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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

R E P O R T

relating to the proposed

Extension of the

WATER SUPPLY STORAGE SYSTEM

at

CANBERRA, A.C.T.

1954-55.

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA.

PARLIAMENTARY STANDING COMMITTEE
ON PUBLIC WORKS.

REPORT

RELATING TO PROPOSED EXTENSION TO THE

WATER SUPPLY STORAGE SYSTEM

AT

CANBERRA, A.C.T.

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MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.
(FIFTEENTH COMMITTEE.)

(Senators appointed 10th August, 1954, Members of the House of Representatives appointed 11th August, 1954.)

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Senator JUSTIN HILARY O'BYRNE (Vice-Chairman).

Senate.

Senator NORMAN HENRY DENHAM HENTY.
Senator EDMUND BEDE MAHER.

House of Representatives.

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WILLIAM PAUL O'CONNOR, ESQUIRE, M.P.
DAVID OLIVER WATKINS, ESQUIRE, M.P.

EXTRACT FROM THE VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES, No. 11,
DATED 26th AUGUST, 1954.

5. PUBLIC WORKS COMMITTEE—REFERENCE OF WORK—WATER SUPPLY STORAGE SYSTEM, CANBERRA.—Mr. Kent Hughes (Minister for Works) moved, pursuant to notice, That, in accordance with the provisions of the *Public Works Committee Act 1913-1953*, the following proposed work be referred to the Parliamentary Standing Committee on Public Works for investigation and report, viz.:—The extension of the water supply storage system for Canberra.

Mr. Kent Hughes laid on the Table plans, &c., in connexion with the proposed work.

Debate ensued.

Question—put and passed.

CONTENTS.

SECTION I.—INTRODUCTION.		Paragraph in Report.
Origin of existing supply	1	1
SECTION II.—THE PRESENT PROPOSAL.		
Storage required	3	3
The Cotter River proposal	6	6
The Queanbeyan River proposal	7	7
Estimated cost	10	10
SECTION III.—THE COMMITTEE'S INVESTIGATIONS.		
General	11	11
Necessity for additional storage—		
The present position	14	14
Average daily consumption	15	15
Measures to reduce consumption	18	18
Provision for the future	19	19
Effect of Canberra lakes on storage required	22	22
Storage reserve	23	23
The alternative proposals—		
The Queanbeyan scheme	26	26
The Cotter scheme	30	30
The health problem	32	32
Water treatment	40	40
Purity of the water	42	42
Catchment control	43	43
Seat of Government Acceptance Act	45	45
Canberra Lakes Scheme	46	46
The separate watershed	48	48
Estimate of costs	49	49
The principal decision	52	52
SECTION IV.—THE COMMITTEE'S CONCLUSIONS.		
Summary of conclusions	56	56

LIST OF WITNESSES.

	Paragraph in Evidence.
Baird, J. M., Technical Assistant to the Engineer-in-Chief, Metropolitan Water, Sewerage & Drainage Board, Sydney, New South Wales	166-170
Gorman, J. C., Director, Googong Pty. Ltd., Googong Station, Queanbeyan, New South Wales	107-124
Guy, R. B., Municipal Engineer, Queanbeyan, New South Wales	74-93
Howlett, R. L., Health and Building Inspector, Queanbeyan, New South Wales	74-93
Jack, K. W., Executive Engineer, Major Development, Department of Works, Canberra	44-63
Lee, F. M., Chief Engineer of Water Supply, Melbourne & Metropolitan Board of Works, Melbourne, Victoria	33-43
Lewis, R. B., Director of Engineering, Department of Works, Hawthorn, Victoria	1-32
Melville, L. G., Vice-Chancellor, Australian National University, Canberra, Australian Capital Territory	145-149
Metcalfe, A. J., Director-General of Health, Canberra, Australian Capital Territory	133-144
O'Hanlon, G. D., Shire Clerk, Yarrawonga Shire, Queanbeyan, New South Wales	125-132
Potter, F. W., Principal Engineer, Water Supply & Sewerage, New South Wales Public Works Department, Sydney, New South Wales	150-156
Smith, R. B., Town Clerk, Queanbeyan Municipality, Queanbeyan, New South Wales	74-93
Spendelove, R. A., Mayor of Queanbeyan, Queanbeyan, New South Wales	64-73
Van Someren, D. B., Chief Medical Officer, Metropolitan Water, Sewerage & Drainage Board, Sydney, New South Wales	157-165
Waitt, F. W. F., Chief Hydraulic Engineer, Water Supply & Sewerage, Department of Works and Housing, Melbourne	1-32
Woodger, T. E., Real Estate Agent and Approved Valuer, Member of Commonwealth Institute of Valuers, Queanbeyan, New South Wales	44-106

THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS—WATER SUPPLY STORAGE SYSTEM, CANBERRA.

REPORT.

The Parliamentary Standing Committee on Public Works, to which the House of Representatives referred for investigation and report the question of the extension of the Water Supply System for Canberra, has the honour to report as follows:—

SECTION I.—INTRODUCTION.

ORIGIN OF EXISTING SUPPLY.

1. In the earliest planning of Canberra, the Cotter was decided on as the main source of supply of domestic water for the city. The water could be pumped from the lower reaches of the river, close to its confluence with the Murrumbidgee, or gravitated from the upper regions of it. In 1900, Mr. Cottin, of the New South Wales Public Works Department, examined the latter method, while in 1917 Messrs. Oliver and Percival did likewise. It has been further closely investigated in the recent studies. Owing, however, to the high cost of the necessary aqueduct with this scheme, it was decided in the early days not to adopt it, but to build a storage, which is now the existing dam on the lower Cotter—as low down the river as possible—and to pump the water from it for about 4 miles to Mount Stromlo service reservoir, about 800 feet higher than the point from which it is pumped. From Mount Stromlo it gravitates to the reservoir at Red Hill and is reticulated to the city.

2. The dam, originally designed to be 100 feet high, was only constructed to a height of 90 feet when wartime restrictions in 1914-18 caused cessation of the work. As the city grew this storage became insufficient, and, in 1949-50 the dam was raised by an additional 26 feet, provision being made at that time for the use of low shutters on the crest at any later date. The dam, 86 feet high, now provides storage for 950,000,000 gallons. After careful examination of the existing structure, in the light of more modern design and construction, it was considered unsafe to raise the present dam, to its full 100 feet in height.

SECTION II.—THE PRESENT PROPOSAL.

STORAGE REQUIRED.

3. The maximum daily demand is at present in the vicinity of 12,000,000 gallons, while it is anticipated that next summer the demand will be in the region of 14,000,000 gallons per day. As this is likely to prejudice the safe draw from the storage, and plans must be made for service to the increasing population for years to come, it is essential to decide now the nature of reserves of water storage to be tapped for the immediate and more distant future.

4. All alternative sources of supply available have been carefully studied by the department, and, of them, the Queanbeyan River offered the cheapest solution, while the Cotter River provided the purest water. At a conference between representatives of the different departments concerned, the merits of each scheme were studied, and it was decided to put before the Public Works Committee the possibilities of both, for decision on the matter.

5. The submission of the Department of Works, referred by the Parliament to this Committee, therefore includes details of both schemes, with the considered opinion that the Queanbeyan River scheme should be adopted as preferable, in view of all the factors involved.

THE COTTER RIVER PROPOSAL.

6. The proposal calls for a dam of concrete gravity section, 122 feet above the river bed level, with a capacity of 2,470,000,000 gallons. It would be situated near Bushranger's Creek, in a narrow gorge where rock foundation could be obtained close to the surface. A comparatively high dam would be necessary, as the valley does not widen greatly upstream of this spot to contain the large volume of water required. The water would still be pumped in the initial stages of the use of this dam. At a later stage, when the demand for water had increased considerably with the population, and other factors combined to make the economics favorable, a pipeline would be constructed and the water could be gravitated to Canberra.

THE QUEANBEYAN RIVER PROPOSAL.

7. The dam for this proposal would be situated on Googong Station, about 6 miles from Queanbeyan, where it would be constructed to impound 2,300,000,000 gallons of water, which could be conveyed by pipeline to Queanbeyan and Canberra by gravity. This site is an excellent one for a dam, and a much greater storage could be provided economically if it were required. The catchment of the Queanbeyan River covers an area of 358 square miles, partly cleared for grazing, and it is proposed to acquire land within 2 miles of the level of the stored water in the dam, involving an area of 9,700 acres held by eleven landholders.

8. As the land is used for grazing purposes, it would be necessary to chlorinate the water, and to filter a proportion of it in times when flooding renders it turbid.

9. The Googong scheme would also be useful for providing additional water for maintaining the level of the Lakes scheme when it is constructed in Canberra, if an extra 4 feet were added to the height of the dam at a cost of £50,000.

ESTIMATED COST.

10. The recommendation of the department was for the construction of the Googong Dam, treatment plant, pipelines, &c., estimated to cost £1,800,000.

SECTION III.—THE COMMITTEE'S INVESTIGATIONS.

GENERAL.

11. The Committee considered this reference in conjunction with that in connexion with the Commonwealth Avenue Bridge, as a great deal of the information required is common to both subjects. This was particularly the case from the point of view of the use of the Googong Dam to provide water for the Lakes scheme. The evidence on both these subjects should therefore be considered together.

12. The plans and information tendered in support of this proposal were studied by the Committee. During visits to Sydney and Melbourne in connexion with its other reference, opportunity was taken to glean the details required for this inquiry. In Melbourne a visit was paid to the Upper Yarra Dam, where the Chairman of the Melbourne Metropolitan Board of Works and his technical officials gave the Committee the utmost assistance at their command in respect of Melbourne's great projects. The Upper Yarra Dam, partly constructed, was of particular assistance and information to the Committee at this stage of its inquiry. In Sydney, various State Government officials gave most important information, particularly in connexion with methods of water storage and treatment on their huge catchment areas, and also from the vital health aspect.

13. In Canberra and Queanbeyan a great deal of evidence was obtained on all the factors implicated in these two rival proposals, and inspections were made of the sites for the dams and adjacent catchment areas.

NECESSITY FOR ADDITIONAL STORAGE.

14. *The Present Position.*—It was represented to the Committee in evidence that, with the present trend of population increase in Canberra the capacity of the existing water supply headworks may be overtaken by the 1955-56 summer with the current rate of consumption, although, with full metering completed and a charge made for wasteful use of water, this position could be postponed for about five years. As planning, design, and construction of additional headworks and pipelines will take about five years to complete, it is essential to proceed with this work at an early date for the enlarged supply to be available in time to cope with the anticipated demand.

15. *Average Daily Consumption.*—A considerable amount of evidence was received in connexion with the amount of water consumed, and rate of consumption, as it has a most important bearing upon the immediate needs for storage. It is also important in view of the fact that the average daily consumption figure is the highest in Australia, and greatly in excess of what was calculated as generous provision when the present dam was built. The maximum daily consumption is said to reach 400 gallons per person in the summer, but throughout the year the average consumption for Canberra is 165 gallons per person per day, compared with Melbourne and Sydney 75, Adelaide 80, Perth 97, Rockhampton 95, Mildura 102, and Cairns 120. Queanbeyan consumption is stated to be about 40 gallons per head per day throughout the year, but it is affected by restrictions, as some of the above figures are also.

16. Climate, particularly rainfall and evaporation, has an important bearing upon the amount of water consumed, and in this connexion it is noted that rainfall in Melbourne averages about 2 inches per month fairly evenly through the year, and evaporation is at the rate of 36 inches per annum, while a similar amount of rainfall in Canberra is not so evenly spread over the year, and is accompanied by an average evaporation rate of over 51 inches per annum. As a garden city, in which the size of the allotments is considerable in comparison with those for city residences, a great deal of water is used on gardens and native strips, as well as on the extensive public garden areas and lawns throughout the city. Canberra is of a size which would embrace practically the whole of Hobart. It is generally contended, however, that a considerable amount of waste occurs, and measures are being adopted at the present time to reduce the average daily consumption to 120 gallons per day, which is officially regarded as a generous allowance.

17. Meters are being installed in order to check where waste occurs, so that measures can be taken to reduce it, and to charge for excessive use by individuals. Opposition was expressed, in evidence, to the installation of meters on the ground that a charge for excess water to residents, who have been encouraged in the past to develop gardens would create the tendency to reduce the use of water on lawns and gardens and concentrate on the productive areas of their vegetable gardens, so essential in Canberra. This matter will be considered, however, and a generous allowance would be set before calculations for excess water would be made. The Committee is of opinion that definite measures, including compulsory metering, should be taken to avoid what appears to be obvious waste, and to reduce the average daily consumption to something less than 120 gallons per day.

18. *Measures to reduce consumption.*—Other measures being adopted to reduce consumption from the storage reservoirs include provision for pumping Molonglo River water for maintenance of areas of parks on the north side of the river, and to tanks on the Administrative Building, so that areas in the vicinity of Parliament House can be treated with river water, and the Committee is of opinion that this action should be taken as a matter of urgency.

19. *Provision for the Future.*—With the adoption of measures to reduce consumption it is officially assumed that the daily average can, and should, be reduced to 120 gallons per head per day. On this assumption the estimates for future requirements have been made.

20. The provision of water for use from Queanbeyan is made in the Canberra reservoir, from which it is reticulated to the Queanbeyan boundary. The town authorities buy the water in bulk and distribute it through their local system to the residents at a charge fixed to cover the costs involved. The amount of water likely to be required by Queanbeyan in the years to come has therefore been included in the total storage capacity calculated.

21. The basis of planning for future storage as submitted in this reference is for a population of 100,000 for Canberra, at 120 gallons per day, and 20,000 for Queanbeyan at 80 gallons per day. These considerations give a grand total of 13,600,000 gallons per day as the average requirement for the system.

22. *Effect of Canberra Lakes on Storage Required.*—It was also submitted that, if additional water is later required for replenishing the water in the Lakes Scheme in dry periods, as has been envisaged for many years, this could be provided by constructing the dam 4 feet higher, at an additional cost of about £50,000. This has not been included in the estimate submitted and the Committee does not recommend it, in view of its recommendations against the use of this dam for the lakes purposes at present, when consideration was being taken to the reference on bridges for Canberra.

23. *Storage Reserve.*—The Committee made particular inquiries to ascertain whether the total storage to be provided would in fact represent an adequate supply in times of drought. It was not clear at the outset why the storage to be provided would only impound about half the total annual consumption calculated on the basis of 13,600,000 gallons per day submitted. It was explained, however, that, coincident with the outflow from the reservoirs, there is a constant inflow, the flow of the streams in the area being much greater than the amount to be drawn off, and the figures submitted have been computed in the light of investigations conducted over a very long period.

The reserve supply should therefore withstand the effects of a severe drought. The reserve supply in Sydney was stated to be sufficient for that city to withstand a drought of eight years, but the critical period

in Canberra would be from six to eight months. For that reason storage reserve, in terms of yearly consumption, need not be so great as would be desirable for Sydney, and a six months' reserve should be safe for Canberra.

24. In this connexion it is noted, however, that the water impounded in the Cotter scheme, allowing a reserve to withstand a six months' drought, is 170,000,000 gallons more than that proposed to be provided in the Googong Dam submitted, though conditions are excellent for providing considerably more storage very economically at this site. The proposed dam on the Cotter River would impound 2,470,000,000 gallons as against 2,300,000,000 gallons in the Googong Dam.

25. As it is calculated that Canberra's population will require storage capacity from which to draw 13,600,000 gallons a day on the average throughout the year in the future, with reserve for a six-months drought, it is evident that there is a necessity to plan immediately for additions to the present storage system. It is recommended, therefore, that, as the time has almost been reached when the present storage capacity will be taxed to the utmost, further storage should be provided as soon as possible.

THE ALTERNATIVE PROPOSALS.

26. *The Queanbeyan Scheme.*—Following a conference of senior officers of the Department of Works, Interior and Health, it was decided to submit the two alternative schemes with the pros and cons of each, to this Committee. The Queanbeyan River proposal, with its dam at Googong Station, was the one selected by the Department of Works to be preferred and submitted as the appropriate one for immediate action, after consideration by the engineers of all matters concerned with the preparation, cost, maintenance, and constant use of the alternative system under review. In their conclusions they point out that, of the two alternatives, the Cotter would give the better raw water, while the Queanbeyan would be the cheaper alternative.

It was strongly emphasized, however, that there were several other very important factors which had to be taken into consideration, one of which was that the Cotter water, while superior in its raw state, nevertheless contained algae which would cause trouble in the equipment in the future, but the Queanbeyan water, after treatment would be of fine quality for domestic purposes.

27. The figures quoted show that the ultimate use of the Queanbeyan scheme could be provided at a capitalized cost of £2,100,000, while the Cotter scheme as ultimately envisaged supplied by gravitation and pumping could be compared at the capitalized cost of £2,100,000.

28. The Queanbeyan scheme would provide an alternative source of supply from an entirely different watershed, and would be a valuable source of supply in times of emergency or breakdown. Water for the Canberra Lakes Scheme and a certain amount of flood control would be available from this source, and by adopting the Queanbeyan scheme the upper Cotter scheme could be reserved for future extensions. In addition, it is considered that a great deal of expense and difficulty would be spared in connexion with the acquisition of the necessary land by taking action now instead of many years hence.

29. It was represented that treatment of the water by chlorination and filtration would be thoroughly satisfactory and reliable as proved in a great many cities of the world, while control of the land forming the watershed could be adequately and safely handled by the New South Wales State Government authorities.

30. *The Cotter Scheme.*—The Cotter River scheme was the one preferred by the Department of Health, the officials of which presented the evidence from the health angle in connexion with the schemes, while a considerable amount of evidence was obtained from other witnesses on this and the remaining aspects of the proposal.

31. The dam would be at an excellent site, near Bushrauger's Creek, where suitable foundations for a concrete dam could be found in a deep narrow gorge, though it would be more costly to erect the structure in these conditions owing to the height required to impound the necessary water. The site is stated to be the best of a number of sites investigated on the Upper Cotter, six other possible sites being further up the river. It is established that sufficient water is available for the population envisaged, and the area is under the control of the Commonwealth. The Cotter water is proved to be softer, and contains less impurities, and, although more expense would be incurred, the height of the Upper Cotter Dam will permit gravitation of the water to Canberra, to be provided for at a later stage, when demand makes it economic to do so.

THE HEALTH PROBLEM.

32. The Health Department expressed strong preference for the Cotter scheme, and urged that the Queanbeyan proposal should not be accepted unless the whole of the catchment area is resumed and strictly controlled. This would involve an additional cost of about £1,000,000, instead of the £175,000 proposed for the acquisition of the area within 2 miles of the actual dam site.

33. The opposition on health grounds was stated by the Health Department in the strongest of terms, and the Committee was shocked to hear of the dire effects likely to accrue from the use of water from the grazing lands which would supply water to the Queanbeyan dam. It was stated by the Director-General of Health, as a result of his inspection, that the whole area is unsanitary; it is a well settled area in parts and most of the homesteads have septic tanks, from which the effluent trickles through the ground into the river; he saw quite a number of sheep dips, the waste from which is tipped on to the ground, and with the first shower of rain it goes into the stream. It was stressed that chlorination will not destroy these poisons, like arsenic and phenyle, though they would be diluted in a dam of this size. He stated that the area is a drought area, and, during his inspection two weeks previously, he saw numerous dead sheep scattered throughout the properties. Quite a number of very gruesome close-up photographs were produced to show what can happen in sheep country, and it was stated that chlorination and filtration can remove bacteria, but do not remove undesirable elements of putrefaction; the proposal to use the Queanbeyan River water depends upon dilution to render the poisonous products harmless.

34. It was also pointed out that virus diseases, such as influenza, small-pox, poliomyelitis, and infectious hepatitis, are filter passers and will survive 100 days in sterile tap water in the dark. He stated that hydatid is reported in relatively heavy infestation in the Googong area, and chlorination would not have any effect on it at all. Several other witnesses also expressed opinions in opposition to the use of the chlorinated water from the Queanbeyan River.

35. The Committee sought other expert evidence to support these serious matters raised by the Health Department, and special attention was given to the question when evidence was being taken from the officials of the Metropolitan Water Sewerage and Drainage Board of New South Wales. The Board's

Chief Medical Officer, who had been made available recently to carry out a complete and independent survey of the Googong catchment area, gave particularly valuable evidence in this matter, and was of great assistance to the Committee in arriving at a balanced view. His technical opinions, based upon his survey, tests and collation of relative information, while supporting to some extent a number of the facts brought forward previously, did a great deal to clarify the matter in this connexion, while the facts evinced by the State Government experts in other fields combined to modify the serious concern built up in the minds of the Committee.

36. Investigation of the health aspects of this question brought forward some most interesting points. Figures prepared regarding arsenic show that it would take 10,000 gallons of sheep dip, mixed evenly through the water in the dam, to produce the equivalent of one teaspoonful in 100 gallons, or something like one part per 1,000,000. Such an amount is known to have been in a water supply and consumed without ill effects. This indicates that the amount of arsenic that could be expected to get into the dam would be negligible. From a wide inspection of the area under discussion the witness saw no dead sheep, and, with a scattered population such as that in this catchment area it would be unlikely that the effluent from the septic tanks would gain access to the running streams except after percolating through the soil and being filtered in that way. Sydney's huge watershed, the Warraumbana, includes several large towns, such as Goulburn, Lithgow and Katoomba. There is no known case of hydatic disease in man that has been proved to be due to drinking infested water, although it is possible that the drinking of heavily infested water could cause it, and no information at all was available of any cases in this area.

37. The disadvantage was pointed out, however, that there is considerable soil erosion on the Queanbeyan watershed and this affects the quality of the water collected. Another disadvantage was stated to be that the phenolic compounds in the sheep dips, with the addition of chlorine to treat the water, could produce an unpleasant taste, though it is not inimical to health.

38. Cross-questioning of the representative of the owners of the land concerned showed that, although the properties have been seriously affected by drought this year, and the conditions still existed during the inspection of the area by this Committee, the land is not particularly subject to drought. There had only been a total of 10 inches of rain since February, but the witness stated that he had lost no sheep, while the land is valued at over £25 per acre, and it has carried without difficulty one sheep to the acre over a period of years.

39. The Committee noted these points, put forward by the landowners as well as by the independent medical and technical experts, and is of opinion that the Health Department has a least over-emphasized the health aspect in this proposal. The evidence is therefore weighted accordingly. It is evident however, that this important side of the question cannot be ignored, and one of the members held the view that further medical evidence should be taken on the matter. It is realized that the medical tests of the water leave no doubt as to the superior nature of the Coter water, and this factor determines itself in favour of the Coter scheme, subject of course to the weight of evidence concerned with the other points bearing upon the final decision.

40. *Water Treatment*.—While considering the health aspect of the proposals, a great deal of evidence was taken concerning the various methods of treatment required to render polluted water fit for drinking purposes. All over the world treatment of water before

use is common practice, and is regarded as reliable and effective. Chlorination is used to kill bacteria, and various methods of filtration are used to extract impurities, giving good water for domestic and other uses. The witnesses in Sydney were able to give information from first hand experience in these matters, and it is generally agreed that, when it is necessary to use poor quality water, suitable treatment can produce perfectly satisfactory results.

41. In spite of all the success possible in taking the impurities out of poor quality water, it is nevertheless accepted that, where pure water is obtainable it should be used. Dr. Van Someren, whose survey of the area and report upon the Googong proposal indicated clearly that this area could be satisfactorily used if certain measures were undertaken for treatment, also gave evidence about a number of medical aspects of the question, but he affirmed that, based on the quality of the water and leaving all other considerations aside, the Coter River scheme is to be preferred.

PURITY OF WATER.

42. Apart from the effects upon health the witnesses from the Department of Works submitted details indicating a surprising amount of impurity in the Coter water, which had caused difficulties in past years. The impurities are food for algae which cause growth in the mains and reservoirs, so that the Coter water has to be watched in this respect. This is not a health matter, however, and suitable measures can be taken to minimize this difficulty.

CATCHMENT CONTROL.

43. Another important factor is the possible effectiveness of control of the watersheds in the alternative schemes. Again in this aspect there were differing points of view making the Committee's final decision a more complex matter. The Coter catchment is under Commonwealth Government control, and this was taken to satisfy all that is necessary to keep the water in its purest state. However, it is pointed out that visitors come into this area, while afforestation workers are present in varying numbers.

44. The Committee feels that, as certain difficulties have already arisen in connexion with inspection of leases on the Queanbeyan catchment under the Seat of Government Acceptance Act, and this adversely affects the control of soil erosion there, the prospect of permanent and successful control by an outside authority cannot be viewed as optimistically as some witnesses appear to do. The Committee has recommended, in connexion with the reference on the question of Canberra bridges, that action be taken to urge the State Government to exercise its strictest control over this area in this regard. The Committee gives considerable weight to this matter of control, especially as resumption of the whole catchment area to ensure the Commonwealth authority would cost so much that the economic advantage claimed for this proposal would disappear.

45. *The Seat of Government Acceptance Act*.—During investigations in connexion with the Googong proposal, evidence was taken in Queanbeyan from local residents and land-holders in the area affected. In view of the strong opposition voiced by these residents to the Googong scheme they were cross-questioned upon the fact that for many years their lands had been subject to an agreement between the Commonwealth and the State of New South Wales, under the Seat of Government Acceptance Act. This agreement severely restricts the normal powers of land ownership in the area, in that the right of the State or residents to use and control certain parts of the Queanbeyan and Molonglo Rivers and tributaries are subject and

secondary to the use and requirements of the Commonwealth. The State is also to protect from pollution all the waters within the catchments of those two rivers. The Committee was surprised to find that there was very little knowledge of this agreement in the locality, though it had been in existence for so long and affects the actual tenure of the land holdings. This is particularly so in the areas in the immediate vicinity of the proposed dam. The Committee recommends that suitable action should be taken to ensure that the residents are informed of the terms of the agreement, not only to acquaint them with the tenure of their holdings, but also to obtain their co-operation in preventing pollution and soil erosion on their properties.

THE CANBERRA LAKES SCHEME.

46. One of the additional factors in favour of the Queanbeyan River scheme was that a dam would be needed at Googong in any case for use when the Canberra Lakes scheme was implemented, and, by an expenditure of about £50,000 an extra 4 feet could be added to the dam proposed for the drinking water reservoir, thus providing the additional amount required at a reasonable cost. The presence of the Googong dam was also claimed as a control on the river in flood time, necessary to preserve the Capital from floods.

47. Considerable evidence was taken regarding the possible use of the dam for flood control, and for preserving the level of the Canberra Lakes scheme in times of drought, with the inference that such use of the dam would be an added incentive to build the water scheme in that area. As the conclusion was reached, however, in the Committee's concurrent reference, that the dam is not required for these purposes, at any rate for some considerable time, this factor does not require further consideration here.

THE SEPARATE WATERSHED.

48. Some witnesses advocated the use of the Queanbeyan River as it offers a completely separate watershed, with alternative source of supply in times of emergency, drought, or war. This contention was one of considerable merit, and the Committee gave it serious consideration, particularly as the existence of two independent schemes would allow them both to be used together or separately, as circumstances demanded. In the Committee's opinion, however, this aspect of the proposal was not sufficient to outweigh other considerations, combined with the fact that the Coter and other streams on Commonwealth land offer ample possibilities for the future, even though at greater cost. In this connexion, also, the desirability to protect all sources of supply which might be required many years hence is regarded as sufficiently covered by the agreement under the Seat of Government Acceptance Act.

ESTIMATED COSTS.

49. Very careful calculations in connexion with the cost of constructing and maintaining the various components of these two alternative schemes were prepared by the engineers and submitted to the Committee. Capital costs, with capitalized costs of operation were prepared to bring the schemes on to comparable bases from the economics point of view, and suitable graphs and diagrams provided excellent assistance to the Committee in the task of studying this important aspect of the proposals.

50. It was particularly important to take special note of this section of the evidence, as it was upon the economic aspect that the preference of the Googong scheme largely rested. The figures show clearly that capital cost alone does not provide a common basis for

comparing the two schemes, as the cost of pumping over the years becomes so important a factor to be reckoned with. The following summary therefore shows the costs of the schemes including capitalized cost of operation if the water is all pumped, or if a combination of gravitation and pumping is decided upon.

	Supply from Coter River.	Supply from Queanbeyan River.
	£	£
All water pumped—		
Capital cost	1,700,000	1,350,000
Capitalized cost of operation ..	1,550,000	600,000
	3,250,000	2,150,000
Gravitation and pumping—		
Capital cost	3,600,000	1,700,000
Capitalized cost of operation ..	100,000	350,000
	3,700,000	2,100,000

51. It will thus be seen that, while the capital cost of providing a system for pumping all the water is much cheaper in capital cost than gravitation with its expensive pipeline, the heavy operational costs make it increasingly expensive as the years go by. It will be seen also that, on the basis of these calculations, the Coter scheme is £1,000,000 more expensive, over the period considered. This is a very powerful argument in favour of the Queanbeyan scheme, but it was not sufficient to convince the Committee against the weight of all the other considerations, as shown in the following record of the deliberations in this matter.

THE PRINCIPAL DECISION.

52. In finally arriving at its decision upon the two alternative schemes the Committee discussed the relevant points at length, weighing all the factors and arguments brought forward in the evidence. There was difference of opinion regarding the conflicting medical evidence, and it was suggested that further evidence should be called in this regard. However, it was indicated that the actual facts of medical tests showed the superiority of the Coter water, and this was not likely to be affected by more evidence at this stage. The result of the discussions was as follows:—

Moved by Senator Maher.—That the Committee recommend the adoption of the Upper Coter scheme for Canberra's additional water supply.

The motion was seconded by Senator O'Byrne.

The Committee divided.

Ayes, 6.	Noes, 1.
Senator Maher.	Mr. Bird.
Senator O'Byrne.	
Mr. Bowen.	
Mr. Cramer.	
Mr. Lawrence.	
Mr. O'Connor.	

And it was resolved in the affirmative.

53. The Committee therefore recommends the construction of the dam on the Upper Coter River to provide for the scheme of combined gravitation and pumping, at a capital cost of £1,300,000 for the next three years, to be followed by construction of necessary pipeline some years later when demand justifies it.

54. This decision is made on the understanding that the water will be pumped from the lower Coter dam for a number of years, the new upper Coter dam being used for additional storage from which to replenish the lower dam as required. When the population of Canberra rises to the stage when the demand for pumped water overbalances the economics of this system, the time will have been reached when the pipeline should be constructed, so that the water may be fed into the reticulation system by gravitation.

55. Under this scheme, the details submitted in evidence show that on an annual budget basis, the capital cost for the first three years will be £1,300,000 as against £1,650,000 for the Queanbeyan scheme. It will entail further heavy expenditure about ten years later, when it is expected that the pipelining will be essential, while the Queanbeyan scheme would only require small further capital expenditure in about fifteen years time.

SECTION IV.—THE COMMITTEE'S CONCLUSIONS.

SUMMARY OF RECOMMENDATIONS.

56. The following is a summary of the recommendations of the Committee, shown in greater detail in the various sections of this Report:—

- (1) Additional storage is required, and should be provided as soon as possible. (Paragraph 25.)
- (2) The Canberra Lakes scheme and flood control do not provide sufficient justification for including special storage at Googong at the present time. (Paragraphs 22 and 27.)
- (3) It is very doubtful that effective control of the Googong catchment area could be exercised in practice through the State Governmental authorities. (Paragraph 44.)
- (4) Resumption of the whole Queanbeyan River catchment area for control purposes would be so costly that the economic advantage of this scheme would disappear. (Paragraph 44.)
- (5) The Seat of Government Acceptance Act provides sufficient safeguards in case of the Googong area being required in the future. (Paragraph 48.)
- (6) Suitable action should be taken to ensure that the landholders in the Queanbeyan and Molonglo catchment areas are acquainted

with the effects of the Agreement concerning control of their lands. (Paragraph 45.)

- (7) The Health Department over-emphasized the dangers of the Googong area, from the health point of view, but other medical tests leave no doubt as to the superiority of the Cotter water. (Paragraph 39.)
- (8) As the Cotter area contains ample possibilities on Commonwealth-owned land for future requirements, the necessity for an alternative watershed is minimized. (Paragraph 48.)
- (9) The Upper Cotter scheme should be adopted for providing additional storage for Canberra's water supply. (Paragraph 52.)
- (10) The dam on the Upper Cotter River should be constructed at an initial cost of £1,390,000, and be followed by construction of pipelines for gravitation system some years hence, when the demand justifies it. (Paragraph 53.)

- (11) Immediate use should be made of Molonglo water for adjacent parks and gardens. (Paragraph 18.)

J. O. ORAMER, Chairman.

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