diggers	1 031	1 482	2 513
Excavators	—	26	26
Cutting machines	—	180	180
Wheel loaders	1 966	139	3 932
Dumper trucks	2 452	814	3 266
Compressors	472	1 145	1 617
Welding machines	869	84	953
Mobile cranes	—	—	—
Land rovers	2 420	7 580	10 000
Vibrators	—	90	90
Dumper	—	—	—
Centrifugal pump	—	8	8
Bus	1 880	1 807	3 687

X PAPHOS REGIONAL OFFICE

by
A Lambrou
Executive Engineer I
Regional Engineer

General

By the end of the year the staff of the Paphos Regional Office was composed of the following:

1 Executive Engineer I—Head
7 Technicians II
8 Technical Assistants
1 Assistant Chief Foreman
1 Secretary—Typist

The Technical staff of the office was engaged in *Water Resources Construction, Design and Investigation.*

WATER RESOURCES BRANCH

The staff of the water resources branch was engaged in the collection of hydrological data as follows:

Surface Hydrology

Stream and Spring Gauging

During the year 12 permanent stream gauging stations equipped with automatic water level recorders were in operation and weekly visits were made for observation and calibration purpose by the use of current meter. A total number of 735 current meter measurements were taken during the year for calibration purposes. Also samples for suspended sediment and boron analysis were taken regularly.

During the year 29 springs were under observation and a total number of 525 spring discharges were gauged by current meter or volumetrically.

Village Water Supply

The water supply of 132 villages was checked during the months of September and October and samples for ionic and nitrates analysis were taken.

Rainfall Observing Stations

Four rainfall observing stations equipped with automatic raingauge 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 125 wells/boreholes.

The distance from the established bench marks on top of every observation well/borehole 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 and at the end of the dry season (November —December) when it is expected to be at the lowest level.

In addition, monthly or weekly measurements of the ground water level were taken from 112 wells/boreholes during the year for special studies.

Analyses

A total number of 393 samples for analysis were taken from wells/boreholes, springs and streams 113 of which for ionic and nitrates, 45 for boron, 9 for suspended sediment and 236 were analysed in the Paphos Regional Office for chloride content.

Questioning

The annual questioning was carried out in south western Paphos hydrological area during summer for determining the ground water extracted, area irrigated and kind of crops planted. A total number of 2450 cases carried out.

Well Sinking Permits

A total number of 169 applications for sinking and covering permits of wells/boreholes were examined and submitted to the District Officer of Paphos. These applications were finally examined and approved or not by the Advisory Committee of the Ministry of Agriculture and Natural Resources and 92 of them were approved.

Encroachment on Rivers and Streams

Sixteen cases for land encroachments on rivers and streams were examined and the Director of Land and Surveys was adviced accordingly.

Quarries and Gravel Pit Permits

Seventy six applications for quarries and gravels pit permits were examined and the supervision of the conditions especially in the river beds carried out by this office.

Plotting

During the year 107 new wells/boreholes were plotted at Polis and a total area of 5 km^2 was covered.

Pumping Schemes on T/C Boreholes

Seven applications regarding improvement of T/C boreholes were received by this office and relevant investigations were carried out, where necessary pumping schemes were prepared and reports were submitted to the central committee for approval.

INVESTIGATION DESIGN AND CONSTRUCTION BRANCH

The staff of the above branch was engaged on the following works.

Small Project Investigations and Designs

During the year 17 new schemes were designed and with estimated costs submitted to the headquarters for approval and inclusion in the budget of next year.

Applications to Divide Land and Building Permits

During 1980, 174 applications to divide land and building permits were examined by this office and reports submitted either to the Director of the Department or to Paphos District office.

Construction Works

The construction works carried out by the Paphos Regional Office are listed under CONSTRUCTION DIVISION.

Operation and Maintenance of Paphos Dams

The operation and maintenance of Paphos Dams was carried out by the staff of this Office and routine visits were carried out for this purpose. Detailed reports were prepared separately and submitted to the Director of the Department.

Committee Meetings

The Regional Engineer took part in numerous committee meetings as the representative of the Director WDD.