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THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

REPORT

relating to the proposed

AUGMENTATION OF DARWIN WATER SUPPLY, NORTHERN TERRITORY.

For Senator Prowse :

I present the Report of the Parliamentary Standing Committee on Public Works relating to the following proposed work :-

Augmentation of Darwin Water Supply,
Northern Territory.

Brought up by Senator Prowse
6.5.65
R.P.W.

6th May, 1965.

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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

AUGMENTATION OF DARWIN WATER SUPPLY, NORTHERN TERRITORY

REPORT

By resolution on 12th November, 1964, the House of Representatives referred to the Parliamentary Standing Committee on Public Works for investigation and report, proposals for the augmentation of the water supply at Darwin, Northern Territory. The Committee have the honour to report as follows :-

GENERAL

1. The Committee visited Darwin in February, 1965 to enquire into three proposed works, one of which is the subject of this report. Evidence was taken in Darwin from representatives of the Department of Works and the Northern Territory Administration and an inspection was made of existing installations, Manton reservoir and the McMinns Lagoon area.

EXISTING WATER SUPPLY AND RETICULATION

2. Darwin is supplied with water from a reservoir on the Manton River, 42 miles from Darwin. The dam holds back 3,500 million gallons of good quality soft water. The catchment is uninhabited and treatment of the water has not been necessary. However, at times, there have been occurrences of dirty water in Darwin and it has been discovered that this is due to small amounts of iron in water coming from the Manton reservoir. The iron in the water is flocculated by biological action in the pipes. Measures to reduce the trouble are being taken including scouring of the reservoir and the reticulation. A ground level service reservoir at the 19 Mile which is part of the reference before the Committee, will act, in part, as a settling basin and so help to minimise this problem.

3. On the basis of a drought of an intensity expected to occur at 40 year intervals, the safe draft of the Manton reservoir is 3.8 million gallons per day. Peak pumping capacity using the existing pumps and reticulation is about 5.3 million gallons daily.

4. Service reservoirs in Darwin cannot be gravity-fed and water to them is pumped through two rising mains, one 15 inch and

the other 12 inch. by electric pumps at the dam and a booster pumping station at Noonamah, 27 miles from Darwin.

5. Seven elevated steel service reservoirs in Darwin with a total capacity of 1,550,000 gallons provide the storage necessary to balance variations in demand. In addition there are two ground level reservoirs with a total capacity of 5.5 million gallons.

6. Previous Reference. Proposals referred to the Committee in 1963 estimated to cost £377,000 including extension of the reticulation system in the town area, a one million gallon elevated storage and two additional pumps were designed principally to ensure an adequate water supply to developing areas in Darwin. The construction programme for the proposals at the time they were investigated by the Committee provided for their completion in June, 1964.

7. The Committee were told that none of this work is likely to be completed before October, 1965. Whilst appreciating that some of the delay has been caused by a shortage of steel and contractual difficulties the Committee were concerned that a delay of at least 16 months should have occurred with this work.

NEED FOR ADDITIONAL SUPPLY AND INSTALLATIONS

8. Population Growth. In recent years the population of Darwin has grown rapidly and to meet this expansion new residential subdivisions have been developed to provide serviced residential blocks.

9. Population figures at 30th June in each of the past four years and expected future trends are :-

	Population of Darwin Water Supply Area.
1961	14,883
1962	16,200
1963	17,700
1964	19,400
1965	21,400
1966	23,400
1967	25,500
1968	28,000
1969	30,450
1970	33,200
1971	36,400
1972	39,600
1973	42,800
1974	46,800
1975	51,000

10. The predictions of population growth seem reasonable in the light of increases experienced in recent years and we are satisfied that they form a sound basis for planning future water supply installations.

11. Requirement. The Committee were told that long range planning of the water supply is based on the requirements of a population of 50,000 which is expected to be reached in 1975. In forecasting future demand a daily average consumption of 180 gallons per head and 270 gallons per head on days of maximum consumption are assumed. On these bases the present facilities and storage will adequately meet needs to the stage the population reaches 21,000. At that time the safe draft will about equal the average day's consumption and the capacity of pumps and reticulation from Manton will equal the peak days consumption.

12. As it is expected that this population level will be reached during the present calendar year, it is necessary to provide urgently an additional source of supply and installations to guarantee adequate water supplies.

SOURCE OF WATER SUPPLY

13. One of the conclusions reached by the Committee when considering the previous reference was that "there should be no delay in advancing the planning necessary for the development of an additional source of water". The basis for this conclusion was the fact that the average daily consumption of water in Darwin was approaching the safe draft of the Manton reservoir, the only source of supply.

14. A number of additional sources of supply have been investigated and it has been concluded that the most satisfactory possibility is the ground water supply near McMinns Lagoon. The sources considered were :

15. McMinns Ground Water Supply. The existence of a large ground water storage within concealed dolomite beds near McMinns Lagoon was established in September, 1963. This area is 20 miles from Darwin and the bore about three miles east of the 19 Mile pumping station. The discovery followed investigations covering an area from Howard Springs eastwards to Humpty Doo, and from Koolpinyah in the north to Berry Springs in the south.

16. The ability of the supply to yield one million gallons per day from one bore was tested by pumping at this rate from November, 1963 to March, 1964. Recorded movements of water levels as a result of this pumping and as affected by recharge derived from rainfall permitted an assessment of the water availability. Pump test results were supplemented by data on the natural variations in the volume of stored water and the effect of rainfall upon recharge.

17. Conditions in the McMinns area suggest that there is considerable rejected recharge, i.e., more water is available than the storage can absorb. When such a storage is pumped, it can be expected to accept water which would otherwise run off. On the evidence now available, it has been concluded that there is a certain availability of one million gallons a day, and a probable availability of between three and five million gallons daily.

18. Raising Wall of Manton Dam. A proposal to raise the wall of Manton Dam by five feet thus increasing the storage to 5,400 million gallons and the safe draft to 4.6 million gallons daily has been examined. A defect in the geological structure of the right abutment was discovered and it has been concluded that it would be inadvisable to raise the wall by conventional methods. However, a recently developed method of pre-stressing with steel cables may enable the work to be carried out without imposing an additional load on the abutment. A further study of this method should be undertaken to establish its feasibility. The immediate requirement for additional storage by raising the wall of Manton Dam was ruled out because of the time factor.

19. Berry Spring. This supply is located on the Berry Creek 34 miles from Darwin. Investigations have shown that water from this source would be satisfactory, but there is a major problem of storage to ensure continuity of supply throughout the year. As a storage of at least 1,000 million gallons would be required, the less costly supply from the McMinns Lagoon area was considered to be more satisfactory at this stage.

20. Darwin River. The construction of a storage dam on the Darwin River was examined but as with the Berry Spring source the costs involved made it less attractive than the McMinns proposal. Furthermore, geophysical and geological studies of the area have disclosed that the foundation conditions are not ideal for a dam. It is likely that water from the Darwin River will be used eventually but the cost of doing so at the present stage would exceed £3 million.

21. Proposed Development of Supply from McMinns. We were told that if the McMinns water is not used for Darwin's water supply, it could be used for agricultural purposes. However, the potential is such that the resource must be properly tested to determine its yield. Adequate testing can only be achieved by pumping at high rates for long periods with the pumped water being removed from the area. While this water could be pumped to waste, the cost would be of the same order as pumping it into the 19 Mile. To meet the requirements of the test, it is preferable then to use the one million gallons involved to supplement the Darwin supply.

22. To interpret the results of the test accurately, during the initial 12 month period which is only possible under a steady head of pressure, the proposal is to pump at an even rate of one million gallons a day. After this initial period, the source could be available for peak load pumping.

23. Analysis of the water shows that it is of good quality, although moderately hard for domestic use. Since this water source is proposed as a supplement to the Manton supply, the hardness will be modified by controlled mixing. The eventual proposal is to add up to three million gallons a day of McMinns water to the supply from Manton. The hardness of this mexture will be well within the range of 50-100 parts per million which is an acceptable level.

24. The Committee were satisfied that the proposal to supplement the Darwin supply by the use of water from the ground storage in the McMinns Lagoon area was the most satisfactory and economic possibility at this stage.

THE PROPOSAL

25. Source of Supply. Funds were made available during the present financial year to equip one bore at McMinns and to construct a 15 inch main to the 19 Mile pumping station. This will be the bore used to test the aquifer. It is intended to sink a second production bore this year and, depending on the results of long term pumping, a third one in 1965/66. The present reference does not embrace this work.

26. It does, however, include the equipping of the latter two bores. The cost of this work will depend on their location in relation to the first bore and to the rising main from that bore to the 19 Mile pumping station. The estimate of £60,000 each to equip these bores assumes that each will need a rising main to the 19 Mile. Final location will depend on the results of the further testing.

27. Service Reservoirs. The Committee, when considering the 1963 reference, were told that planning is based on storage reservoirs holding supplies equal to 1.5 times the maximum days consumption, and elevated service reservoirs with capacity for one third of the maximum days consumption. For a population of 50,000, 4.55 million gallons will be provided in elevated service reservoirs and 15.5 million gallons in ground level reservoirs.

28. At the previous hearing, the Committee were informed of the plan to erect a 10 million gallon reservoir at the 31 Mile. Investigations since then have indicated that this is not the most suitable site. One of the factors contributing to this is that iron which enters the reticulation at Manton is still in a suspended state at the 31 Mile and if it is to be extracted, it can be done more effectively at the 19 Mile. In addition, a tank at the 19 Mile will permit mixing of the water from Manton and McMinns.

29. The present proposal is to provide a four million gallon storage at the 19 Mile which also will be used initially to test the first McMinns bore. To test the bore properly it will be necessary to pump at a steady head of pressure and this could not be achieved by introducing water direct into the rising main as pressure heads would vary with the amount of water being pumped from Manton.

30. With the construction of a four million gallon holding reservoir at the 19 Mile, ground level storage will total 9.5 million gallons. This would be sufficient for the population expected in 1969 if it was conveniently distributed. However, because of the population expected in the Casuarina area, it is desirable to install a six million gallon service reservoir and a one million gallon elevated service reservoir in that area in 1966/67 to be ahead of requirements. Until that time the service reservoir at Rapid Creek and Winnelli will provide sufficient storage.

31. Reticulation. The work in this reference involving improvement of the reticulation system is in two parts. The first is the enlargement of the pipeline from the 19 Mile pumping station to Berrimah to permit an increase in the quantity of water that can be pumped to Darwin. Without an enlargement, the capacity of the reticulation would be limited to a peak days supply of 6.3 million gallons and this would not be adequate in 1966/67. This pipeline will be required regardless of whether the McMinns ground water storage comes up to expectations as it is quite clear that future storages will be in the general area south of Darwin.

32. For financial reasons, this work which is a 30 inch main, has been programmed for construction over both 1965/66 and 1966/67. The Department of Works has, however, suggested that there could be financial advantages in letting the work in one contract.

33. The second part of the reticulation work relates to the extension of the supply to the residential sub-divisions to be developed in the Casuarina area. The initial water supply for Alawa, the first neighbourhood unit in the Casuarina area, is by means of a 15 inch main from the Rapid Creek area and using the existing 500,000 gallon service storage in that area. The pipes supplying the Nightcliff/Rapid Creek area, however, are not large enough to supply requirements in the Casuarina area beyond Alawa and a main from Berrimah to Casuarina is necessary to ensure adequate water supply to the second and later neighbourhood units.

34. Pumping Station. It is proposed to erect a pumping station at the 31 Mile to increase the rate of pumping from Manton to 6.1 million gallons daily. This unit will replace the existing pumping station at Noonamah which has not the capacity to handle the increased consumption.

35. Water Softening Plant. When the work was referred to the Committee, the description used included the provision of water softening facilities. This part of the work has now been deferred because it has been determined that the degree of hardness of the mixture of Manton and McMinns water will be acceptable until more than 3 million gallons per day of McMinns water is used. This is not now expected to take place until some time after 1966/67.

36. The Committee recommend that the work proposed be carried out.

PROGRAMME AND COSTS

37. The estimated value of the work referred to the Committee is £1,212,000. The timing of the construction of the various components and the cost of each is indicated.

During 1965/66			
(1)	Stage I of pipeline from McMinns Pumping Station to Berrimah (30,000 feet of 30" diameter pipe from Berrimah to 14 Mile).	£311,000	
(2)	Pumping Station at the 31 Mile	50,000	
(3)	Service Reservoir of four million gallons located at McMinns Pumping Station	70,000	£431,000
During 1966/67 (or later)			
(1)	Stage 2 of pipeline from McMinns Pumping Station to Berrimah (26,000 feet of 30" diameter pipe from 14 Mile to McMinns)	269,000	
(2)	Pipeline from Berrimah to Casuarina	217,000	
(3)	One million gallon elevated service reservoir at Casuarina	100,000	
(4)	Six million gallon ground level service reservoir at Casuarina	75,000	
(5)	Equip two bores at McMinns with a rising main	120,000	781,000
			£1,212,000

38. The Committee were informed that ideally the work should be completed in a two year period but for financial reasons it may be necessary to extend the latter part of construction into the third year.

39. We noted that the remaining works required to develop a water supply for a population of 50,000 will be referred to the Committee after investigations into the water available from the McMinns area have been completed.

SUMMARY OF RECOMMENDATIONS AND CONCLUSIONS

40. The recommendations and conclusions of the Committee arrived at after studying the evidence presented are set out below. Alongside each is shown the paragraph in the report to which it refers.

		Paragraph
1.	The Committee were concerned that a delay of at least 16 months has occurred in the completion of work referred to the Committee in 1963.	7
2.	IT IS NECESSARY TO PROVIDE URGENTLY AN ADDITIONAL SOURCE OF SUPPLY AND INSTALLATIONS TO GUARANTEE ADEQUATE WATER SUPPLIES TO DARWIN.	12
3.	A further study should be undertaken to establish the feasibility of raising the wall of Manton Dam.	18
4.	THE PROPOSAL TO SUPPLEMENT THE DARWIN WATER SUPPLY BY THE USE OF WATER FROM THE GROUND STORAGE IN THE MCMINNS LAGOON AREA IS THE MOST SATISFACTORY AND ECONOMIC POSSIBILITY AT THIS STAGE.	24
5.	THE COMMITTEE RECOMMEND THAT THE WORK PROPOSED BE CARRIED OUT.	36
6.	The estimated cost of the work referred to the Committee is £1,212,000.	37

W.J. Brimblecombe

(W.J. Brimblecombe)
Chairman.

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4th May, 1965.