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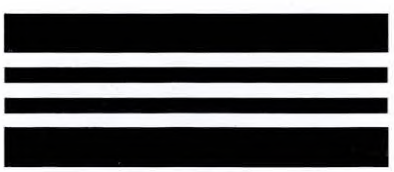

CYPRUS

WATER SUPPLY AND IRRIGATION DEPARTMENT

ANNUAL REPORT FOR 1951

BY

I. L. WARD, B.E., M.I.C.E., M. INST. W.E.

Water Engineer

NICOSIA

PRINTED AT THE CYPRUS GOVERNMENT PRINTING OFFICE

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CONTENTS

Annual Report of the Water Supply and Irrigation Department for the Year 1951.

The engineering and geological side of all Government water supply work in Cyprus is in the hands of the Water Supply and Irrigation Department, whose activities cover the whole range of water supply, including the search for new sources, irrigation, and the provision of water for domestic purposes. The administrative problems of village Irrigation Divisions and Associations and of domestic Water Commissions are dealt with by the District Commissioners. Disputes over water rights are handled chiefly by the District Commissioners in consultation with the Law Officers, the Department of Land Registration, and the Water Supply and Irrigation Department. The agricultural problems involved in the economic use of irrigation water are the responsibility of the Department of Agriculture.

2. The year 1951 has seen a further increase in the activities of the Department. In addition to a record output of irrigation and village domestic water supply works a start has been made on new town water supplies at Limassol, Famagusta, Paphos and to a lesser extent at Nicosia. New irrigation works have proceeded at rather more than the pace set by the post-war development plan ; village water supplies have exceeded last year's record by 30% ; and the drilling of boreholes has proceeded 20% faster than the 1950 record. During the year water development works have been carried out in 215 of the island's 627 villages and in all of the chief towns. In addition many investigations for new works have been made.

3. The year's rainfall was abnormal. In the 1950/51 winter it was exceedingly low, from 50% to 65% of average. In the summer there was an unusual number of heavy rainstorms on the central plain. In Nicosia the rainfall in the months of October to March was only 5.88″ compared with a normal of about 10.7″, while in summer there were no less than 6.45″ of rain compared with a normal of 1.2″. The low winter rainfall resulted in low yields from springs and wells, a factor that had its effect upon the Department's work. A number of emergency domestic water schemes was carried out, including some for Nicosia town. There was an unprecedented demand from private persons for new boreholes and for the cleaning of old ones that had gone dry or nearly dry. In the Eastern Mesaoria, where irrigation depends upon flood water, the absence of winter floods caused a bad harvest and poverty, and the Department was required to carry out irrigation and anti-erosion works as relief measures.

4. The work of the irrigation branch of the Water Supply and Irrigation Department deals chiefly with the following :—

(*a*) Gravity irrigation schemes developing small springs by excavation at source, by lining channels in masonry to prevent loss of water, and by constructing masonry tanks for night storage.

(*b*) Gravity irrigation schemes involving the diversion of seasonal or perennial flow from rivers and watercourses by means of weirs and channels.

(*c*) Pumped irrigation from boreholes and open wells—a means of utilizing the natural underground water resources.

(*d*) Gravity irrigation from infiltration galleries constructed in slow yielding aquifers, in fissured rock, or in river gravels—a means of tapping natural underground reservoirs without the expense of pumping.

(*e*) Water conservation in artificial reservoirs for periods of a few days to several months.

The above types of scheme fall into two major categories, viz. gravity irrigation works and pumped irrigation works. In the former, the water flows by gravity without mechanical assistance, but in the latter the water is raised from boreholes and wells by some form of machinery.

5. The rate of progress in irrigation since the commencement of the Ten-Year Programme of Development in 1946 is shown in the following table:—

	Gravity Irrigation		Mechanical Irrigation (i.e. Pumped)	Total
	Perennial	Seasonal		
	Donums	*Donums*	*Donums*	*Donums*
1946 Census..	59,409	284,977	53,131	397,517
	say 59,500	say 285,000	say 53,000	say 397,000
Estimated at end of 1950 (see W.S.I.D. Annual Report, 1950)..	70,000	313,000	67,500	450,500
New Irrigation, 1951 (approx.) ..	4,000	6,000	7,500	17,500
Estimated totals at end of 1951 (approx.)	74,000	319,000	75,000	468,000
Percentage increase since 1946 census and commencement of Ten-Year Programme of Development	24%	12%	41.5%	18%

6. In the domestic water section, most attention is given to village supplies, and the work comprises the development of water sources, the laying of main pipe lines to villages and the installation of piped distribution systems including storage tanks and public "fountains". A "fountain" is a combined public standpipe, trough and drainage soak-pit. Usually no house connections are included. The sources may be springs, infiltration galleries, boreholes, or wells, and the water is sometimes partly for domestic use and partly for irrigation. Town water supplies are not controlled by the Water Supply and Irrigation Department but the Water Engineer is represented on all town Water Boards. Where there is no Water Board the authority is usually the Municipal Council, which frequently seeks the help of the Department and is seldom refused.

7. The number of villages in Cyprus with piped water was estimated to be 346 in the census of 1946, but of these it was estimated in the same year that only 100 were in satisfactory condition. Since then more than 200 schemes have been completed, but many only improve or replace old installations. It is now estimated that the total number of villages with piped water is 400, or 64% of the 627 villages named in the census. Of these 241 (38%) may be considered to be in satisfactory condition, and 159 (26%) need fundamental repairs or replacements. The villages still without piped supplies are on the whole situated far from reliable sources, and the cost and difficulty of providing them with piped water will usually be greater than in past schemes. Moreover, a higher standard of living is becoming evident and a greater number of fountains per unit of population is now wanted. Of the four large towns in Cyprus only one, Larnaca, may be said to have a reasonably satisfactory water supply. For Nicosia, Limassol and Famagusta, new schemes have been prepared by the Water Supply and Irrigation Department, and work is now in progress at Limassol and Famagusta. Some preliminary works have also been carried out at Nicosia.

8. GRAVITY IRRIGATION: There has been no change of policy during the year, and on the whole the Department has continued to concentrate on many small gravity irrigation schemes rather than a few large ones. There has, however, been a demand for improvements on the larger perennial waters as described in the next paragraph. A steady flow of proposals for new schemes continues and, in spite of all that has been achieved, there is still no sign of a falling off in demand or of an approaching limit. Proposals for new works usually originate among the cultivators, who are frequently inspired by completed schemes in neighbouring villages. Their proposals are usually sound in principle, and require little modification by the Department's officers, except in technical detail. All construction work is carried out by the Water Department. Management and maintenance of the works upon completion pass over to the beneficiaries. The total number of gravity irrigation schemes completed in 1951 is 125 commanding 10,387 donums of new irrigation of which 4,332 can be irrigated perennially. A further 33 schemes were in hand at the end of the year and 100 more were ready for construction. These figures are exclusive of flood damage repairs.

9. The typical hill scheme consisting of a perennial water source, masonry or concrete lined channels, and frequently a masonry irrigation tank has retained its popularity. In the Pitsillia (the hill area in the centre of the island), every village now has at least one new irrigation scheme. Some have as many as 20 or 30 or more, e.g. Polystipos has 33, Kyperounda 30, Agros 27, Ayios Konstantinos 18, Palekhori 11 and so on. A new tendency is becoming evident among those who use the larger perennial sources of water. These irrigators have in the past been satisfied with the water they have received through unlined earth channels, but they are now realising that, like the users of the very small sources, they have much to gain by preventing water losses. Three of these larger schemes were completed during the year, viz. Prodhromos (£9,280), Pedhoulas (£17,500) and Tembria and Korakou (£15,000). Two others, both in the Solea Valley near to Tembria, are in hand at Galata (£14,000) and Evrykhou (£10,500). These last two schemes were sought as soon as the cultivators saw the successful results achieved by their neighbours at Tembria and Korakou. Two further large schemes now in course of preparation are for the users of the Lapithos springs in the Kyrenia hills. The first, Kephalovryso, will cost about £18,500 and the second, Sphinarkotikon, about £14,500. During the year 96 perennial hill schemes have been completed commanding 3,087 donums of new irrigation. A further 24 were in hand at the end of the year, and many more are planned.

10. Two water storage schemes have been under construction in 1951, and two more are being considered for 1952. The two under construction include the Petra and Kafizes dams. The former, a 30 feet high structure, has been completed and the latter, which will be 70 feet high, and the highest in Cyprus, is about half finished. Both are described in Appendix 2. The other two schemes are for a 35 feet dam at Lythrodhonda and a 35 feet dam at Kandou. The usefulness in Cyprus of dams such as these has been proved; but because of the lack of sites where the volume of water stored is commensurate with the cost, they are unlikely to have a marked influence on the total area of irrigated land in the island.

11. A few projects utilising the steady winter and spring flow of the larger rivers have been completed in 1951. Chief of these are the schemes at Limnitis, Geunyeli, Kouklia and Akhelia, all commenced in 1950, and described in detail in the 1950 Annual Report.

12. Flood, or spate-water irrigation, by which sudden floods of short duration are utilized to irrigate winter and spring crops, mainly cereals, is practised chiefly in the Mesaoria, although it is to be found in other places throughout the island. In 1951 no large schemes have been undertaken, but a number of minor ones, including improvements to existing works have been carried out in various places, chiefly in the Eastern Mesaoria.

13. A number of flood damage repairs was carried out during the year at a cost of £8,757. Most of these repairs were needed following the floods of December, 1949, but they were not executed until 1951 for various reasons, chief of which was that the owners of damaged works had been slow in finding the means to pay their share of the cost (one-fifth). Drought relief works, costing £9,154, were carried out in the grain growing areas, where the dry winter of 1950–51 had caused a bad harvest. These works were executed chiefly in places where they would have been uneconomical except as relief works. In some places, as at Palekythro, where a weir and irrigation channels were built, the works were mainly anti-soil erosion measures.

14. Regular measurements of the flow of 143 springs in different parts of Cyprus are being taken for record purposes. A start has been made on the measurement of flood discharges ; two automatic water level recorders have been installed, one on the Pedias River at Nicosia, and the other on the Serakhis river at Morphou. They will provide records of all floods passing these two places.

15. The Eastern Mesaoria Irrigation Works comprise the reservoirs built in that area some 50 years ago, and some 9,700 donums of land. From 1939 to 1951 the management of both works and lands has been in the hands of the Water Supply and Irrigation Department. In recent years it has been realised that this Department alone is not in a position to use and develop the lands efficiently and so in 1949 it was decided to transfer control to a committee under the chairmanship of the Commissioner of Famagusta, with representatives of the Director of Agriculture, Accountant-General and the Water Engineer as members. The transfer took place on 1st February, 1951. During the year the Water Department carried out some minor repairs to the works at Kouklia and Prastio, and prepared plans for anti-erosion and anti-flood measures at Syngrasi.

16. Domestic Water Supply : Good progress was made in 1951 in village water supplies for which sufficient pipes and materials have been available. New water supply schemes for the chief towns have been started.

17. A total of 68 village water supply schemes was completed during the year, and on the 31st December, a further 24 were still in progress. These figures compare with 52 completed in 1950, and 32 in 1949. Investigations for new schemes are keeping pace with construction, and 123 more are ready to be started as staff become available, and as financial and other formalities are settled.

18. Among the villages for which schemes have been completed, or were in hand in 1951, are four where house-to-house connections were wanted instead of the usual public fountains. These are Pedhoulas (summer population 6,000) Agros (1,800), Athienou (3,200), and Polis (1,200). In each case all the extra cost has been provided by the village. A number of additional requests for house-to-house supplies also came from villages in which work has not yet started. In other places, instead of asking for house-to-house connections, villagers have wanted more than the usual number of street fountains. These requests show a tendency in village communities to seek more and more facilities for their water supplies.

19. There has been an increased demand for pumped domestic water schemes. Until recently village folk fortunate enough to possess a reliable well in or near their village were content to draw water by hand, but they are now tending to ask for engine driven pumps in spite of the expense of fuel and maintenance. Eight village pumping schemes, drawing water from wells or boreholes, have now been completed. In each case the water is pumped into a masonry storage tank, from which it gravitates through pipes to the usual system of fountains in different parts of the village.

20. Planning in the field and office, and discussions, have been proceeding on two projected village water supply schemes of more than ordinary importance.

(*a*) In the Paphos district it is proposed to utilize the water of a large forest spring, the Appidhes, for a combined project to serve a large number of waterless villages. Eleven villages have signified their wish to join in the scheme, and detailed plans have been drawn up accordingly. These villages are Pano Panayia, Asproyia, Kritou Marottou, Simou, Stroumbi, Tsadha, Lemona, Phalia, Ayia Marina, Amargeti and Kili. As there is a surplus of water at the spring, which has now been excavated, and built in masonry, it has been decided that the main pipe lines will be big enough to convey a 30% surplus over the requirements of the 11 villages. The extra cost will, in the first instance, be borne by Government, but if more villages decide to join the scheme in the future each will be required to pay its share. In the meantime the surplus water will be leased by Government for irrigation. The cost is now estimated at £80,000 of which the villagers will be asked to contribute £31,500. The total population of the 11 villages was 5,179, by the 1946 census, and is now probably about 6,000.

(*b*) The problem of supplying domestic water to the dry villages of the Eastern Mesaoria has again been receiving attention. A total of eleven trial boreholes in the Kyrenia hills between Kythrea and Trypimeni, sunk over a period of years, has failed to produce a suitable source. A scheme for pumping water from Kokkini Trimithia is both expensive and inconvenient, because of the long pipe lines, and the need to operate pumps at a great distance from the villages. The only scheme found to be technically practicable is that of piping water from the Kythrea spring, where water that is now lost through leaky channels, might be utilised. A volume equivalent to 3% of the flow of the Kythrea spring would provide domestic water for the dry villages of the plain ; it is expected that more than this quantity could be saved by lining some of the Kythrea channels. Although the scheme is straightforward on the engineering side, it presents administrative difficulties, because the inhabitants of Kythrea resent the diversion of any of their water. A revised preliminary scheme has been prepared to serve nine villages whose combined population by the 1946 census was 5,695. The villages are Angastina, Marathovouno, Mousoulita, Yenagra, Pyrga, Chatos, Mora, Petra tou Dhiyeni and Kourou Monastir. The total cost, excluding the cost of compensation to Kythrea and of lining irrigation channels at Kythrea, is estimated at £44,000.

21. Details regarding the various town water supplies are given in Appendix 1. The new schemes planned by the Water Supply and Irrigation Department in the past few years are now under construction at Limassol, Famagusta and Paphos and, to a lesser extent, at Nicosia. The total cost of these works will be about £700,000. Further improvements, required chiefly at Famagusta, will eventually bring the total cost to £1,000,000 or more.

22. The financing and administration of the new town water supplies and their future operation has been facilitated by the formation of Water Boards under a new law described in paragraph 34 and Appendix 1. Government loans to cover the cost of the new works have been made in each case.

23. Drilling for Water : More boreholes were drilled in 1951 than in any previous year, and the area of land irrigated with pumped underground water continues to increase rapidly. Applications for both subsidised and full cost boreholes came in at a very high rate, probably because the dry winter of 1950–51 caused a general shortage of water. Full cost boreholes were sometimes drilled for persons who, although entitled to the subsidised rate, preferred the more expensive full-cost holes because their applications were attended to more quickly.

24. At the beginning of the year eleven drilling rigs were in operation. In January the boilers of two old steam-driven Star rigs were declared unfit for service, and only nine machines were left in action. After some experimenting it was found possible to replace the old steam engines with new diesel engines and both rigs were brought into commission again. A further very old Star rig, abandoned a number of years ago, was resurrected from the scrap heap and fitted with a new diesel engine and a re-built frame. It is now working successfully. At the end of the year twelve rigs were in operation, five on loan from the Army, and the remaining seven Government property. Four of the seven Government machines are upwards of 25 years old.

NUMBER OF BOREHOLES DRILLED IN 1944–1951.

	1944	1945	1946	1947	1948	1949	1950	1951
For private individuals and companies ..	34	56	61	35	92	135	132	157
For Government ..	23	16	3	17	25	46	32	41
For War Department	4	—	19	15	—	—	27	32
Totals	61	72	83	67	117	181	191	230
Aggregate footage drilled.. ..	9,115	12,785	11,686	12,171	21,397	33,610	40,751	47,766
Average Depth ..	150	177	141	182	182	186	213	208

25. Boreholes have been drilled for a number of purposes with varying degrees of success as shown in the following table. A " successful " borehole is one which on test yields more than 1,000 gallons per hour of usable water.

BOREHOLES DRILLED IN 1951.

Purpose	No.	Footage Drilled	Percentage Successful	Total Tested Yield in gallons per day
Irrigation	139	26,732	71.9	13,828,000
Domestic Water	10	2,147	30.0	281,000
Observation of ground water level	9	2,299	88.9	905,000
Prospecting	16	3,910	68.8	1,153,000
War Department.. ..	25	5,115	76.0	2,376,000
Industrial	9	1,372	33.3	447,000
Total for Water ..	208	41,575	69.2	18,990,000
Engineering boreholes ..	22	6,183	—	—
Total Drilled ..	230	47,758	—	—
Old Boreholes cleaned or cased	21	—	—	—

26. Five of the engineering boreholes were drilled for the Army, two for the R.A.F. and thirteen for the Public Works Department at Limassol. The irrigation boreholes can produce 14 million gallons of water per day, which is sufficient to irrigate 7,000 donums in summer or 21,000 donums in winter, if pumped steadily at half the tested rate. Pumped irrigation from both boreholes and open wells is estimated to have increased by about 7,500 donums in 1951.

27. The total tested output of 296 successful irrigation boreholes sunk since the commencement of the Ten-Year Development Programme in 1946 now amounts to 49 million gallons per day. If pumped steadily at half the tested rate, they could irrigate 24,500 donums in summer and 73,500 donums in winter. This represents a theoretical increase of 46.1% over the figure of 53,131 donums given in the 1946 Census Report. A further increase in pumped irrigation has been caused by some 5,000 open wells sunk by private persons. Not all these boreholes and wells have yet come into production, but it is estimated that the area under pumped perennial irrigation has increased by about 22,000 donums, i.e. by 41% in the past five years.

28. As in 1950, most of the successful boreholes have been drilled in the Pliocene/Pleistocene formations, though good water has been obtained from the Miocene in a few areas. In the Western Mesaoria, 47 out of 49 boreholes proved successful, with a total tested yield of 8.0 million gallons per day. In the Kalopsidha–Pergamos–Liopetri area, 76 boreholes were drilled, of which 56 were successful, with a total tested yield of 5.8 millions per day. Thus, of the total water made available in 1951, some 13.8 million gallons or 72.6%, have come from these two areas.

29. The most interesting discovery in 1951 was the location of good quality water in the Miocene sands and gravels south of Laxia village. Here five out of six boreholes proved successful, with a total tested yield of 732,000 gallons per day. This water was found to contain sodium carbonate, probably derived from natrolite in the sediments, and as a result has a total hardness which is less than the carbonate hardness. It seems probable that the Miocene aquifers, which are overlain by Pliocene beds, extend westwards beneath the Pediaeos valley as far as Ayii Trimithias and eastwards beyond Laxia. It is hoped to drill more prospecting boreholes in this area in 1952. The new Laxia water may be of the greatest importance to Nicosia. Water from one of the boreholes was piped to Nicosia as an emergency town supply to relieve this year's water shortage. Another borehole is to form one of the permanent sources of the new town water supply.

30. At Sarama, south of Polis, excellent water was struck in the Terra reef-limestone of Miocene age. This may lead to further development in that general area. South of Larnaca, at Kiti, good water was found in shallow Pleistocene deltaic sediments, but the area is limited, and already well-developed by means of wells. Four unsuccessful prospecting boreholes in the Kyrenia range again demonstrated the difficulty of locating water by drilling in that area.

31. Nine more observation boreholes were sunk in 1951, three at Phrenaros, five in the Ormidhia–Xylophagou area, and one at Pergamos. There are now 18 such observational boreholes in Cyprus. The monthly readings of water-level show that in the Western Mesaoria, the water levels for August–December, 1951, are about 2 feet lower than those for the corresponding period of 1950. This is not a cause for alarm since the 1949–50 winter was one of abnormally heavy rainfall and that of 1950–51 very dry. As a result, replenishment of the aquifers in 1950–51 was small, and demands for pumped water high. Variations in the water-table just south of Morphou town suggest full development over a limited area. In the south-east of the island, near Phrenaros, the water-table fell about 4 inches between May and December before pumping for the Famagusta Water Board commenced. In the Ormidhia–Xylophagou and the Pergamos area there was a fall of 18 inches between June and December. The period of observation is, of course, too short to draw any valid conclusions from these results.

32. The rate of drilling in 1951 was four times greater than in 1946, when the Development Programme commenced. In order to plan for the future, and to be certain that the underground water reserves of Cyprus are not being overdrawn, it has been considered necessary to review the past and take stock of the present. Dr. D. J. Burdon, Assistant Water Engineer, has accordingly prepared a full review of the underground water resources of Cyprus. His report assembles the available data about the island's water geology in much greater detail than has hitherto been attempted. It is hoped to publish the report in due course ; in the meantime Dr. Burdon gives a summary in Appendix 4.

33. MISCELLANEOUS : Miscellaneous activities in the Department occupy a considerable proportion of the time of the technical staff. In Nicosia three water supply systems, viz. the Government House–English School supply, the supply for the Government Offices and Hospital, and the supply to the Prison and the houses of Government officers, are all managed by the Department. Personnel of the Department exercise technical control over the water supply works of the Nicosia Water Administration, which provides water chiefly to the part of Nicosia within the old city walls. The maintenance of the Larnaca town water supply is supervised by staff of the Department. A number of miscellaneous works, including pumping tests of boreholes and wells, has been carried out for the Military, Village Water Commissions, and private persons. Some 614 drainage holes, each 7–8 feet deep, were drilled for the R.A.F. on the Nicosia airport runway. 13 shallow holes to test the foundations of the proposed Limassol quay were drilled in the sea bed for the P.W.D. after that Department had mounted a drilling rig on a barge. A similar operation was performed for the military at Dhekelia where 5 holes were sunk in the sea bed. Some experiments in recharging a group of wells at Ayios Memnon, Famagusta, with water from the Paralimni Lake have been arranged. Regular measurements of water levels have been made in 14 wells at Nicosia, 24 near Famagusta and in 18 boreholes at other places throughout Cyprus, to provide data for a study of seasonal changes in ground water conditions.

34. LEGISLATION : In 1951 there have been two notable additions to the water laws of Cyprus, the one concerning town water supplies, and the other underground water.

35. The first is a new law entitled the Water Supply (Municipal and Other Areas) Law, 1951, which provides for the control and management of water supplies in municipal and other areas, and for the establishment of Water Boards. Under another law, the Municipal Corporations Law, a Municipality has a legal duty to " provide or cause to be provided a good and sufficient supply of water ". The difficulties under which the Municipalities have laboured to fulfil their legal duties have been great, particularly on the financial side, as their resources are limited. Under the new law a Municipality, with its consent, may be relieved of its direct responsibility for water supplies, if a Water Board is set up by the Governor in Council. In these circumstances a Water Board will be comprised of members nominated partly by Government and partly by the Municipality as described in Appendix 1. Water Boards have already been formed at Nicosia, Limassol and Famagusta.

36. The Wells Law of 1945 has been amended to provide for Government control over the sinking of boreholes and wells in areas where the Governor is satisfied that special measures for conservation of water are necessary. The amendment also provides for Government control over the use of water from new wells and boreholes throughout the island. Six areas have been declared under the amended law, with the object of protecting the town water supplies of Nicosia and Famagusta and the sources used by the army at Dhekelia. A seventh area, for the protection of the Larnaca town water sources, is under consideration.

37. FINANCIAL : The following is a summarized statement of the expenditure of the Water Supply and Irrigation Department in 1951 :—

	Government		Contribution from Beneficiaries	Totals
	Colonial Development and Welfare Grants	Cyprus Funds		
	£	£	£	£
1. Gravity Irrigation Schemes ..	86,450	21,615	55,428	163,493
2. Village Water Supplies ..	30,000	34,337	52,070	116,407
3. Subsidised Drilling	—	5,974	2,960	8,934
4. Prospecting for Water	—	7,705	—	7,705
5. Drilling upon Repayment ..	—	—	6,210	6,210
6. Nicosia Water Supply	—	—	14,399	14,399
7. Limassol Water Supply ..	—	—	140,565	140,565
8. Famagusta Water Supply ..	—	—	2,047	2,047
9. Larnaca Water Supply ..	—	—	1,445	1,445
10. Drought and Flood Relief and Repair Works	—	16,098	2,563	18,661
11. Miscellaneous works upon repayment	—	1,230	2,640	3,870
12. Departmental and Maintenance	—	39,111	—	39,111
	116,450	126,070	280,327	522,847

38. Not included in the above statement is the following expenditure which has been subject to the advice or supervision of the Department :—

	£
1. Paphos Water Supply	12,913
2. Pipes imported by the Nicosia Water Board ..	38,493
3. Pipes and pumps purchased by Famagusta Municipality	19,645
4. Government Casing Pipes sold to the public for boreholes drilled by the Department	2,248
	£73,299

39. Included in the first of the above two statements are :—

	£
1. Personal Emoluments	23,503
2. Wages for Labour	162,000
3. Travelling and Subsistence	2,767
4. Paphos Chiftliks, Irrigation	5,655
5. Repairs to Eastern Mesaoria works	750
6. Purchase of Pipes for Limassol Water Supply ..	109,449
7. Purchase of Drilling Plant and re-building three drilling rigs	3,339
8. Total cost of Drilling excluding Item 7, staff salaries and overhead expenses	19,510
9. Drought Relief Works	9,154
10. Flood Damage Repairs	8,757

40. The average cost of a new borehole has been £91.3, and the average cost per foot drilled about £0.441. A subsidised borehole has on the average cost £98.5, a borehole drilled upon full repayment £54.6, and a prospecting borehole £215.5. A reason for the low cost of boreholes drilled upon repayment is that recipients including the army, frequently provide their own transport. Prospecting boreholes cost more, because they are usually drilled in remote places. These costs, of course, do not include permanent pumping plant or the borehole casing pipe, and they are also exclusive of depreciation of drilling plant, and the salaries and expenses of supervisory staff. They include the wages of the crews, transport of drilling plant, repairs, and minor replacements of drilling tools and equipment.

41. Village contributions towards the cost of gravity irrigation works vary from one-fifth to one-third according to the type of work, the lower fraction being for flood or spate-water irrigation schemes, and the latter for perennial irrigation. Payment by the villagers is made in cash, in free labour (capitalized in the above statements) or by Government loans at low rates of interest. Village domestic water schemes are paid for, half by Government, and half by the village, the village contribution being either in cash or by Government loan. Boreholes under the Subsidized Drilling Scheme are carried out for private irrigators at a fixed price to them of £32.10.0 per borehole and the balance which, in 1951 has on the average amounted to about £66, is paid by Government. Private individuals requiring boreholes for purposes other than irrigation are charged the actual cost in full including departmental charges. The Army, Municipal Corporations, Companies, etc., also pay the full cost and departmental charges.

42. STAFF AND LABOUR: On the 31st December the Department lost two of its senior officers. Dr. Burdon, Assistant Water Engineer, left on a year's secondment to the United Nations Food and Agriculture Organization, Syria, and Mr. Levonian, Superintendent of Waterworks, retired from Government service to take up an appointment as manager of the newly formed Nicosia Water Board. Mr. A. H. Ph. McLaughlan was appointed to a new post of Senior Engineer on 1st December, 1951. Mr. L. Ford, Temporary Assistant Engineer, resigned his appointment on 7th April, 1951, to take up a more responsible one in Greece and was replaced on 17th April, 1951, by Mr. A. F. Butler. Other staff at the end of the year comprised the following:—

Senior Inspector of Water Supplies	1
Inspectors of Water Supplies	5
Temporary Inspectors of Water Supplies ..	4
Technical Assistants	8
Temporary Technical Assistant	1
Foremen	77
Accounts, Clerical and Miscellaneous	26

43. During the year three temporary Inspectors of Water Supplies and two permanent Technical Assistants were appointed. One Inspector of Water Supplies was promoted to Senior Inspector and one Technical Assistant to Inspector. A successful year's work has again been made possible only by the enthusiasm of the staff and their willingness to work long hours. A special word of praise is due to Mr. Levonian who is retiring after 39 years of continuous Government service; the success of the Water Supply and Irrigation Department in recent years and the team spirit among the staff and foremen are largely due to his good influence.

44. The average number of labourers employed was 1,280 of whom 13% were "skilled". This compares with an average 1,142 in 1950 of whom 12% were skilled. The approximate monthly averages are as shown:—

January	1,100	April	1,300	July	1,350	October	1,400
February	1,100	May	1,300	August	1,350	November	1,400
March	1,300	June	1,250	September	1,350	December	1,250

45. As in other Government Departments a 44-hour week is observed by all labour. From Monday to Friday the working day is 8 hours, but on Saturday 4 hours only. The 4 hours on Saturday is considered a full day, and wages are paid for 8 hours. In drilling for water a bonus system is used, whereby a drilling crew, if it exceeds a certain prescribed monthly output, receives an addition to its normal weekly wages.

46. DEMAND FOR SCHEMES : The usual keen interest in all kinds of water supply works was intensified in 1951, because the low winter rainfall had resulted in a shortage of water both for domestic use and for irrigation. The requirements of the larger towns for new water supplies have been recognised and work is starting ; trained staff to supervise these major schemes can be found in Cyprus only at the expense of village works, and a certain reduction in village water supplies and irrigation schemes may therefore follow. In 1951 good progress was made in meeting the continued demand for village water supplies, but there is still a long waiting list of applicants. Requests for gravity irrigation works were on the whole met, but the demand for more persists. The unusually dry winter resulted in an unprecedented number of applications for boreholes ; these could not be drilled with the available machinery in 1951, but they will be completed in 1952. In general it may be said that the demand for irrigation works is being satisfied, but the rate at which domestic water problems can be attended to is limited by the availability of suitable technical staff.

I. L. WARD,
Water Engineer.

January, 1952.

APPENDIX 1.

TOWN WATER SUPPLIES.

Following the enactment of the Water Supply (Municipal and Other Areas) Law in May, 1951, Water Boards were formed in Nicosia, Limassol and Famagusta to take over, from the respective municipalities, the responsibility of supplying water to the public. Under the terms of the law each Board is comprised of three Government members and three nominated by the relative Municipality. The Chairman, who is chosen from among the six by the Governor, has a casting vote. In each of the three Boards the Government members are the Commissioner of the District, the Accountant-General and the Water Engineer. The Commissioner has been appointed chairman in each case. Government loans, for the purpose of carrying out new schemes, have been arranged.

Nicosia : The Water Board was formed on 1st July, 1951, and a Government loan for £300,000 has been approved. The scheme described in the Annual Report for 1949 has been modified and enlarged by including among the sources of supply a second borehole at Kokkini Trimithia, and a new borehole at the recently discovered water-bearing area to the south of Laxia. The former low-yielding Laxia boreholes have been excluded. The scheme will now provide an average of 1,000,000 gallons per day instead of 850,000 gals. p.d. outside the city walls. Some preliminary works have been executed including a store and foreman's office at the reservoir site. Contracts have been concluded for asbestos cement pipes to bring water from Ayii Trimithias, Kokkini Trimithia, Laxia, Makedhonitissa Monastery and Arab Ahmed Chain-of-Wells (£78,500), and for deep well turbine pumps for the boreholes at Ayii Trimithias, Kokkini Trimithia, and Laxia (£1,750). At the end of the year the Water Board was considering various methods of executing the scheme. The Water Supply and Irrigation Department carried out three emergency schemes for the Water Board to relieve last summer's severe water shortage. These enabled a normal summer supply to be maintained within the city walls and in some areas outside, in spite of the drought. The cost was £12,000 approximately.

Limassol : The Water Board was formed on 5th September, 1951. A Government loan of £300,000 has been approved, and the scheme described in the 1950 Annual Report is being carried out by the Water Supply and Irrigation Department. This will provide 1,250,000 gallons of water daily during most of the year and about 800,000 gallons in summer. The sources are three springs called Kephalovryso, Kria Pighadia, and Mavrommata, 20 miles by pipe-line from Limassol.

Three major contracts have been concluded, one for asbestos cement pipes for the distribution system (£102,540), and two for steel pipes to bring the water from the springs to the reservoir (£71,969 and £8,536). All the asbestos cement pipes and two shipments of steel pipes have arrived. Tenders have been invited for the supply of 4,500 half-inch water meters. Other imported materials have been ordered through the Crown Agents for the Colonies.

Construction work is proceeding near the headworks, and on the service reservoir at Limassol. The waters of the Kephalovryso, Kria Pighadia, and Mavrommata springs have all been brought under control and led into collecting tanks. Very little new work was required at Kephalovryso which was attended to several years ago, when it was excavated and protected by stone walling. At Kria Pighadia, a tunnel 540 feet long was driven under the river bed to tap the water before it found its way upwards into the river gravels. A similar tunnel of 350 feet was driven at Mavrommata. Work is now proceeding on the laying of 20 miles of steel pipes to Limassol. The service reservoir at Limassol, now under construction, measures 150′ × 120′ and will hold 800,000 gallons. The floor is of lime and cement concrete, the sides of masonry, and the roof of reinforced concrete. At the end of the year about half the structure has been built and work is continuing. A masonry store and office have been built beside the reservoir.

To acquire the springs of Kephalovryso, Kria Pighadia and Mavrommata, the Water Board will pay some £10,500 in compensation money and in addition spend £1,500 on providing watering places for flocks.

Famagusta : The Water Board was formed on the 22nd of August, 1951, and a Government loan of £60,000 will shortly be made for the purpose of carrying out the scheme described in the Annual Report for 1950, for acquiring land for a reservoir site and for other incidental purposes. The new scheme is to provide about 416,000 gallons of good quality water daily ; construction was started by the Water Supply and Irrigation Department in November.

The necessary pipes and pumping plant, which had been ordered early in the year by the Municipality before the formation of the Water Board, have all arrived.

Preliminary works at Phrenaros, where the 4 new boreholes for the new supply are situated, are in hand. These include the casing of the boreholes, the installation of the electro-submersible pumps, the construction of a switchboard room and attendants' quarters, and the construction of a collecting tank. The Central Electrification authority is bringing a 4½ mile electric power line to the site from Dherinia. The laying of the 7 mile main pipe line to Famagusta will start as soon as the pumps are working ; the 200,000 gallon reservoir at Famagusta will be commenced as soon as the land acquisition formalities are completed.

The object of the scheme now in progress is to relieve the acute difficulties caused by the increasing salinity of water pumped from the 5 boreholes at Stavros. Additional sources, to double the volume of good quality water, are needed, and the pipe distribution system of the town requires nearly total replacement. Details of the major project have not been prepared, but the cost is expected to be of the order of £300,000.

Larnaca : No Water Board has been formed in Larnaca. The town water comes from a chain of wells constructed by Abu Bekir Pasha in about 1745 and donated to the town. Under the terms of the Deed of Dedication the administration of the supply is vested in the Evcaf Department, an organization formed under the Evcaf Law for the management of Moslem properties. The Water Supply and Irrigation Department assists the Evcaf Department by giving technical advice when required and by attending to the maintenance of the supply.

The winter floods of 1949–50 damaged the chain-of-wells. Some of the damage was repaired in 1950, but since then careful inspections have shown that 1,250 feet of the tunnels have collapsed to such an extent that repairs are impracticable. A new tunnel parallel to the old one is accordingly now being excavated ; it will be lined in precast reinforced concrete sections to support the roof and sides which are of gravel. When the new tunnel is completed the water will be diverted into it, and the old one abandoned. The cost of the work will be about £3,620.

Other parts of the tunnel are also in bad condition and may need replacement before long. The estimated cost is £5,220. If the demands for water increase, a reservoir to store the night flow of the chain-of-wells may also become desirable.

Paphos : In this case a Water Board has not been considered necessary and the control of the town water supply remains in the hands of the Municipality. Government has granted a loan of up to £20,000 for the renewal of the existing pipe distribution system and the construction of a new service reservoir. The work is now being carried out by the Municipality under the supervision of the Water Supply and Irrigation Department.

When the present scheme is completed it will be possible to deliver all the available water to any part of the town without loss or difficulty. The problem of providing additional water has yet to be tackled. The town is expanding and the extension of the distribution pipes to new areas will be advisable when more water has been obtained.

APPENDIX 2.

DESCRIPTIONS OF CERTAIN IRRIGATION SCHEMES.

(*A*) *Kafizes.*—This scheme consists of a dam and some minor works to provide additional irrigation water for the Lefka Co-operative Irrigation Society. When completed the dam will be the highest in Cyprus.

Water from the Kafizes River was first used by Lefka in 1931. In that year a sub-surface weir was built in the river gravels at the site now chosen for the new dam, and an 8 inch pipe line, 31,200 feet long, laid to Lefka down the river valley. The pipe, which is still in good condition, is big enough to discharge 800,000 gallons per day at Lefka, but in summer, under present circumstances, only 300,000 to 350,000 gals. p.d. are available.

The new dam, on which one season's work has been completed, is to store winter water at the head of the pipe line so that the pipe may be more nearly filled in summer. It will impound sufficient water to double the present summer discharge of the pipe for at least two moths in every year, at the time when water is most needed.

The dam is to be a concrete and masonry structure of the gravity overflow type founded on igneous rock. The crest will be 70 feet above foundations, and 50 feet above the river bed ; the length of the dam at crest level will be 100 feet. From the foundations to 6 feet above bed level it is constructed in 1 : 2 : 4 and 1 : 3 : 6 cement concrete. Above the 6 feet level the hearting is of rubble masonry set in lime-cement mortar of 1 : 2 : 9 and 1 : 3 : 12 mix. The upstream 5 feet and the downstream face will be set in 1 : 3 cement mortar. Longitudinal and transverse inspection galleries are provided at bed level and foundation drains are connected to the galleries by vertical 3″ pipes built into the concrete. A diversion tunnel lined in reinforced concrete, passes through the rock of the right abutment at a distance of 40 feet from the nearest part of the dam. The draw-off pipe will pass through the tunnel, and be operated by an ordinary 6″ sluice valve downstream of the dam. A 10″ penstock fixed on a diaphragm wall at the head of the tunnel will be used as a de-silting under-sluice.

The work is being carried out in two stages, the first in the summer of 1951 and the second in the summer of 1952. The first stage, which includes the construction of the diversion tunnel, the excavation of the foundations, and the building of the dam to 6 feet above bed level has been completed. Some difficulty was experienced in excavationg the foundations down to solid rock. The average depth of gravel to be removed was 20 feet, as anticipated, but matters were complicated by the unsuspected presence at this depth of two large caverns from which issued some strong springs. The caverns had to be cleaned of all loose material and the springs isolated and piped away before concreting could be carried out. The first stage was started in May, 1951, and completed in November before the normal flood season.

Minor works, consisting chiefly of the lining of distributary channels in Lefka are now in progress and will continue during the winter. Work on the main dam is scheduled to re-start in May, 1952.

The estimated cost of the dam is £17,000 and of the minor works £3,000. Of the total £20,000 the Co-operative Society has paid £8,000, obtained by a Government loan ; the balance of £12,000 has been provided as a free grant by Government. It is expected that the scheme will make possible 500 donums of new irrigation and 200 donums of seasonal irrigation.

(*B*) *Petra.*—A scheme for this Irrigation Division was completed in 1948. It comprised a 30 feet high dam of 7,000,000 gallons storage capacity and some 15,000 feet of channels. The area irrigated is about 2,500 donums in winter and 250 in early summer. To increase the storage of water for early summer cultivation the Irrigation Division asked for a second dam in the same river, about ½ mile upstream of the first. The channels of the 1948 scheme would serve the second dam. The proposals were accepted, and the new dam has now been built.

The new dam is the same height as the first, i.e. 30 feet above the stream bed. It has a smaller capacity, impounding only five million gallons instead of seven. It is founded on the pillow lavas which form the bed rock at this point, about 8 feet below the stream bed. Some minor springs issuing from the excavated foundation were led clear of the structure by pipes built into the masonry, and a transverse drainage channel was built from bank to bank across the foundation of the dam. In excavating the right bank abutment it was found that the bed rock did not rise with the surface of the ground, but instead fell away to form a small secondary valley filled with alluvium. This had not been revealed by a series of trial pits sunk before construction had started. To prevent leakage down this burried depression it was necessary to excavate a trench 120 feet long and on the average 20 feet deep and to fill it for a depth of about 10 feet with lime concrete. The hearting of the main dam is of stones embedded in 1 : 3 : 8 lime-cement mortar. The outer 2 feet both upstream and downstream is of uncoursed masonry in 1 : 2 cement mortar. The upstream face is plastered with three coats of cement mortar to prevent seepage through the structure.

Work started in May, 1951, and was completed in November at a cost of £6,160 of which the Division paid £1,667. The additional area of early summer irrigation now rendered possible will be about 225 donums of which 75 will be perennial.

(*C*) *Prodhromos.*—The cultivable lands of Prodhromos are near the village, and about 2 miles from the Kharcha springs which supply both irrigation and drinking water. The irrigation water flows to the village through the forest in an open gravity channel. Leakage from the channel was so great that although there is sufficient water at source to irrigate several hundred donums only about 120 have been irrigated in the past. The villagers have long been aware of the losses of water, and they petitioned Government for assistance to have the channels lined in concrete.

A scheme was approved and the work carried out mostly in the winter of 1950–51. Prodhromos is the highest village in Cyprus (4,400 feet) and is normally too cold in winter for work of this sort. In summer, however, there would be difficulties in building a new concrete channel in the bed of an old earth one, because a continuous flow of water would have to be maintained for irrigation and, if construction works were proceeding, many temporary diversions would have to be made. The work was, therefore, pressed forward in the winter in spite of the cold. Fortunately the winter of 1950–51 was mild and the scheme was completed without difficulty by October, 1951, having been started in November, 1950. Some 12,950 feet of reinforced concrete channels were built at a cost of £9,280 of which the villagers paid £2,387. The area benefiting is about 300 donums.

Upon the completion of the above scheme the Commissioner, Limassol, provided a further £1,000 for improvements to distribution channels. This additional work was nearing completion at the end of the year.

(*D*) *Pedhoulas.*—The Pedhoulas Irrigation Division controls some 6 miles of small channels fed from 37 springs and 4 streams. The channels are built around steep hillsides and in the past they have been mostly of earth or loose stone construction. There has consequently been much loss of water by leakage. Before the present scheme was carried out some 290 donums of good class orchard and garden land in the valley were irrigated regularly, and a further 140 when sufficient water was available.

In 1951, 26,500 feet of the channels were lined in reinforced concrete, and, in precipitous places 5,300 feet were replaced by steel pipes. In addition permanent intakes with screw gates were provided, small weirs were built to divide the flow in correct proportions to the various channels, and numerous outlets

were fixed for the easy control of water flowing to individual plots. The works were commenced in February, 1951, and completed by November, 1951, at a cost of £17,500 of which the Division paid £4,505. An area of about 500 donums has benefited. The Division is now pressing for further improvements estimated to cost £2,000.

Upon the completion of the scheme the Committee of the Irrigation Division gave a luncheon party at which the Colonial Secretary was the principal guest.

(*E*) *Tembria and Korakou.*—The lands irrigated by these Irrigation Divisions are some of the best in Cyprus ; they can be seen from the road as one motors up the Solea Valley to Troodos. Until recently very few irrigation channels in this valley had been lined with concrete or masonry, but a change in attitude is now taking place among the villagers, who have come to realise that it is profitable to prevent waste of water.

These two Divisions share the same main channel and they have combined for the purpose of the scheme. Water is taken from the Karyotis River along some 3 miles of main channel to irrigate garden and orchard lands lying between the channel and the river. The main channel and some branches totalling in all 18,000 feet, have been lined with reinforced concrete and many incidental works have been included, among them a permanent intake and silt trap, screw control gates, controlled divisions, some small aqueducts, and many outlets. The maximum size of channel was 3′ × 1′ 4″, designed to take a flow of 10 cusecs. Work commenced in January, 1951, and was finished by November. The cost was £15,000, of which the beneficiaries paid £4,286. About 800 donums benefit. Now that leakage losses have been prevented the area of land actually irrigated in a season has probably increased by about 50%.

The success of the scheme led immediately to applications for similar works in the nearby villages of Galata and Evrykhou.

(*F*) *Tersephanou.*—The Tremithios River, on which the Tersephanou Weir is situated is remarkable for its sudden and severe floods. Three weirs built in past years have been destroyed or rendered useless, by sudden high floods which attain a discharge of 7,000 cusecs or more.

The present scheme is a revival of an old one. It consists of a weir to divert flood water into a channel on the right bank, the Tersephanou channel, and the re-conditioning of the channel. Provision is made for diverting water to the old Kiti channel, on the left bank, if the latter is repaired in the future.

The new weir structure consists of two weir walls in series, the first to divide water between the river and the Tersephanou channel in the proportion of 1 : 10. Downstream of this weir wall, at a distance of 22 feet, the second makes possible the diversion of part or all of the 9/10ths into the Kiti channel, while the balance continues down the river. A spillway on the Tersephanou channel returns excess water from the channel to the river.

Both the main weir walls are 100 feet long. The first is 7 feet high and the second 6′ 6″. Both are built on the same 70 foot wide apron which is founded on gravel, not on rock, and which is 5′ 0″ thick on the upstream side tapering to 2′ 6″ downstream. There is a 5 feet 6 inches deep cut-off wall. The wide apron is to reduce the rate of seepage under the weir sufficiently to eliminate the danger of undermining. Wing retaining walls parallel to the direction of flow will contain floods up to about 4,000 cusecs but thereafter the water will overtop the left wall and spread across the Kiti channel to the left bank. Screw gates are provided at the heads of both channels. The old Tersephanou channel has been re-formed to a bed width of 6 feet and regraded over a length of 7,500 feet with two traxcavators.

An unusual feature of the work was the method by which an old reinforced concrete weir wall was incorporated into the new structure to form the upper weir wall. The old wall, 100 feet long and 7 feet high, had been undermined by successive floods and had broken at the centre into two parts. At the point of breakage the crest had sunk by about 1′ 6″, while at the abutments it remained almost at its original level. To restore the position each half was raised separately by 3–50 ton hydraulic jacks and an entirely new foundation about 8 feet deep was built underneath, over the whole length.

Several floods of upto about 3,500 cusecs have passed over the new weir since its completion without causing damage.

The full scheme was nearing completion at the end of the year. The cost will be about £6,700 of which the Irrigation Division has paid £500. Some 1,000 donums will receive spate water irrigation.

(*G*) *Ayios Ioannis.*—The people of Ayios Ioannis have in the past been unable to utilise fully the water of several springs, chief of which is Neron-tou-Pitsilli, because there are few cultivable lands near them. The springs are beside the Akaki River but their cultivable lands are near the village some 6,500 feet away. Between the spring and the cultivable land is some high ground which cannot be crossed by an open gravity channel.

Two possible schemes presented themselves (*a*) a long open channel across the face of a series of unstable cliffs or (*b*) a direct tunnel under the high ground. The latter was accepted and a scheme that included a 4,000 foot tunnel and 3,550 feet of masonry channels was started in June, 1951. At the end of the year it was nearing completion.

The cost of the work will be about £6,000 of which one-third has been paid by the Irrigation Association by means of a Government loan. Some 70 to 80 donums will be irrigated in summer, and about 480 in winter and spring.

(*H*) *Orounda.*—A few years ago some 25 of the inhabitants of Orounda excavated a successful chain of wells about 4,000 feet long on the left bank of the Peristerona River. The work was carried through without Government assistance. As a result of their enterprise the villagers were able to irrigate about 100 donums below the outlet of their chain of wells. There was surplus water on the left bank of the river but it was beyond their means to carry it across to the right bank where their best lands were situated. They had no rights to the use of the water in the river. They accordingly asked for Government help, which was granted after they had formed themselves into an Irrigation Association.

Work commenced in March, 1951. The river crossing was made by an 8″ pipe buried deep enough below the gravels of the river bed to escape damage from floods. Some 6,600 feet of masonry channels were built to carry the water to the upper part of the cultivable lands. Before these were finished the beneficiaries were able to test the scheme and they were so pleased with the results that they at once asked for an extension of a further 1,200 feet of channel, including a 400 foot tunnel.

The total cost of the works will be about £7,000 of which the members of the Association have contributed one-third in free labour. The area irrigated is 400 donums in winter and spring, and 250 donums in summer.

APPENDIX 3.

DESCRIPTION OF CERTAIN VILLAGE WATER SUPPLY SCHEMES.

(*A*) *Athienou.*—The water for this scheme is taken from the privately owned Athanassi chain-of-wells which yields 500,000 gallons per day in the summer, and 900,000 in the winter. One-third of the water was purchased and piped to the village.

The main pipe line consists of 24,000 feet of 9 inch diameter Everite asbestos cement pipes, and conveys slightly more than one-third of the winter flow, about 390,000 gallons per day, to a 6,000 gallon storage tank in the village. The water is distributed by a reticulation system consisting of 18,700 feet of piping up to 6" in diameter to 37 standard fountains at selected points : provision has also been made for a house to house metered service. The main pipe line was laid between December, 1947 and September, 1948, and the distribution pipes between March and December, 1951. The new scheme provides more than double the domestic needs of the village, so a considerable quantity of water is used for irrigation.

The cost of the work was £18,100. Of this £2,183 was spent on purchasing the water and £16,717 on the main pipe line and distribution system. The cost per person based on a population of 3,169 by the 1946 census was £5.96 for a minimum supply of 52 gallons per head per day. Half the total cost was paid by Government, and half by the Athienou Municipality.

Athienou derives great benefit from the new scheme because its old domestic water supply was not only insufficient for the needs of the village, but was also injurious to health, particularly to the teeth, due to the presence of fluorine in the water.

(*B*) *Polemi.*—This scheme is of interest in that use is made of a 3" pipe line laid in 1939 to carry water from Khrysoroyiatissa to Phiti, Ayios Dimitrianos and Kathikas. This old pipe line is 5 miles long and sustains a water pressure of 600 lbs. per square inch in places where it crosses the Ezuza valley. To provide for the future it was made large enough to supply several villages in addition to the original three.

The water for Polemi was obtained by purchasing 8 gallons per minute of the flow of the Papalouka spring, near Khrysorroyiatissa, and piping it first in the existing 3" pipe line to Phiti and then to Polemi in 24,500 feet of new 2" pipe line. The distribution system consists of two storage tanks, one mile of 1" pipes, and 10 standard fountains.

Ay. Dhimitrianos & Kathikas

The cost of the work was £5,640, half of which was borne by the village. £810 was spent on purchasing the water, £426 on reimbursing Phiti with Polemi's share of the Phiti pipe line, £250 for extending the headworks at Papaloukas spring, and £4,154 for conveying the water from Phiti to Polemi, including the distribution of the water in the village.

The population of Polemi by the 1946 census was 754 so the cost per person was £7.6 for an average supply of 15 gallons per person per day. Work was commenced in July, 1951, and completed in October, 1951.

(*C*) *Pano and Kato Dhikomo.*—This is a single scheme serving two villages, Pano Dhikomo and Kato Dhikomo. It is a pumped water supply.

The source is a borehole drilled in the foothill limestones of the Kyrenia range at a place where the ground level is higher than the villages. The water is pumped into a distribution box at the well head by a reciprocating borehole pump operated by a 6 h.p. diesel engine. At the distribution box the water is divided in proportion to population. 72% is conveyed to Kato Dhikomo by a 4,600 foot pipe line 2 inches in diameter and the remainder to Pano Dhikomo by 2,740 feet of 1½ inch pipes. Pano Dhikomo has two standard 1,500 gallon storage tanks, and Kato Dhikomo has a covered 9,000 gallon masonry tank.

The distribution system includes about 25,000 feet of pipe line from 2½ to ¾ inches in diameter and delivers water to 11 fountains at Pano Dhikomo and 30 at Kato Dhikomo.

The pump yields water at 2,000 gallons per hour. If it is operated for 12 hours per day the supply, for a population of 1,888 by the 1946 census, will be 13 gallons a day per person which is considered sufficient for domestic purposes. The present need of the villages is satisfied with less than this quantity.

The work was commenced in September, 1950 and completed in April, 1951—the cost was £6,000, Kato Dhikomo contributing £2,223 and Pano Dhikomo £777. The cost per person is £3.15.

(*D*) *Pano and Kato Pyrgos.*—This is a single scheme serving two villages, Pano Pyrgos and Kato Pyrgos. The water is obtained by tapping four adjacent springs at Jinourkes in the State Forest. The flow of the springs, 48,600 gallons per day as measured on the 7.6.51, is conveyed to Pano Pyrgos in a 45,000 foot 3″ diameter galvanized steel pipe line. From Pano Pyrgos a 9,900 foot pipe line 3″ in diameter conveys about 32,400 gallons per day to Kato Pyrgos.

Distribution of water at Pano Pyrgos is effected through a 1,500 gallon storage tank and a reticulation system consisting of 4,606 feet of pipe line from 1½″ to ¾″ in diameter to 10 standard fountains at selected sites in the village. At Kato Pyrgos the arrangement is similar, except that there are 2 storage tanks and 26 fountains.

The scheme was commenced in July, 1950, and the work for Pano Pyrgos was completed in June, 1951. Water has been piped to Kato Pyrgos, and at the end of the year work on the distribution system of Kato Pyrgos was still in progress. It will be completed early in 1952.

The estimated cost of the work is £14,100. The contribution of Pano Pyrgos was £1,300 and Kato Pyrgos £3,400, and the balance of £9,400 was paid by Government. The population of the two villages by the 1946 census was 1170, so the cost is about £13 per person for a supply of 42 gallons per head per day as gauged in June, 1951. At the present time less than half of the water is used for domestic purposes and the balance for irrigation.

(*E*) *Ayios Theodhoros.*—Two springs at the locality Meliona on the northern slopes of the Kyrenia Range were purchased for this supply. From gaugings taken over a period of 4 years the flow is seen to vary from year to year, and with the seasons, from 5,000 to 12,000 gallons per day.

The water was conveyed to the village through 46,000 feet of 2 inch pipe line designed to deliver the maximum flow so far recorded. Distribution in the village is by means of two 1,500 gallon storage tanks, 9.500 feet of ¾″ to 2″ piping, and 20 fountains. An improvised deep furrow plow was used for the pipe line trench, and proved economical where the location of the line was on flat land.

The cost of the work was £7,812, half of which was contributed by Ayios Theodhoros. Expenditure of £960 was incurred in purchasing the water, and £6,862 in piping and distributing it to the village. The population by the 1946 census was 852 so the cost per person for a supply of 6 to 10 gallons per person per day is approximately £9.25. Work was commenced in June, 1950, and completed in April, 1951. An opening ceremony was attended by His Excellency the Governor on 10th June.

(*F*) *Psillatos and Vitsadha.*—This is another scheme which serves two villages. The water is taken from the Parmaksizin Suyou and Aghli Pounar springs in the Kyrenia hills, and is conveyed in 26,000 feet of 1½″ diameter pipe line to a distribution box at the locality Kukutari, where it is divided in proportion to the population of the two villages.

From the distribution box a 10,500 foot $1\frac{1}{2}$" main conveys 5,554 gallons per day to Psilatos and a 4,500 foot $1\frac{1}{4}$" main conveys 4,219 gallons per day to Vitsadha. The water is distributed in the former village by means of one standard 1,500 gallon storage tank, 4,600 feet of 1" to 2" pipe line, and 9 fountains; and in the latter by one storage tank, 3,050 feet of $\frac{3}{4}$" to 1" pipe line, and 7 fountains.

The flow of the springs varies considerably with the seasons, and based on gaugings over a period of five years the minimum supply to be expected is 9 gallons per person per day in the summer, rising to about 22 gallons in the winter.

The cost of the work was £5,800 of which Psilatos contributed £1,795, and Vitsadha £1,130. The expenditure incurred by Psilatos and Vitsadha per person for a minimum supply of 9 gallons a day was approximately £7.89 and £6.55 respectively.

Work was commenced in October, 1950, and completed in April, 1951. His Excellency the Governor attended an opening ceremony on 10th June.

(*G*) *Pano Zodhia.*—This village is supplied with water by a pumping plant housed in a masonry engine house. The plant is installed on a borehole half a mile from the village and consists of a deep well reciprocating pump worked by a 6 h.p. diesel engine. The pump delivery is 2,000 gallons per hour.

From an 8,000 gallon masonry storage tank at the pump house, the water is conveyed to 26 fountains in the village by a distribution system involving about two miles of pipe line from 3 to 1 inch in diameter.

The cost of the scheme was £4,000 or £3.72 per person. Work was commenced in August and completed in November.

The pump at present operates for about 6 hours per day and delivers 12,000 gallons or 11 gallons, per person per day, based on a population of 1,073 given in the 1946 census. If the villagers need more water they can, of course, work the pump for longer hours.

(*H*) *Letimbou.*—The water supply of Letimbou is tapped from the Rinos spring, which was bought from the Holy See of Paphos for £265.

The flow of the spring which varies from about 6,000 to 12,000 gallons per day is piped to the village through 19,500 feet of 3 inch main designed to take the maximum flow.

The water is distributed in the village through twin storage tanks equipped with animal watering troughs, 1,300 feet of one inch distribution pipes, and one fountain at the lower end of the village.

The flow at the storage tank was 9,043 gallons per day as measured in July, 1951, and gives an average supply of about 13 gallons per day per person for a population of 699 by the 1946 census. In the spring, surplus water will be available for irrigation.

The total cost of the work, half of which was borne by Letimbou, was £5,000, and the cost of the scheme per head of the 1946 population is £7.15. Work was commenced in May, and completed in November.

APPENDIX 4.

THE UNDERGROUND WATER RESOURCES OF CYPRUS.

In this Appendix Dr. D. J. Burdon, Assistant Water Engineer, summarises a detailed report that he is preparing. It is hoped that his full report will be published in due course.

The general hydrology of Cyprus shows that in an average year precipitation amounts to a million million gallons of water. The percentage of this which soaks into the underground aquifers depends on the topography and geology of the island. A detailed review has been made of the geology of the island based on all past and recent work ; from this it is clear that drilling for water in Cyprus can be expected to yield valuable amounts of good quality water only from the Quaternary and Pliocene deposits (which cover 33% of the island), and from a few of the areas underlain by Miocene and Eocene-Oligocene formations. By combining the geology with the hydrology, it has been calculated that about 7.5% of the total rainfall, i.e. 75,000 million gallons per year, soak into aquifers suitable for development by wells, by chains-of-wells and by boreholes.

Four maps have been prepared covering the whole of the Mesaoria from Famagusta and Larnaca Bays to Morphou Bay. On these maps all boreholes have been plotted and their yield indicated. The maps also show the geology of the areas and the contoured surface of the underground water-table, where such exists, as well as the Miocene/Pliocene interface and the chemical composition of the water for certain areas. Detailed descriptions of the 17 sub-areas into which the Mesaoria has been sub-divided form the bulk of the report.

Based on the information obtained from drilling in the past, a programme for the complete development of the underground water resources of Cyprus has been drawn-up. It is estimated that 4,000 boreholes will be necessary, and that they should be sunk at the rate of about 200 per year. The proposed distribution of the boreholes is tabulated.

As a result of this programme, it is estimated that by about 1970 a total of some 100,000 donums of land will be under summer irrigation with water pumped from boreholes. By that time, the area under irrigation from open wells should have risen to 75,000 donums ; if not, supplementary drilling may be necessary. In addition, it is estimated that 25,000 donums will be under irrigation with water drawn from the underground aquifers by means of chains-of-wells. In all, a total of 200,000 donums should be brought under perennial irrigation with water drawn from the underground reservoirs.

Of the 75,000 million gallons which annually reaches these underground reservoirs, it is assumed that a little over 50%, i.e., 40,000 million gallons per year, are recoverable. By 1970, it is thought that this full amount will be extractable, 30,000 million gallons from wells and boreholes, 7,000 million gallons from chains-of-wells and the balance of 3,000 million gallons by various means for domestic use and not for agriculture. The 37,000 million gallons will be ample to irrigate 200,000 donums in summer. This distribution is considered to be equitable and the optimum manner in which the total underground water resources of Cyprus can be utilized.

APPENDIX 5.

IRRIGATION SCHEMES COMPLETED IN 1951.

	Location	Nature of Construction	Donums commanded. New Irrigation		
			Winter	Summer	Total
	Ay. Irini (Kannavia)—				
1	Krio-Nero	Spring, channels and tank ..	—	20	20
2	Pera-Yitonia ..	do. ..	—	13	13
3	Phterykha	Construction of an irrigation tank	—	10	10
4	Ayios Epiphanios (Orinis)	Irrigation tank and piping ..	—	8	8
5	Angastina	Construction of weirs, masonry and earth channels and gates..	100	—	100
6	Ay. Neophytos (Monastery)	Spring, piping	—	9	9
7	Ayia Anna	Masonry channels and irrigation ports	30	—	30
	Agros—				
8	Dhihalorotsos ..	Channels	—	40	40
9	Mesi-Dhihalorotsos	do.	—	30	30
10	do. ..	Additional channels	—	5	5
11	Pano-Vrysia ..	Spring	—	9	9
12	Kato-Vrysia ..	Spring and repairs to tank ..	—	9	9
13	Messi-Vrysia ..	Spring	—	6	6
14	Esso-Yitonia ..	Spring, channels and tank ..	—	23	23
15	Rodhitis	Weir, spring and tank	—	13	13
	Ayios Pavlos—				
16	Pano-Xyries ..	Weir, channels and tank ..	—	25	25
17	Kato-Xyries ..	do.	—	18	18
18	Kokkinoyia ..	Masonry channels	—	14	14
19	Dhimma-tou-Khoriou	do.	—	3	3
20	Vrysi-tou-Khoriou	Spring and retaining wall ..	—	16	16
	Ayios Konstantinos—				
21	Philippou	Masonry channels and tank ..	—	11	11
22	Karka	Spring, channels and tank ..	—	19	19
23	Kato-Vavatsinia ..	Masonry channels and tank ..	—	22	22
24	Strakidhin	do. ..	—	7	7
25	Pano-Vavatsinia ..	do. ..	—	16	16
	Alona—				
26	Kokkinos	Chain of wells	—	20	20
27	Dhendra-tou-Pouliou	Masonry channels and enlarging of tank..	—	15	15
28	Ayios Sozomenos— Ahmed-Dede ..	Weir intake and channels ..	1,500	—	1,500
29	Athrakos (Kalimera) ..	Weir and channel	—	20	20
	Arakapas—				
30	Koutsis	Lining of channels	—	150	150
31	Skolli	do.	—	180	180
	Ayios Theodhoros—				
32	Maroudhis	Masonry channels	—	15	15
33	Limni	Spring, masonry channels and tank	—	19	19
34	Kato-Avlaki ..	Masonry channels	—	5	5
35	Lasmarka ..	do.	—	10	10
36	Ay. Yeorghios ..	Masonry channels and tank ..	—	20	20
37	Koufes	Weir and masonry channels ..	—	20	20
38	Kato Ay. Yeorghios	Weir, masonry channels and repairs to a tank	—	4	4
39	Dhexameni ..	Weir and masonry channels ..	—	12	12
40	Pano Avlaki ..	Masonry channels	—	12	12
41	Astromeritis	do.	800	—	800
	Agridhia—				
42	Pano Vrysia ..	Piping and tank	—	13	13
43	Kato Vrysia ..	Masonry channels and tank ..	—	15	15
		Totals carried forward ..	2,430	876	3,306

	Location	Nature of Construction	Donums commanded. New Irrigation		
			Winter	Summer	Total
		Brought forward ..	2,430	876	3,306
	Dhymes—				
44	Livadhia	Masonry channels and tank ..	—	23	23
45	Haji Fisouni ..	Masonry channels and piping ..	—	32	32
46	Kardhama ..	Spring, piping and tank ..	—	20	20
47	Engomi (Messi River)	Repairs to channels & earth bank	—	—	—
	Exo Metokhi—				
48	Tokloudhes-Yerondas	Repairs to channels & masonry walls	—	—	—
49	Gypsos (Vathys) ..	Construction of small diversion weirs, repairing of banks, etc.	—	—	—
50	Gypsos (Part II) ..	do.	—	—	—
	Geunyeli—				
51	Almirkos	Weir, channels, tunnels, syphon, irrigation port	2,000	—	2,000
52	Jinar Dere	Irrigation ports, etc.	30	—	30
53	Galini	Desilting gate and masonry channels	—	70	70
54	Gourri	Weir and channels	—	7	7
55	Gaidhouras (Tappa) ..	Earth channels, culverts, etc. ..	300	—	300
56	Koloni	Piping	—	9	9
57	Kanli Keuy	Channelling	100	—	100
	Kourdhali—				
58	Appides	Masonry channels	—	10	10
59	Pano Anastasi ..	Weir and irrigation tank ..	—	15	15
60	Vathis	Weir and channel	—	13	13
61	Kato Amiandos (Englisis)	Weir, masonry channels & tank	—	26	26
62	Kato Mylos (Koutsoullos)	Masonry channels & aqueduct	—	40	40
	Khandria—				
63	Vrysia	Spring, masonry channels & tank	—	14	14
64	Yerophilippou ..	Spring	—	8	8
65	Kalokhorio (Kambos)	Weir, masonry channels & tank	—	9	9
66	Kalopanayiotis (Frangolakkos)	Repairs to channels, weirs, tanks	—	—	—
67	Kharcha (Mesa-tou-Nerou)	Spring, channels, repairs to a tank	—	80	80
68	Karavas (Mezere) ..	Spring, masonry channels and repairs to a tank	—	60	60
69	Lythrodhonda (Koutsos)	Heightening of the dam ..	—	25	25
70	Limnitis (Mylos-tou-Patsalou)	Construction of additional channels	—	50	50
	Lagoudhera—				
71	Potamia	Weir and masonry channels ..	24	10	34
72	Vrysi-entos-Khoriou	Spring	—	11	11
73	Fontallouri	Weir and channels	—	8	8
	Louvaras—				
74	Pishirin	Spring, piping and tank ..	—	18	18
75	Kato Pervolia ..	Masonry channels	—	20	20
76	Lefkoniko (Harman Alti)	Weir and channel	140	—	140
77	Louroujina (Lymbourka)	Chain of wells	—	30	30
78	Mora	Repairs to intake	—	—	—
79	Moutoullas	Repairs to small weirs, channels etc.	—	—	—
	Marathovouno—				
	Lishinia	Repairs to weir and channels ..	—	—	—
81	Kaf-Dere	do. ..	—	—	—
82	Milikouri (Vrysi-tou-Khoriou)	Weir and masonry channels ..	—	30	30
		Carried forward ..	5,024	1,514	6,538

	Location	Nature of Construction	Donums commanded. New Irrigation		
			Winter	Summer	Total
		Brought forward ..	5,024	1,514	6,538
83	Pretori	Irrigation tank and channels ..	—	30	30
84	Patriki	Reforming of earth banks, construction of culverts, etc. ..	—	—	—
	Platanistasa—				
85	Koukkoupas ..	Spring and masonry channels ..	—	15	15
86	Pano Themelia ..	Spring	—	7	7
87	Kato Themelia ..	do.	—	4	4
88	Vrysi	Masonry channels and tank ..	—	18	18
89	Kato Kokkinohomata	Weir, masonry channels & tank	—	25	25
90	Pano Kokkinohomata	Masonry channels and tank ..	—	20	20
	Polystipos—				
91	Platanoudhia ..	Irrigation tank	—	4	4
92	Manoyili	Masonry channels	—	16	16
93	Sklinijera	Springs, piping & irrigation tank	—	16	16
94	Parakania	Masonry channels	—	9	9
95	Khrysomyloudhi ..	Spring	—	9	9
96	Parakania	Additional channels	—	4	4
	Phterikoudhi—				
97	Vartali	Weir, spring, masonry channels	—	18	18
98	Paravkasha ..	Spring and masonry channels ..	—	8	8
99	Pano Kalamythasa	Masonry channels	—	15	15
100	Karkas	Masonry channels and tank ..	—	14	14
101	Ayiasma	Spring, piping and tank ..	—	12	12
102	Paleosophos (Kalamoulia)	R.C. channels	—	24	24
103	Prodhromos (Kharcha)	R.C. channels and ports ..	—	200	200
104	Pedhoulas (Sterkas) etc..	R.C. channels, piping and ports	—	232	232
105	Petra (Atsas).. ..	Construction of a dam	150	75	225
	Prastion—				
106	E.M.I.W.	Embankment Prastion-Kouklia repairs	—	—	—
107	Kenouryia.. ..	Repairs to channels and masonry walls	—	—	—
	Peristeronopiyi—				
108	Elita	Repairs to weir and channels ..	—	—	—
109	Lizion	do. ..	—	—	—
110	Palekythro (Laxies) ..	Soil erosion weir and channels	300	—	300
111	Sarandi (Kanjeli) ..	Weir and masonry channels ..	—	20	20
112	Statos (Kato Pighadhi)	Spring, masonry channels & tank	50	25	75
113	Sykopetra (Kountouria)	Spring, masonry channels & tank	—	17	17
114	Strongylos(E.M.I.W.)	Repairs to channels and retaining walls	—	—	—
	Trikomo—				
115	Kyparisha	Channels and gate	300	—	300
116	Koloka	Repairs to channels and weir ..	—	—	—
117	Tembria & Korakou (Esso Yitonia) ..	R.C. channels, aqueduct, silt gate, etc.	400	360	760
118	Vyzakia (Holetra-tou-Papa)	Aqueduct, masonry channel and irrigation port	—	180	180
119	Vitsadha (Kior Dere)	Irrigation ports and culverts ..	400	—	400
120	Yerasa (Lithosoura)	Weir, masonry channels, piping tank	100	90	190
	Zoopiyi—				
121	Pano Kremos ..	Spring, channels and tank ..	—	25	25
122	Kato Kremos ..	do. ..	—	20	20
123	do. ..	Additional channelling	—	10	10
124	Lymbidhes ..	Spring, channels and tank ..	—	10	10
125	Karka-tou-Matera	do. ..	—	16	16
		Grand Total	6,724	3,062	9,786

APPENDIX 6.

IRRIGATION SCHEMES IN HAND AT THE END OF 1951.

	Location	Nature of Construction	Donums commanded. New Irrigation		
			Winter	Summer	Total
	Agros—				
1	Eleni	Spring	—	5	5
2	Kato Kaoukkalis ..	Masonry channel and tank ..	—	16	16
3	Ay. Ioannis (Kapsalia)	Channels and irrigation tank ..	—	18	18
	Ayios Theodhoros—				
4	Piphanis	Masonry channel	—	25	25
5	Kramberadhes ..	Masonry channel and piping ..	—	6	6
6	Ay. Ioannis Maloundas (Pitsilos Water) ..	Chain of wells, masonry & earth channels, piping	480	80	560
7	Arakapas (Koutsi) ..	Additional lining of channels ..	—	20	20
8	Dhymes (Kambos) ..	Masonry channels and irrigation tank	—	20	20
9	Dhiorios (Djipos) ..	Spring (chain of wells) ..	100	40	140
10	Evrykhou (Kakodisha)	R.C.C. channels and irrigation ports	100	350	450
11	Galata (Sinaorkotis) ..	R.C.C. channels and irrigation ports	—	365	365
12	Kalopanayiotis (Agni)	Weir, piping and irrigation tank	—	36	36
13	Kouklia Chiftlik ..	Lining of channels	—	—	—
14	Kyperounda (Stremmata Koutsinas) ..	Masonry channels and tank ..	—	57	57
	Kalokhorio—				
15	Kato Marammenos	Masonry channels	—	10	10
16	Pano Marammenos	do.	—	9	9
17	Louvaras (Paralona) ..	Weir, piping and irrigation tank	—	25	25
18	Lefka (Kafizes) ..	Masonry dam, piping and channelling	200	500	700
19	Linou (Molos) ..	Screw gate, retaining walls ..	60	20	80
20	Malia (Maletti) ..	Weir, masonry channels ..	60	80	140
21	Marathovounos (Kontovelis)	Repairs to weir, channels and culvert	—	—	—
22	Odhou (Makriadhomi)	Weirs, retaining walls, masonry channels	100	50	150
23	Orounda (Limni) ..	Masonry channels, tunnel and cutting..	400	250	650
24	Prodhromos	Lining of channels	—	30	30
25	Patriki	Repairs to channels, diversion weirs and culverts	—	—	—
26	Palekhori (Orinis) (Sklidhros)	Weir, masonry and earth channels and pipe crossings	1,080	20	1,100
	Sykopetra—				
27	Agridhia	Masonry channels	—	5	5
28	Konomidhes ..	do.	—	7	7
29	Tris Elies (Kamenoudhia)	Masonry channels	—	36	36
30	Tersephanou	Weirs, masonry & earth channels	500	—	500
	Zoopiyi—				
31	Meshakos, Pano ..	Weir and piping	—	6	6
	Meshakos	do.	—	5	5
		Totals	3,080	2,091	5,171

APPENDIX 7.

IRRIGATION SCHEMES READY FOR CONSTRUCTION AT THE END OF 1951 BUT NOT YET STARTED.

	Location	Nature of Construction	Donums commanded. New Irrigation		
			Winter	Summer	Total
	Alona—				
1	Dhali	Springs	—	9	9
2	Makos	do.	—	6	6
3	Alithinou (Kapsala) ..	do.	—	9	9
4	Athrakos (Mavrosikiotis)	Spring, channel and tank ..	—	50	50
5	Askas (Ay. Paraskevi)	do. ..	—	20	20
6	Ay. Epiphanios (Milisandra)	Spring and channels	—	12	12
7	Ay. Amvrosios (Platanos)	Small weir and channels ..	30	50	80
8	Agros (Kokkinos) ..	Masonry channels and piping ..	—	4	4
	Ay. Konstantinos—				
9	Exo-Pano-Kollayia	Weir and masonry channels ..	—	10	10
10	Exo-Kato-Kollayia	do. ..	—	9	9
11	Katrakoulli ..	Spring and piping	—	5	5
12	Dophanides ..	Spring and masonry channels ..	—	10	10
13	Pano-Kollayia ..	Weir and channels	—	16	16
14	Mesi-Kollayia ..	do.	—	11	11
15	Ay. Mamas (Kapilio)	Masonry channels & irrigation tanks	—	33	33
16	Apsiou	Masonry channels	—	80	80
17	Arakapas (Arghaki) ..	Weir, lining of channels and irrigation tank	—	30	30
18	Ay. Ioannis (Agros)— Acros	Masonry channels	—	40	40
19	Arsos (Pissous) ..	Weir and masonry channels ..	—	30	30
	Angastina—				
20	Louria	Repairs to irrigation ports, construction of spillway	—	—	—
21	Ay. Yeorghios ..	Repairs to apron & wing-walls ..	—	—	—
22	Ayios Therapon ..	Construction of irrigation tanks	—	30	30
	Ayios Elias—				
23	Kapsalis	Construction of anti-erosion weir and retaining wall	400	—	400
24	Paleomylos ..	Repairs to channels & masonry walls	—	—	—
25	Dhymes (Rousou) ..	Spring and masonry channels ..	—	10	10
26	Eylenja	Repairs to retaining walls, construction of spillway	—	—	—
27	Engomi	Construction of irrigation ports and screw gates	500	—	500
	Geunyeli—				
28	Almyros	Repairs to main irrigation channel	—	—	—
29	Jinar-Dere ..	Repair to wing walls & apron ..	—	—	—
	Kalokhorio—				
30	Kapouti (Demadona water)	Spring, masonry channels and repairs to irrigation tank ..	200	76	276
	Kato Amiandos—				
31	Kardhama	Spring	—	9	9
32	Fournia	Weir, masonry channels and tank	—	16	16
33	Kambos	Retaining walls	—	—	—
34	Kritou Marottou ..	Piping	—	12	12
		Carried forward ..	1,130	587	1,717

	Location	Nature of Construction	Donums commanded. New Irrigation		
			Winter	Summer	Total
		Brought forward ..	1,130	587	1,717
	Khandria—				
35	Dhisha	Spring and masonry channels ..	—	9	9
36	Markettou.. ..	Weir, channel and tank ..	—	16	16
	Kalokhorion—				
37	Kato-Paschali ..	Weir, masonry channels & tank	—	26	26
38	Pano-Paschali ..	do. ..	—	36	36
39	Kambidhes ..	Tunnelling and piping	—	5	5
40	Orongou	Spring, masonry channels & tank	—	18	18
41	Paleouthoris ..	Spring	—	6	6
42	Kholetria-Nata ..	Weir, lining of channels, river-crossing and culverts.. ..	125	180	305
43	Kalopanayiotis ..	Piping	—	9	9
	Kyperounda—				
44	Theotokou-Mylos	Weir, masonry channels & piping	—	40	40
45	Kalathi	Weir, masonry channels and irrigation tank	—	10	10
46	Vrysi-tou-Mangouri	Masonry channels and tank ..	—	16	16
47	Dhyo-Potami ..	Masonry channels	—	6	6
48	Vassilikon	Weir, masonry channels and irrigation tank	—	20	20
49	Kaloritin ..	Spring, weir and tank	—	14	14
50	Kato Moni (Vayiani)	Tunnelling & masonry channels	80	50	130
51	Koutraphas (Kato) ..	Construction of intake masonry channel and river-crossing ..	120	—	120
52	Lythrodhonda ..	Dam and repairs to channels ..	300	100	400
	Louvaras—				
53	Pano Pervolia ..	Excavation of spring, construction of a weir and channels ..	—	38	38
54	Ramia	Additional masonry channels ..	—	16	16
55	Tsoukalias ..	Construction of a weir and channels	—	12	12
56	Pano Monastria ..	Weir, channels and irrigation tank	—	31	31
57	Arodhafnidhia ..	Spring and irrigation tank ..	—	16	16
58	Kyra	Spring	—	16	16
59	Fournia	Masonry channels and tank ..	—	16	16
	Lapithos—				
60	Kephalovrysos ..	R.C.C. channels, irrigation ports	—	1,000	1,000
61	Sphinarkotiko ..	do.	—	300	300
62	Marathasa	Weir, intake and channelling ..	—	500	500
	Mitsero—				
63	Kouloupashi ..	Weir, masonry channel & tank	—	35	35
64	Rodhanis	Channels and tank	—	30	30
	Milikouri—				
65	Kephalovrysos ..	Additional masonry channelling	—	10	10
66	Katsounia	Weirs, masonry channels and piping	—	60	60
67	Moutoullas	Masonry channels, weirs, repair to tanks	—	113	113
	Meniko—				
68	Mylos-Kourkousa	Lining of tunnels in masonry ..	100	50	150
69	Litharkas	R.C.C. channels and piping ..	—	200	200
70	Mora	Repairs to retaining wall, construction of screw-gates ..	—	—	—
71	Nikitari (Neron-ton-Nomadon	Weir, masonry channels and irrigation ports	—	90	90
	Polystipos—				
72	Makrinos	Spring and tank	—	6	6
73	Makroullis ..	Weir, channel and tank ..	—	24	24
		Carried forward ..	1,855	3,711	5,566

	Location	Nature of Construction	Donums commanded. New Irrigation		
			Winter	Summer	Total
		Brought forward ..	1,855	3,711	5,566
	Polystipos—				
74	Laxia	Spring and masonry channels ..	—	5	5
75	Vrysi	Masonry channels and irrigation tank	—	8	8
76	Ay. Yeorghios ..	Spring	—	2	2
77	Dhafni	do.	—	2	2
	Potamia—				
78	Potamos	Weir, masonry channels and tank	—	35	35
79	Ronga	do.	—	12	12
80	Yerakia	do.	—	7	7
81	Pedhoulas (Kaminitou-Kouzalou), etc.	Spring, weirs and piping ..	—	62	62
	Pelendria—				
82	Kountlos	Weir, masonry channels and piping	—	15	15
83	Livadhia	do. ..	—	13	13
84	Kountourides ..	Repairs to channels	—	4	4
85	Paleomylos (Hardji water)	Weir, masonry channels, irrigation ports	—	207	207
	Potami—				
86	Sykamies	Repairs to head works	—	—	—
87	Kashanos	Building & extension of tunnels	—	35	35
88	Sisklipos (Vrysi-tou-Khoriou)	Masonry channels and repairs to tank	—	12	12
89	Sinda (Kuchuk-Dere)	Construction of spillway & earth bank	2,000	—	2,000
90	Tris Elies (Fountana)	Masonry channels	—	18	18
91	Voni	Construction of intakes and channels	1,200	—	1,200
92	Vavatsinia	Weir, masonry channels and irrigation tank	—	45	45
93	Vasilia (Ouvalla) ..	Masonry channels, repairs to tank	—	46	46
94	Yeri (Kokkinokremmos)	Weir and channels	1,000	—	1,000
	Zoopiyi—				
95	Shiotides	Spring and weir	—	20	20
96	Vrysi-tou-Khoriou	Tunnelling	—	30	30
97	Chippou	do.	—	8	8
98	Kato Karkas ..	Spring	—	8	8
99	Pano Karkas ..	do.	—	7	7
100	Vrysi-tou-Rotsou	do.	—	20	20
		Totals	6,055	4,332	10,387

APPENDIX 8.

VILLAGE WATER SUPPLIES COMPLETED IN 1951.

1. Akhyritou
2. Alambra
3. Alekhtora
4. Amargeti
5. Angastina
6. Anoyira
7. Ardhana
8. Asomatos (Kyrenia)
9. Astromeritis
10. Athienou
11. Ayia Anna
12. Ayios Amvrosios (Limassol)
13. Ayios Dhimitrianos
14. Ayios Dhimitrios
15. Ayios Elias
16. Ayios Epiktitos
17. Ayios Nikolaos (Paphos)
18. Ayios Theodhoros (Famagusta)
19. Ayios Theodhoros (Limassol)
20. Ayios Theodhoros (Soleas)

21. Ayios Vasilios
22. Chakistra
23. Dhoros
24. Elea (Nicosia)
25. Ephtagonia
26. Ephtakomi
27. Gastria
28. Goudhi
29. Kambos
30. Kandou
31. Karmi
32. Kato Amiandos
33. Kato Dhikomo
34. Khalassa
35. Khandria
36. Kholetria
37. Klavdhia
38. Lasa
39. Letimbou
40. Maroni
41. Palekhori Morphou
42. Pano Dhikomo
43. Pano Lefkara
44. Pano Pyrgos
45. Pano Zodhia
46. Paralimni
47. Pedhoulas
48. Pendalia
49. Peristerona (Famagusta)
50. Peyia (Ay. Yeoryios Church)
51. Phlamoudhi
52. Phterikoudhi
53. Pissouri
54. Polemi
55. Prodhromos
56. Psilatos
57. Pyrga (Larnaca)
58. Sanidha
59. Sina Oros
60. Skoulli
61. Strongylos
62. Temblos
63. Tembria
64. Trimithousa (Paphos)
65. Vavla
66. Vitsadha
67. Yialousa
68. Zoopiyi.

APPENDIX 9.

VILLAGE WATER SUPPLIES IN HAND AT THE END OF 1951.

1. Agros
2. Alethriko
3. Analiondas
4. Ayios Dhometios
5. Elea (Nicosia)
6. Eylenja
7. Galata
8. Galatia
9. Geunyeli
10. Kakopetria
11. Kallepia
12. Kato Platres
13. Kato Pyrgos
14. Kato Zodhia
15. Kilinia
16. Klirou
17. Komi Kebir
18. Lapithiou
19. Mazotos
20. Perapedhi
21. Pharmakas
22. Phasoula (Limassol)
23. Polis
24. Sophtadhes.

APPENDIX 10.

VILLAGE WATER SUPPLY SCHEMES READY FOR CONSTRUCTION AT THE END OF 1951 BUT NOT YET STARTED.

1. Anarita
2. Ayios Ioannis (Paphos)
3. Erimi
4. Kolossi
5. Lemithou
6. Mari
7. Mamoundali
8. Milia
9. Milikouri
10. Moronero
11. Pedhoulas
12. Phinikas
13. Souskiou
14. Statos
15. Stavrokono
16. Yeroskipos

Note : Nos. 1–16 have already provided their share in the cost of the works.

17. Akanthou
18. Ammadhies
19. Ayios Nikolaos (Famagusta)
20. Hamid Mandres
21. Kato Kividhes
22. Kridhia
23. Mamonia
24. Mousoulita
25. Omodhos
26. Paleomylos
27. Pano Kividhes
28. Potami
29. Prastio Evdhimou
30. Silikou
31. Spilia
32. Trimithi
33. Yiolou
34. Akhelia
35. Akhna
36. Alaminos
37. Alona
38. Anavargos
39. Angolemi
40. Aphania
41. Apsiou
42. Arakapas
43. Aredhiou
44. Arghaki
45. Armenokhori
46. Arminou
47. Athrakos
48. Avgorou
49. Ayia Kebir
50. Ayia Marina Xyliatou
51. Ayia Marinoudha
52. Ayia Trias
53. Ayii Trimithias
54. Ayii Vavatsinias
55. Ayios Epiphanios Soleas
56. Ayios Konstantinos
57. Ayios Pavlos
58. Ayios Theodhoros (Larnaca)
59. Ayios Tykhonas
60. Dhali
61. Dhavlos
62. Dhrousha
63. Galinoporni
64. Kalogrea
65. Kambia
66. Karavostasi
67. Katokopia
68. Keumurju
69. Khoulou
70. Kilanemos
71. Kinousa
72. Kokkina
73. Korovia
74. Kouklia (Famagusta)
75. Kourdaka
76. Knodhara
77. Kyperounda
78. Lazania
79. Lefkoniko
80. Leonarisso
81. Livadhia (Larnaca)
82. Mandres (Famagusta)
83. Mandres (Morphou)
84. Margi
85. Melandra
86. Mitsero
87. Moutayiaka
88. Nikitari
89. Nikoklia
90. Ora
91. Pakhyammos
92. Palekhori (Dagh)
93. Palodhia
94. Paramytha
95. Phini
96. Photta
97. Plataniskia
98. Prastio (Paphos)
99. Pyla
100. Pyrgos
101. Sellain t'Api
102. Sisklipos
103. Skarinou
104. Spitali
105. Tala
106. Tavros
107. Terra
108. Trakhonas
109. Vasilia
110. Voroklini
111. Vouno
112. Vroisha
113. Xerovounos
114. Xyliatos
115. Yerakies
116. Yerani
117. Yerasa
118. Yeri
119. Yermasoyia
120. Yerolakkos
121. Yerovasa
122. Yialia
123. Ypsonas.

Note : Nos. 17–33 have applied for loans to cover their share in the cost of the works.