

# Water dreaming

Australia has one of the most variable rainfalls on earth. Discovering new ways to obtain and manage water has long been seen as a key to Australia's prosperity. Many solutions have been imagined to the problem of the variable water supply. A solution can be a product, an idea, a new angle on an existing idea or a new way of doing something.



NAA: A1200, L22714

Cloud seeding, near Sydney, 1957

## Investigation

Select one solution:

- water divining – documents 1 to 2
- nuclear explosions – documents 3 to 5
- cloud seeding – documents 6 to 8
- prayer – documents 9 to 11

List the main characteristics and features of the solution. How did it work? Where was it designed to be used? Who would have used it?

## Reflection

Does the solution address the issue of Australia's limited rainfall? How practical do you think the solution is? Give reasons to support your answer.

Would this solution:

- have been economically sustainable?
- have been environmentally friendly?
- have provided a 'quick fix' or a long-term solution?
- be successful in the commercial market today?

### **Extension**

Explore another Australian solution – such as the dual flush toilet or the Dethridge wheel – and how it has contributed to Australia. Which of these have survived and can still be found in today's market?



# Document 1

## Use of the divining rod

"Dunreath" Private Bag,

TAMWORTH, Feb. 26th 1926.

Dr. EARLE PAGE.

Dear Sir,

I am writing to you on the chance that I might be of some use to your Government in their great undertaking, the North South Railway. The way that I might, or could be of use is in the locating of underground water. I am able, with the use of the Divining Rod and certain chemicals, to make certain of getting good supplies of water every time, also I am able to tell the depth and the quality of the water. I have picked hundreds of sites around here, and am confident that I can go to any well in Australia, where water has been struck, and tell within a few inches the depth of same. I am not going to weary you with what I can do, or have done in the past, because I well know that water finding with just a green twig has proved so many times a failure that I do not wonder at our scientists laughing at it, but I do say this; I do it in a different way and use a little scientific knowledge for the job.

I am writing this, because I realize that our drier areas can be made vastly more productive by tapping the underground streams, and as I stated before I can find them without fail, and estimate their depths. Also by using the same scientific principles I can locate oil just as accurately as I can water I think, therefore, I am sure that where the Government is boring for oil in Papua I could aid the geologists a very great deal by picking the centre of the oil bearing stratas.

Now please do not read this and forget all about it because I can assure you that I can put forward facts to prove what I say and if the Governmtne of Australia would along with their geologists interest themselves in me and my system we could add millions of pounds yearly to our national income.

Congratulating you and Mr. Bruce on your very sane administration and hoping to hear from you, yours faithfully,  
(SGD) GEORGE H. DUNN.(JNR)

Letter to Earle Page



## Macintosh's well at Ainslie, Canberra

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(1) Macintosh's Well at Ainslie.

Early in 1919 the district was short of water, and there was the usual recrudescence of water diviners. Mr. S. Daniels gave his assistance to Mr. Macintosh of Ainslie. Mr. Macintosh kindly furnished me with full details of the diviner's work, which differs in no particular from the usual procedure.

The diviner used a forked rod of gum cut from the adjacent clump to the north (see large map). He tested for water hereabouts, but found none. Then he walked south - see fig 3 - and the fork began to dip 200 feet away from the clump. He followed the "flowing stream" towards the old Post Office. It crosses the spur of undecomposed porphyry shown in the photo and traversed the yard. Here it was confined to a belt about 100 yards wide, and the diviner advised the owner to sink in the middle of the belt just where it left his property (See fig.4).

Mr. Macintosh with great energy and perseverance sank his well through the decomposed zone fringing the porphyry bluff. I measured the rocks roughly as follows : -

Top.	18" grey soil
	6" ironstone gravel
	24" clay
	6" coarse gravel
	18" clay
	12" gravel
	12" clay
	6" gravel
	48 feet decomposed porphyry-tuff
<u>Bottom</u>	<u>8 feet less decomposed tuff</u>
	<u>64 feet total</u>

A vertical 'vein' or crack with pug was some assistance in excavating for the lower 30 feet. Great credit is due to Mr. Macintosh for his energy, for the work occupied his spare time for eight months. At 56 feet some water came in - giving 15 gallons by the morning. At 64 feet water was "bubbling in."

The well supplies from 400 to 800 gallons in 24 hours as far as we could roughly measure it. A 400 gallon tank is

NAA: A361, DSG21/420

Extract from a report by Griffith Taylor, 1920



Macintosh's well at Ainslie, Canberra

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filled and a luxuriant garden is the result of the well.

The diviner had estimated that water would occur about 56 feet. The method (as I was told in another case) probably being to divide the width of the belt by two, and change yards into feet: i.e.  $\frac{112 \text{ yards}}{2} \times \frac{1}{3} = \text{depth in feet.}$

Extract from a report by Griffith Taylor, 1920

NAA: A361, DSG21/420



Excavating a lake by H-bombs

# Excavating a lake by H-bombs

From ANTHONY TUCKER, our Science Correspondent

Canberra, March 20

The Australian Government is considering a proposal to use three 10-megaton hydrogen bombs to create a large artificial lake in Queensland.

The lake, to be used for irrigation, would be close to the tiny township of Birdsville, on the Diamantina River, one of the major river depressions which floods irregularly. In a normally arid area, the soil is highly fertile, but the evaporation rate is about 15 feet a year, while rainfall rarely exceeds two inches.

To provide certain irrigation from the natural rainfall demands protective water storage, and this can be achieved in very deep although open reservoirs. The three bombs could create a crater 1,200 feet deep and roughly three and a quarter miles long by one and a quarter miles wide. This would provide irrigation waters for an area of about 300,000 acres.

### Waterproof base

This is small in comparison to the areas in need of water, but it would provide an adequate experimental assessment of the method. Professor Leach, of the Snowy Mountain authority, who first proposed the experiment, is certain that the radio-active contamination of the crater would be negligible after a few months.

The justification of the method is that, at the current shelf price of American hydrogen bombs, the excavation would cost only one fiftieth of that by conventional methods. A 10-megaton bomb bought as an extension of the United States "Ploughshare Project" costs about £300,000.

This would bring excavation costs below a million pounds, and used below the critical depth at which a "burst out" of radio-activity can occur, there is no appreciable fallout.

The major engineering benefit is that the explosion creates a vitreous mass which seals the base of the cavern and renders it waterproof without further engineering work, while at the same time excavating in less than a minute an area which by other methods would take more than a year.

### American pressure ?

It has been suggested that there is now some American pressure to carry out the experiment as soon as possible because the United States testing ground in New Mexico is not suitable for explosions of this magnitude. This seems probable, for there have recently been investigations into the accumulative health hazard in New Mexico that are the result of peaceful "Plowshare" experiments.

Birdsville, which has a population of only 70, lies 450 miles from the nearest major town, and it is quite clear that there need be no hazard in the experiment.



NAA: A3211, 1974/7951

Article from *The Guardian*, 1966



Document 4  
Hydrogen bombs

# TELEX REPORT

The programme in an item on nuclear explosion featured Dr. Gerald Johnson, Associate Director of Project Ploughshare, controlled by the American Atomic Energy Commission, who described plans to build a new Panama Canal by nuclear explosion.

DEREK COOPER:

..... And at present Australia is deciding whether to buy three 10 megaton hydrogen bombs from the States at £300,000 each to make a 4½ square mile 400 yard deep lake in Queensland. It would irrigate 300,000 acres and provide invaluable experience for the future about this method of large scale digging.

\* \* \*

For: AUSTRALIA HIGH COMMISSION

Hugh Murphy Esq.

Prog: Tomorrow's World

Service: BBC-1

Serial: 53614/JIF

Date: 2.6.66.

Time: 7 p.m.

Length: 45 secs.

**Tellex Monitors Limited** 4 Macclesfield Street London W1 · Telephone Gerrard 3103/4

NAA: A3211, 1974/7951

Telex report of the BBC program



Peaceful use of nuclear explosives

SUBMISSION NO:

COPY NO:

CONFIDENTIAL

FOR CABINET:

PEACEFUL USE OF NUCLEAR EXPLOSIVES

Experiments carried out in the United States and Russia suggest that nuclear explosions may be used to effect large reductions in the cost of fracturing and/or removing large quantities of earth and rock. From the Australian point of view this appears to have particular significance in -

- (a) civil engineering projects such as earth-fill dams, large excavations for water storage and the construction of harbours;
- (b) the fracturing of large low-grade orebodies.

2. The programme of experimentation in the peaceful use of nuclear explosions in the United States (known as Project Plowshare) appears to have achieved a considerable measure of success and some of the basic data required to assess the effectiveness of the technique is now available. A large amount of information is also available which suggests that the radiation hazards associated with underground explosions are very much less than those associated with above-ground explosions; so much so that it appears that the radiological hazards will not constitute a major bar to practical applications of the technique. Evidence available also suggests that the seismic and air blast effects even with large explosions can be accurately predicted and in any case are restricted to a relatively small area immediately surrounding the explosion.

3. The cost advantage of nuclear explosion techniques over conventional methods, especially where the

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NAA: A1838, 720/10/10

Submission by the Minister for National Development, 1963



## Peaceful use of nuclear explosives

CONFIDENTIAL

- 2 -

fracturing or removal of very large quantities of earth or rock are involved, appears to be so great that there are grounds for believing that these techniques may provide the answer to the construction of works or development of resources which otherwise would be regarded as impracticable because of capital requirements or because of marginal economics.

4. The Australian continent is well situated to take advantage of these methods. Extensive areas are sparsely settled and there are large stretches of coastline without natural harbours. We foresee the exploration of our mineral resources as a means of attracting overseas investment and promoting decentralisation. We are not well endowed with water resources and there will be a continuing requirement for large water storages, particularly if these can be constructed in a manner which will minimise evaporation. Nuclear explosives give promise of enabling this kind of storage to be made, both for deep storage facilities and in the construction of conventional type dams.


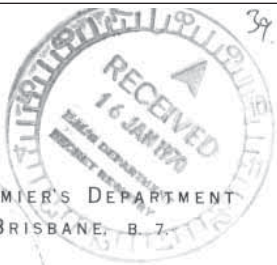

A1838, 720/10/10

Submission by the Minister for National Development, 1963



## Cloud seeding to increase rainfall

661-448 p 11  
See for admin from  
Mini L. change please. ES: Ho  
15/1



12th January, 1970.

My dear Prime Minister,

A three month cloud-seeding operation was conducted by my Government between 15th September and 14th December, 1969, in an effort to alleviate the most serious drought so far experienced in this State. The advice and assistance rendered by C.S.I.R.O. in connection with the project is gratefully acknowledged.

Since no conclusive cloud-seeding research has been conducted in Queensland to provide a reliable measure of potential benefits to be expected in northern latitudes from continuous cloud-seeding, it is only in extreme circumstances such as drought that Government expenditure on cloud-seeding here can be justified.

In undertaking this project we were aware of the fact that from the data available cloud-seeding during drought is unlikely to have a significant broad area effect in breaking the drought but a desperate situation often justifies the adoption of any measures which have a hope of success.

In this operation it was not possible to assess results on a quantitative basis but it is the opinion of participating officers, based on their independent observations, that useful falls of rain occurred on various occasions in consequence of cloud-seeding.

My Government remains extremely interested in cloud-seeding as a possible means of increasing rainfall within given areas and over a continuing period of time and we are fully conscious of the far-reaching benefits to be anticipated from even comparatively small increases in seasonal rainfall in many parts of Queensland.

It is realised that the current C.S.I.R.O. experiment in Tasmania may eventually help to clarify the role of cloud-seeding generally but, because of different meteorological conditions, it is felt that Tasmanian results could not fairly be extrapolated to most of Queensland.

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The Right Honourable the Prime Minister  
of the Commonwealth,  
CANBERRA. A.C.T. 2600.

15/1

NAA: A463, 1973/1594

Extract from a letter from Joh Bjelke-Petersen, Queensland, 1970



## Document 6 (part 2 of 2)

### Cloud seeding to increase rainfall

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Cloud-seeding experiments conducted by C.S.I.R.O. in parts of New South Wales and Victoria are claimed to have produced statistically valid increases in rainfall but a similar experiment commenced several years ago in south-eastern Queensland was unfortunately suspended because of operational problems before any conclusive results were obtained. If anything, the results appeared to indicate that there had been a decrease in rainfall as a consequence of cloud-seeding operations.

In a C.S.I.R.O. report to the Standing Committee on Agriculture dated 6th January, 1967, in which "possibly favourable" areas for cloud-seeding were defined, it was indicated that "it is likely that suitable conditions also occur over large parts of western and northern Australia. However, no experiments have been carried out in these regions and further investigations would be necessary before their potential can be assessed".

NAA: A463, 1973/1594

Extract from a letter from Joh Bjelke-Petersen, Queensland, 1970



Document 7  
Cloud seeding



NAA: A1200, L22714

Near Sydney, New South Wales, 1957



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## Rainmaking and cyclone control

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P  
466

QUEENSLAND FRUIT AND VEGETABLE NEWS

October 9, 1958

### Rainmaking and Cyclone Control

C.S.I.R.O. HOPES

During the recent Tweed Banana Festival the organising committee invited Dr. E. G. BOWEN, Director of C.S.I.R.O. Radiophysics Section, as guest speaker, to a men's dinner, which was part of the week's celebrations. According to the Murwillumbah "Daily News," Dr. Bowen, in telling of cloud-seeding experiments, said rainmakers hoped, in the future, to "steer" flood-producing cyclonic rainstorms away from the Australian east coast. He said cyclonic disturbances from the Coral Sea or the Gulf of Carpentaria caused torrential coastal rain or beneficial downpours west of the range.

This depended on which side of the range they travelled southwards.

By laying an aerial track of silver iodide down the Tasman, clouds may be induced to drop rain harmlessly out to sea.

Dr. Bowen said rainmaking experiments had been confined to suitable areas of average annual rainfall between 10 to 15 inches.

Intensive experiments had taken place in the Guthega region of the Snowy Mountains, the Mt. Lofty range near Adelaide and the New England Range between Tamworth and Inverell.

Stations for intensive experiments would be set up in the Warragamba catchment and the Darling Downs by next year.

Rainmakers had produced rain worth more than £5,000,000 in the Snowy region and at least £200,000 worth of water for the Guthega dam, which was directly convertible into revenue.

This had been produced at about one hundredth of its value.

Dr. Bowen said rainmakers had little hope of producing rain in central Australia, where there was rarely a suitable cloud to "seed."

Dr. Bowen said natural rain fell from one of two causes.

These were ice crystals gathering moisture as they fell through a cloud, when the cloud's temperature at the top was at least minus 15 deg. centigrade.

The other was updraughts in warm clouds producing rain from the collision of moisture particles.

Rainmakers were concerned with producing the first condition in clouds artificially by adding dry ice or silver iodide, known as the supercooling method.

He said suitable cumulus clouds were those with a ceiling temperature of from minus eight to 12 degrees centigrade which were not cold enough to produce rain naturally, but were susceptible to an agent.

Dry ice, first used by American scientists, Langmuir and Schaffer, in 1946, was a successful agent, but uneconomic because of the quantity and load needed to start rain.

The fairly recent discovery of silver iodide which could be sprayed in cloud

NAA: J3078, 2369 part 1

Extract from article, *Queensland Fruit and Vegetable News*



## Rainmaking and cyclone control

October, 1958

form from plane into the base of a cloud and carried upwards naturally, had made rain-making an economical proposition.

Hexagon shaped silver iodide crystals were identical with ice crystals and attracted moisture in the same way as ice crystals.

Australians first successfully made rain over the Blue Mountains, using dry ice, where they produced  $\frac{3}{4}$  in. in a shower.

**"COMMERCIALISED"**

Rainmaking only now was coming out of a period of the "doldrums" in the United States, where commercial rainmakings had made it unpopular.

These professionals had made the mistake of trying to produce rain from the ground by releasing silver iodide clouds.

A company, set up to produce rain for 10 per cent. deposit and the rest if the rain average was raised after six months, was making 90 per cent. sheer profit without real benefit to farmers.

The company had formed a subsidiary to sell sunshine, when it realised all farmers did not want rain at the same time.

The companies had operated simultaneously in the same areas to exploit farmers.

He said Australian scientists had realised that rain taken from one area by seeding clouds in another was not generally beneficial.

Current experiments were to raise the three-year average of a given area above the level of any past similar period.

The increase at Guthega in the last three years had been 32 per cent., 18 per cent. and 28 per cent.

NAA: J3078, 2369 part 1

Extract from article, *Queensland Fruit and Vegetable News*



Document 9

Only God can send the rain

18 SEP 1944

Dunolly  
Vic  
14-9-44

Mr John Curtin  
Dear Sir

I am writing to ask you  
if you will call on Australian  
Prayer for Rain Sunday next  
We are in a great plight stock  
dying & facing ruin like hundreds  
of other soldier settlers  
Only God can  
send the rain  
Will you as the Prime  
Minister call all to prayer in  
all Churches that God Almighty  
will send rain to relieve the  
condition.  
We have no money here  
as I have put all mine into bonds  
Every Loan I at Dunolly Bank  
have subscribed. Now we have  
no feed no water & losing stock  
& sheep every week. Please will you  
help us  
Your true friends  
Jas & Beltha Bell

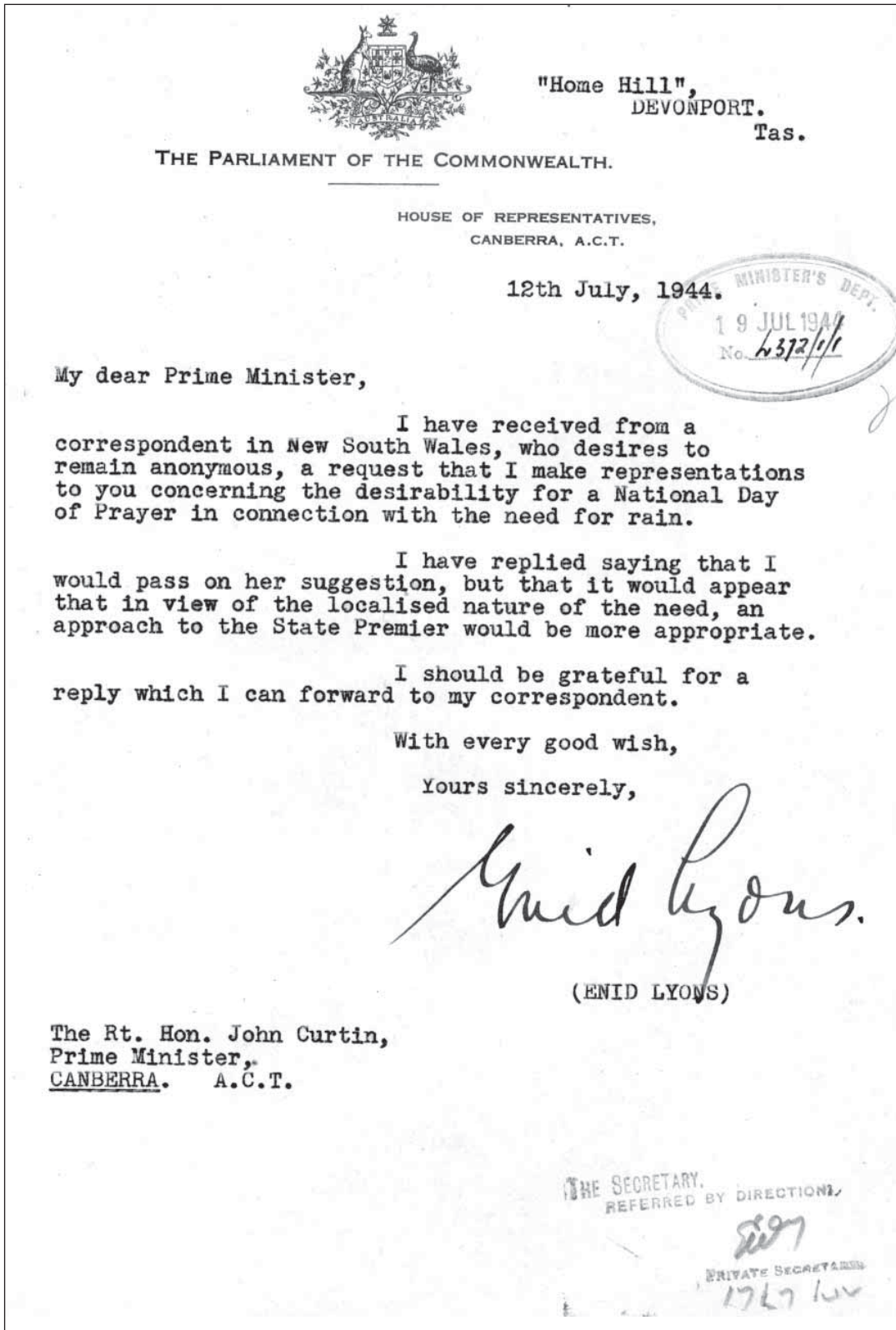
NAA: A461, L372/1/1

Letter to John Curtin



Document 10

Day of prayer for rain



Letter from Enid Lyons



Document 11

Day of thanksgiving for rain



"Grantwood"

C O W R A. N. S. W.

2nd June, 1942.

5 - JUN 1942

The Prime Minister,  
Parliament House,  
CANBERRA. A.C.T.

Dear Sir,

a few weeks ago a call was made for a day of Intercession for rain. The call has now been answered with bounteous rains; resulting in the saving of the lives of millions of sheep, the growth of pasture grasses and crops, provision of adequate water supplies, conservation of fodder supplies and the release of an enormous quantity of manpower for more essential work.

Do you not think it fitting that a special Day of Thanksgiving should be set apart?

Yours faithfully,

*Chas Grieve*

NAA: A461, L372/1/1

