Dams in Cyprus
1964-1965

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DAM CONSTRUCTION 1964-1965

Large scale construction of dams in Cyprus is a feature of recent years. Most of the important water storage works have been constructed after the proclamation of Independence in 1960. The Government of the Republic realising the importance of water storage in a country like Cyprus where agriculture constitutes the main pillar of the economy and rainfall is scanty and unstable has launched a most ambitious and far-reaching programme of dam construction.

During the first five years of the Republic's life the sum of £3 million was spent in dam construction and the tempo is increasing. £1 million is provided in the 1966 Budget for dams and other water storage projects.

In the pages that follow an account is given of water storage projects completed or taken in hand during the years 1964–1965.

Cyprus is a semi arid land, receiving on the average 19 inches of rainfall, which amounts to one million gallons of water. This yields an average surface flow of 73,000 million gallons, and the loss to the sea is about 40,000 m. gallons annually. The Government of Cyprus in its efforts to save every drop of rainfall has embarked in its first 5-year programme into an extensive dam construction programme.

The achievements in construction of the 1st five year's plan record the impoundment of 3,500 million gallons of water which serves irrigation, recharge, water supply and flood control. (See graph below).
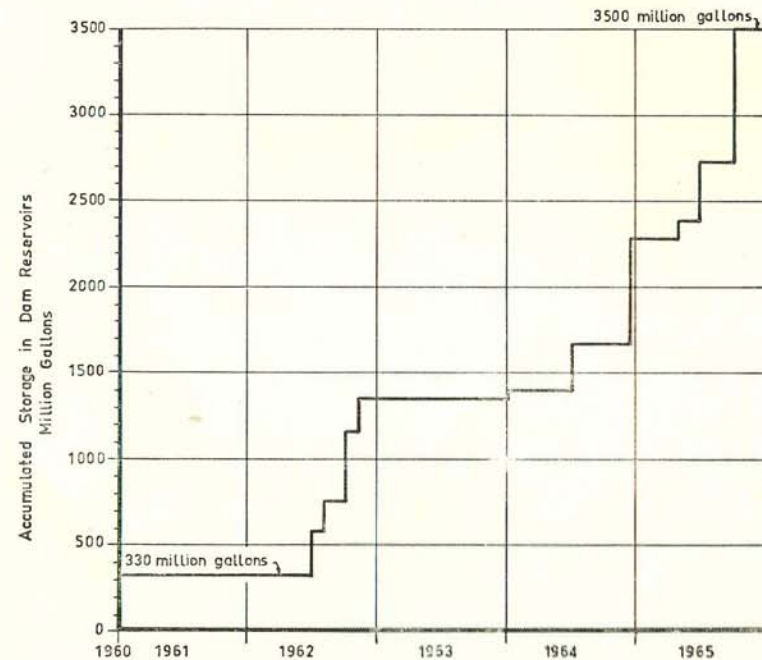
AGROS DAM

Agros dam was built on the uppermost reaches of Limnatis River, N.W. of Agros village. The water available for storage is derived from 0.4 sq. miles catchment, two upstream springs and the surplus domestic W.S. which comes from Troodos.

The design incorporates both rockfill and earthfill types, thus utilising materials available within 1 mile distance from the damsite.

The dam can impound a capacity of 25 million gallons or 100,000 cub. meters of water approximately. This will help irrigate 160 donums of fruit trees through 6000' of channel belonging to 150 small shareholders.
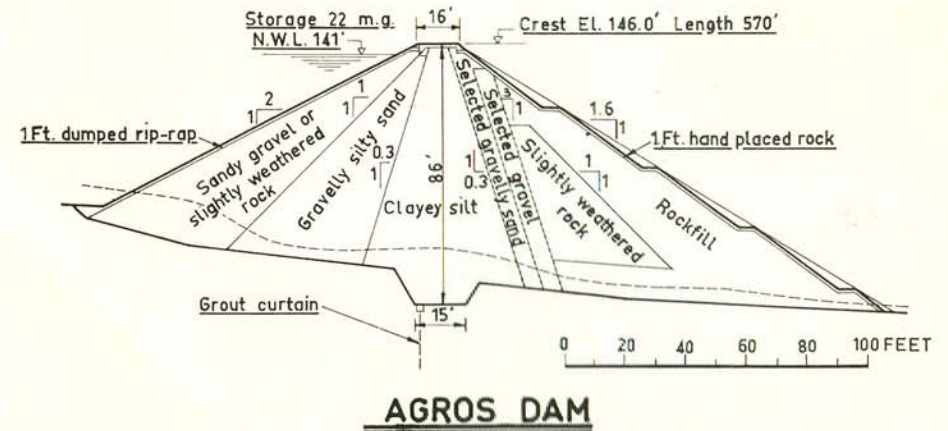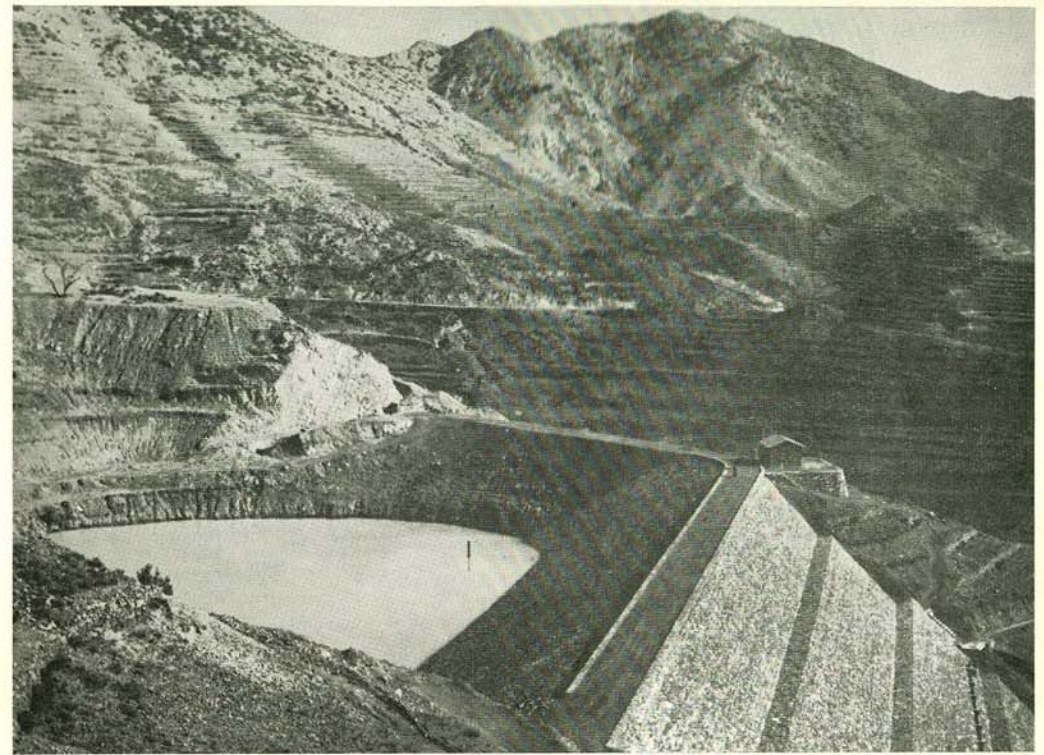
The Agros dam underlines Government efforts to develop the Pitsillia region. The indirect benefits of the dam will be :

(a) increase the low income of this area.

(b) stop the constant flow of manpower to the big cities in search of jobs.

Total expenditure of dam and distribution = £50,000.

Design Data :

1. Maximum height of Dam	85 feet
2. Maximum depth in the reservoir	48 feet
3. Capacity of reservoir	25 million gallons
4. Surface area of reservoir	3.51 acres
5. Total volume of fill	80,000 cub.yds. (includ. 15,000 cub. yds. of rock)
6. Upstream Slope	1 : 2
7. Downstream Slope	1 : 1.6
8. Maximum capacity of Spillway	180 cub. secs.
9. Catchment Area	0.4 sq. miles
10. Average rainfall in catchment	30 inches
11. Average annual run-off	35 million gals.
12. Length of chute	200 feet

AGROS DAM

Storage 253 mg
NWL 290.0

Crest El. 300.0 Length-421'6"

Alluvial material
with rockfill drains

Sandy sea gravel (SP)

Silty
clay
(Cl)

Sandy sea gravel (SP)

Rockfill

Rockfill

Gravel 6" max size

Concrete cutoff wall

0   20   40   60   80   100 FEET

ARGAKA-MAGOUNDA DAM

ARGAKA-MAGOUNDA DAM

The Argaka–Magounda dam was designed by Messrs Howard Humphreys, Consulting Engineers, London and constructed by Messrs Mowlem-Ridgway Joint Venture under bilateral agreement involving finance facilities. This dam was constructed at full Government cost and although the construction began in 1963 the embankment and spillway were finished in 1964 at a total cost of £275,000.

The Argaka–Magounda dam is of the rockfill type and measures 100 feet at its maximum height. This major irrigation scheme commands 2,500 donums of perennial and spring crops belonging to Argaka and Magounda villages.

Design Data :

|	
1. **Maximum height of Dam**	**100 feet**
2. **Maximum depth of water, in reservoir** ..	**90 feet**
3. **Capacity of reservoir**	**250 million gals.**
4. **Surface area of reservoir**	**26,5 acres**
5. **Total volume of fill**	**180,000 cub. yds.**
6. **Upstream Slope**	**1 : 1.5**
7. **Downstream Slope**	**1 : 1.75**
8. **Maximum capacity of Spillway**	**6,000 cub. secs.**
9. **Catchment Area**	**19,3 sq. miles**
10. **Average rainfall in catchment**	**30 inches**
11. **Average annual run-off**	**1,310 million gals.**
12. **Length of chute**	**Stepped spillway**
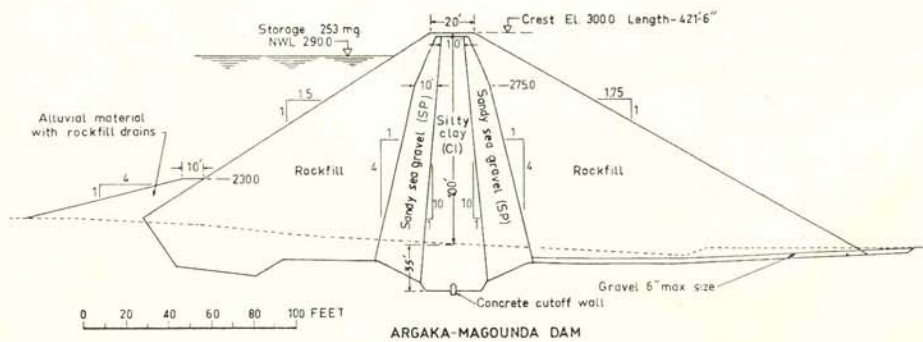
AYIA MARINA DAM

The Ayia Marina dam was also entrusted to Messrs Mediterranean Constructors as the Pomos dam. Designs were prepared by Messrs Energoprojekt, Consulting Engineers, Belgrade, and construction began in 1963. Beginning of 1964 the construction stopped because of abnormal conditions in the area and after terminating the contract, the job was taken over and completed in 1964 by the Water Development Department.

In 1965 the primary distribution system was completed and with completion of the secondary distribution system in 1966 this dam will command 500 donums of perennial irrigation.

The cost of dam and distribution amounted to £128,000.

Design Data :

1. Maximum height of Dam .. .. 100 feet
2. Maximum depth of water .. .. .. 87.5 feet
3. Capacity of reservoir .. .. 70 million gals.
4. Surface Area of reservoir .. .. 8,24 acres
5. Total volume of fill .. .. 80,000 cub. yds.
6. Upstream Slope .. .. 1 : 1.5
7. Downstream Slope .. .. 1 : 1.6
8. Maximum capacity of Spillway .. .. .. 4,500 cub. secs.
9. Catchment Area .. .. 3.6 sq. miles
10. Average rainfall in catchment .. .. .. 19 inches.
11. Average annual run-off .. .. 76 million gals.
12. Length of chute .. .. 150 feet

AYIA MARINA DAM

KALOPANAYIOTIS DAM
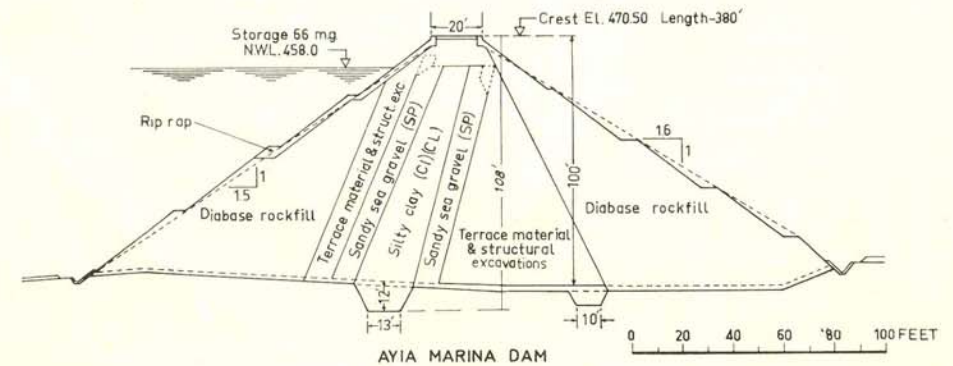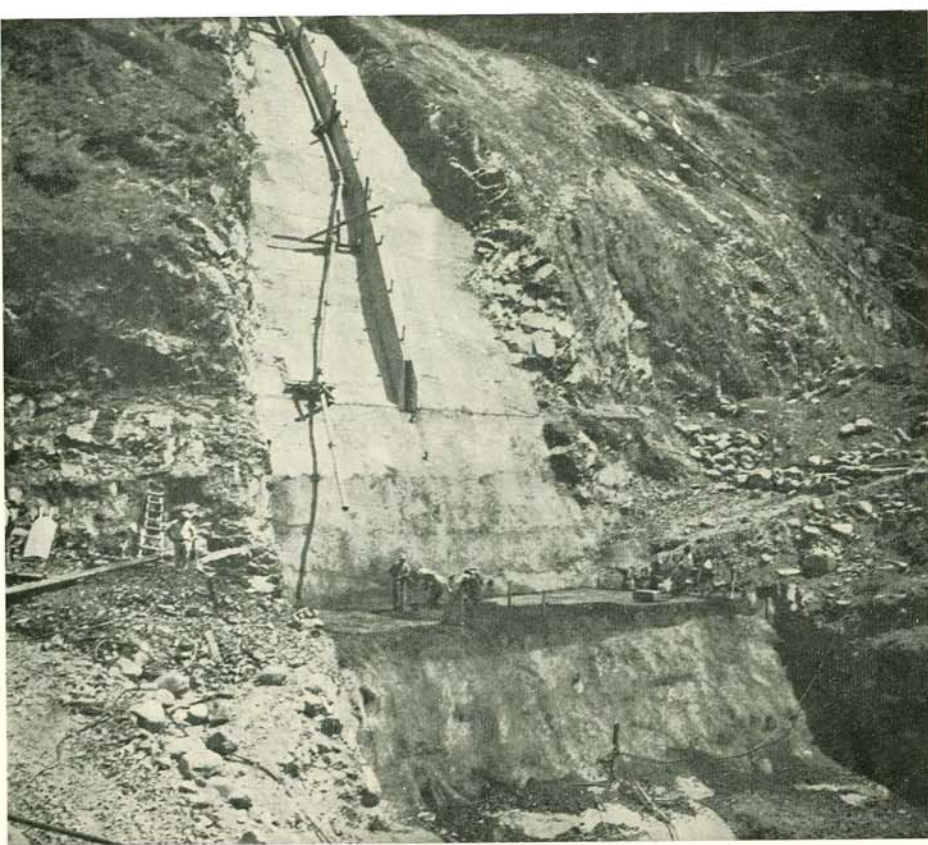
KALOPANAYIOTIS DAM

The Kalopanayiotis dam, designed by Messrs Howard Humphreys, London, and constructed by the Water Development Department, is the second impoundment scheme for irrigation purposes on the Marathasa River. The first being Lefka dam which was started before Independence in 1960.

The dam was designed as an earth embankment with a maximum height of 120′ and will impound at maximum W.L. a capacity of 100 million gallons of water.

In 1964 diversion tunnel and the coffer dam were constructed, while the whole of 1965 was taken up for foundation excavation, Grouting consolidation and part of fill for the embankment. This dam will command 700 donums of perennially irrigated crops.

Design Data:

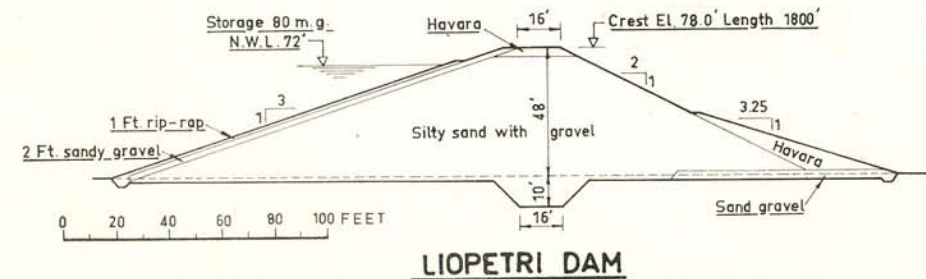|	
1. Maximum height of Dam	100 feet
2. Maximum depth of water in the reservoir ..	87,5 feet
3. Capacity of reservoir	100 million gals.
4. Surface Area of reservoir	11.6 acres
5. Total volume of fill	167,000 cub. yds.
6. Upstream Slope	$\frac{1}{2}$: 2
7. Downstream Slope	1 : 2
8. Maximum capacity of Spillway	8,500 cub. secs.
9. Catchment Area	10,2 sq. miles
10. Average rainfall in catchment	35 inches.
11. Average annual run-off	1,500 million gals.
12. Length of chute	240 feet
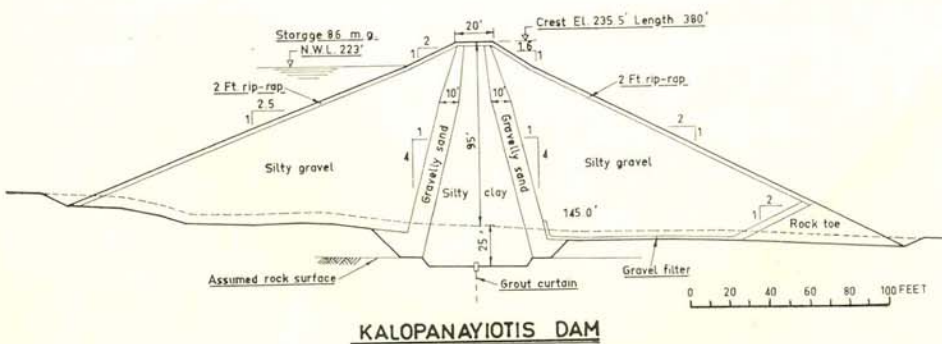
LIOPETRI DAM

Liopetri dam was constructed on the Potamos river, two miles S.W. of Liopetri village in the second half of 1964 with the purpose of replenishing by recharge the depleted area. The dam was planned and designed by Water Development Department. Operation records and recharge figures are kept with the view to deciding in the near future in favour of a pumping scheme to recharge the beginning of the acquifer near Liopetri.

This dam is one of the major projects in construction and impoundment of its type for the Famagusta Area.

Total expenditure on this recharge scheme was £33,000.

Design Data :

1. Maximum height of Dam	50 feet
2. Maximum depth of water, in reservoir	44 feet
3. Capacity of reservoir	80 million gals.
4. Surface Area of reservoir	18.27 acres
5. Total volume of fill	65,000 cub. yds.
6. Upstream Slope	1 : 2
7. Downstream Slope	1 : 2
8. Maximum capacity of Spillway	6,000 cub. secs.
9. Catchment Area	9 sq. miles
10. Average rainfall in catchment	19 inches.
11. Average annual run-off	110 million gals.
12. Length of chute	1,200 feet

Storage 80 m.g.
N.W.L. 72'
Havara
16'
Crest El. 78.0' Length 1800'
2
1
3
1
1 Ft. rip-rap
Silty sand with gravel
48'
3.25
1
2 Ft. sandy gravel
Havara
10'
16'
Sand gravel
0 20 40 60 80 100 FEET

LIOPETRI DAM

MAVROKOLYMBOS DAM

Mavrokolymbos dam built on the river with the same name in 1964–1965 commands an area of 4,000 donums. The designs were prepared by Messrs Energoprojekt, Belgrade, whilst the construction was entrusted to Messrs CYBARCO LTD for the Civil Engineering Works. This dam site presented a great number of difficulties especially as the foundation material of the dam and spillway was serpentine.

The tunnel excavation was completed in spring 1965 whilst the tunnel lining in October of the same year. The dam is of the earthfill type with very gentle slopes to avoid the possibility of landslides and can impound 500 million gallons of water.

The distribution system design was given to a Bulgarian Firm "Techno-exportstron", Sofia. Total cost of the dam only, is £250,000. Construction of the distribution system will start in 1966.

Design Data :

1. Maximum height of Dam	132 feet
2. Maximum depth of water, in reservoir	119 feet
3. Capacity of reservoir	500 million gals.
4. Surface Area of reservoir	43,62 acres
5. Total volume of fill	350.000 cub. yds.
6. Upstream Slope	1 : 3
7. Downstream Slope	1 : 2
8. Maximum capacity of Spillway	12,000 cub. secs. (at 10 ft. head)
9. Catchment Area	15,8 sq. miles.
10. Average rainfall in catchment	24 inches.
11. Average annual run-off	1,390 million gals.
12. Length of chute	865 feet

MAVROKOLYMBOS DAM

Storage 186 m.g.
N.W.L. 220.0 — 2230
2.5
Rip rap
1
Mainly silty gravel (GM)
Clayey silt (MH)
Mainly silty gravel (GM)

|—16'—|
Crest El. 229.0 Length-2400
45°

2
1
River gravel & sand (GW)

|—13'—|

0   20   40   60   80   100 FEET

OVGOS DAM

OVGOS DAM

Ovgos dam is the second major project for the Morphou Area in the first Five-Year Development Programme of the Cyprus Government. The dam was designed and constructed by the Water Development Department.

The location of Ovgos dam favoured the direct impoundment of 186 million gallons of water. The original idea was to irrigate about 1,000 donums of orchards although some direct recharge would take place from the reservoir into the underlying acquifer. One of the tasks facing the designers at the early stage of the design was to get rid of the contaminated mostly low saline flows well upstream before coming into the reservoir and turning the impounded waters saline. This was overcome by a diversion weir of one cusec flow. The above mentioned salinity results from the leaching of salts from certain geological formations.

Cost of the dam only amounted to £110,000, while that of the distribution system is estimated at £40,000.

Design Data :

1. Maximum height of Dam	.. .. ..	.. 46 feet
2. Maximum depth of water in the reservoir	..	37 feet
3. Capacity of reservoir	.. .. ..	.. 186 million gals.
4. Surface area of reservoir	.. .. ..	.. 65.13 acres
5. Total volume of fill	.. .. ..	.. 170,600 cub. yds.
6. Upstream Slope	.. ..	.. 1 : 2.5
7. Downstream Slope	.. ..	.. 1 : 2
8. Maximum capacity of Spillway	.. ..	.. 14,000 cub. secs.
9. Catchment Area	.. ..	.. 88.9 sq. miles.
10. Average rainfall in catchment	.. ..	.. 15,4 inches
11. Average annual run-off	.. .. ..	.. 293 million gals.
12. Length of chute	.. ..	.. 1,050 feet
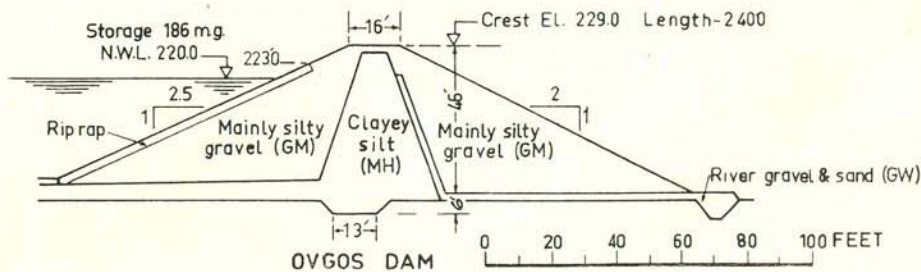
POLEMIDHIA DAM

With the Morphou dam constructed in 1962 as the largest in Cyprus, in 1965 Polemidhia dam took the first place as the largest dam constructed so far in the Island both in capacity of fill in the enbankment as well as the capacity of the reservoir.

The Polemidhia dam was designed by Messrs Energoprojekt, Consulting Engineers, Belgrade, and constructed by Messrs Mowlem and Ridgways, of London through a bilateral agreement involving finance facilities. The dam was built on the Garyllis river, 4 miles from Limassol near the village of Polemidhia. The 1964 construction programme comprised the coffer dam, Grouting works, tunnel diversion and preparation of foundations. In 1965 they dealt mainly with the Grouting works, embankment fill and construction of the spillway. The Grouting contract was entrusted to Messrs Soil Mechanics Ltd. of London in association with Messrs Soletanche of Paris.

The capacity of the reservoir being 750,000,000 gallons of water which will help irrigate some 3,000 donums of perennial crops.

The Polemidhia dam as well as Yermasoyia dam, to be completed in 1966-67, will go a long way towards irrigating in the Limassol area available irrigable lands and in particular the Zakaki and Phassouri plantations which are now facing the problem of overpumping the Zakaki acquifer.

Dam construction costs amounted to £750,000; further more the Water Development Department is preparing plans for the distribution system to be undertaken in 1966.

Design Data :

|				
1. **Maximum height of Dam**	..	..	..	**125 feet**
2. **Maximum depth of water, in the reservoir (at spillway level)**	..	..	..	**102.50 feet**
3. **Capacity of reservoir**	..	..	..	**750 million gals.**
4. **Surface area of reservoir**	..	..	..	**65 acres**
5. **Total volume of fill**	..	..	..	**281,000 cub. yds.**
6. **Upstream Slope**	..	..	..	**1 : 2**
7. **Downstream Slope**	..	..	..	**1 : 2 (with two berms)**
8. **Maximum capacity of Spillway**	..	..	**20,000 cub. secs.**
9. **Catchment Area**	..	..	..	**30 sq. miles**
10. **Average rainfall in catchment**	..	..	**24 inches**
11. **Average annual run-off**	..	..	**1,000 million gals.**
12. **Length of chute**	..	..	..	**450 feet**

POLEMIDHIA DAM
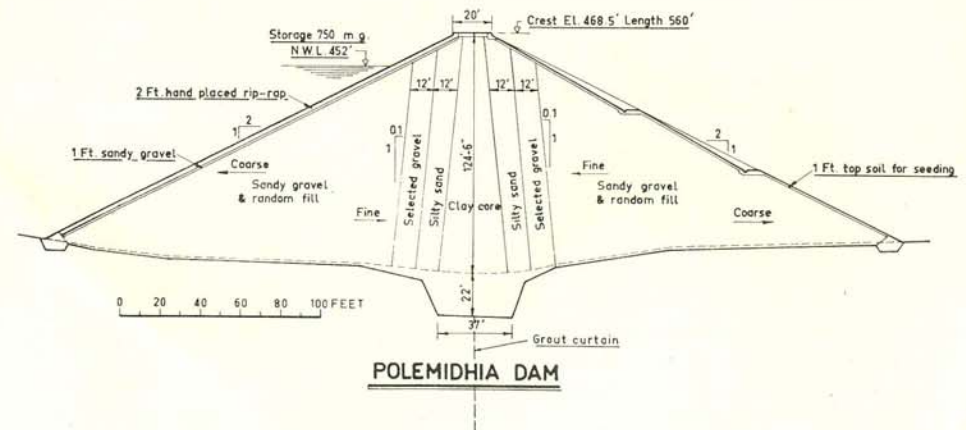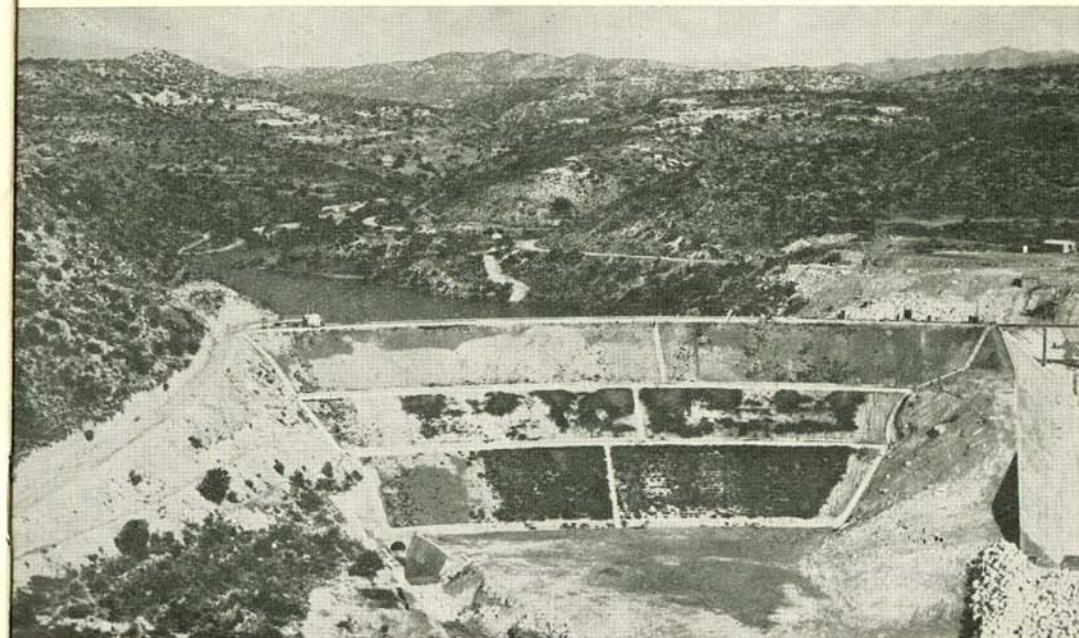
POMOS DAM

Pomos rockfill dam was constructed on the Livadhi river, Tylliria, after designs prepared by Messrs Energoprojekt, Consulting Engineers, Belgrade. The contract was given in 1963 after international tenders to Messrs Mediterranean Constructors of Athens. In February 1964 the contract was terminated because of abnormal conditions in the area and the Water Development Department took over the completion of the works.

In 1965 a Grouting contract was signed by the Director of Water Development Department and Messrs Foundation Engineering, Ioannou and Paraskevaides Joint Venture Nicosia. The primary distribution system amounting to 40,000 feet of R.C. channels were constructed in 1965, and with the completion of the secondary distribution system in 1966 this major irrigation scheme will command 1,500 donums of perennial crops.

Construction costs of Pomos dam, distribution, Grouting and acquisition will amount to £323,000.

Design Data :

1. **Maximum height of Dam**	**110 feet**
2. **Maximum depth of water in reservoir**	**97 feet**
3. **Capacity of reservoir**	**189 million gals.**
4. **Surface Area of reservoir**	**20,8 acres**
5. **Total volume of fill**	**200,000 cub. yds.**
6. **Upstream Slope**	**1 : 1.5**
7. **Downstream Slope**	**1 : 2**
8. **Maximum capacity of Spillway**	**11,000 cub. yds.**
9. **Catchment Area**	**13,6 sq. miles**
10. **Average rainfall in catchment**	**22 inches**
11. **Average annual run-off**	**441 million gals.**
12. **Length of chute**	**300 feet**

POMOS DAM
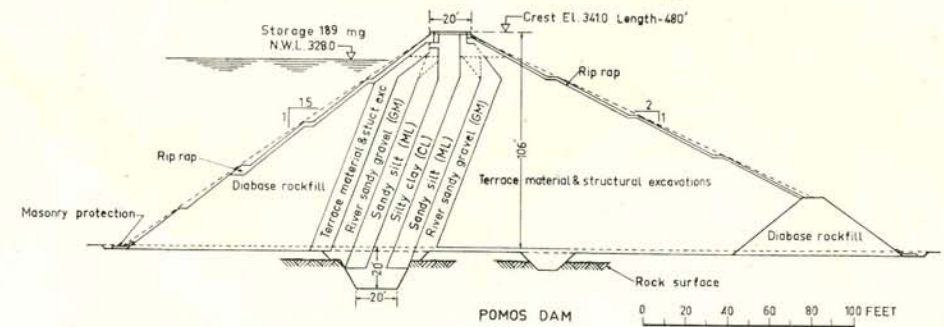
DAMS IN CYPRUS SINCE INDEPENDENCE IN 1960

No.	Existing Dams	Type of Dam	Height (ft.)	Storage Capacity (million gals.)	Year constructed	Irrigable Land perennially
	A.					
1.	Athalassa	Earth	42	174	1962	1,000 donums
2.	Ayios Nicolaos	Earth	10	108	1961	Recharge
3.	Ayios Georghios	Earth	20	25	1961	Recharge
4.	Geunyeli	Earth	50	230	1962	1,480 donums
5.	Lefka	Concrete Gravity	80	80	1962	450 donums
6.	Morphou	Earth	37	450	1962	Recharge
7.	Paralimni–Panayia Dam	Earth	23	10	1962	Recharge
8.	Paralimni Recharge : 35 small dams					
9.	Prodromos	Earth	20	25	1962	160 donums
10.	Sotira	Earth	20	12	1962	Recharge
11.	Aloa	Earth	15	4	1962	Recharge
12.	Argaka–Magounda	Rockfill	100	270		1,500 donums
13.	Ayia Marina	Rockfill	96	70		500 donums
14.	Ayia Napa (7 small dams)	Earth	20	12		Recharge
15.	Famagusta Antiflood : Kato Dherinia ..	Earth	22	38		Antiflood
16.	Famagusta Recharge : Ayios Memnon..	Earth	16	11		Recharge
17.	Kanli-Keuy	Earth	40	245	1963	1,000 donums
18.	Mia Milea	Earth	54	74		600 donums
19.	Ovgos	Earth	46	186		3,000 donums
20.	Pomos	Rockfill	108	189		1,500 donums
21.	Kiti Dam	Earth	52	400		2,500 donums
22.	Agros	Earth	85	25	1964	160 donums
23.	Liopetri	Earth	50	80	1964	Recharge
24.	Polemidhia	Earth	125	750	1964	3,000 donums
	B.—Dams under Construction 1965–66 :					
25.	Kalopanayiotis	Earth	100	100		700 donums
26.	Mavrokolymbos	Earth	132	500		4,000 donums
27.	Yermasoyia	Earth	120	3000		5,000 donums