

THE DROUGHT ANTIDOTE FOR THE NORTH-WEST, OR  
THE UTILISATION OF THE ARTESIAN RESOURCES  
OF NEW SOUTH WALES.

By PERCY ALLAN, M. Inst. C.E., M. Am. Soc. C.E.,  
Principal Assistant Engineer for Water Conservation, Department of  
Public Works, N.S.W.

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[*Read before the Sydney University Engineering Society, 10th October,  
1906.*]

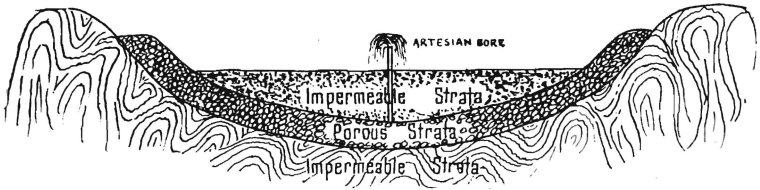
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INTRODUCTION.

So much valuable information has been published from time to time on the potentialities of the artesian water-supply of New South Wales by Mr. E. F. Pittman, Government Geologist of New South Wales; Professor David, of the Sydney University; Mr. J. W. Boulton, for many years Superintendent of Public Watering Places in this State; Professor Gregory, and Mr. Gibbons Cox; whilst the annual reports by Mr. J. B. Henderson, M. Inst. C.E., deal so exhaustively with the artesian supply in Queensland, that but little new is left to be said on the general question. As, however, some present may not have had the privilege of studying the many lucid contributions on the subject by these authorities, perhaps—whilst according them full acknowledgment—the author may be pardoned for quoting very freely from their literature, his contribution solely relating to the practical part of sinking the wells and constructing the distributing works so necessary to secure the full advantage of an artesian flow when once tapped.

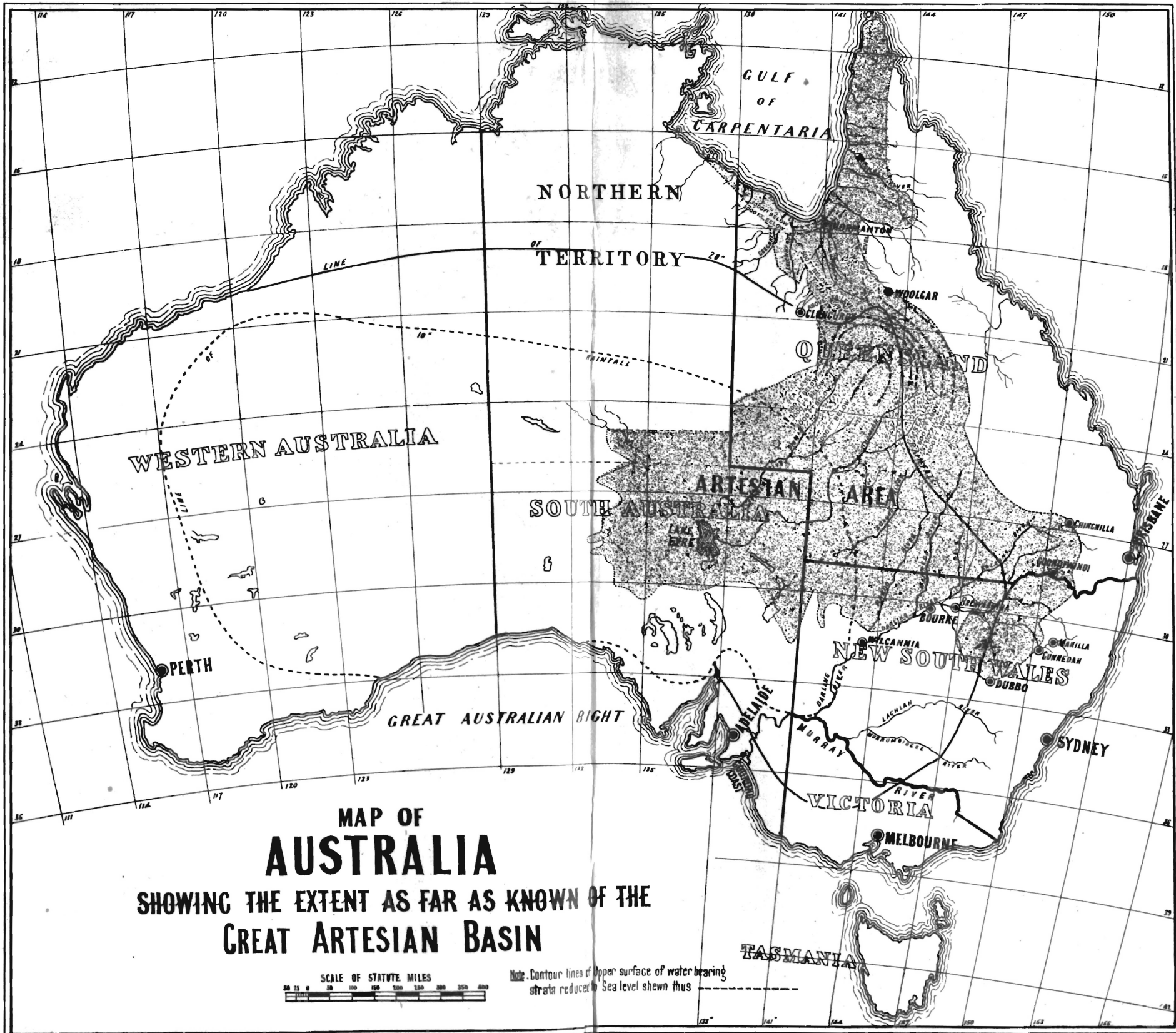
CONDITIONS NECESSARY FOR THE OCCURRENCE OF ARTESIAN WATER.

The Government Geologist, Mr. E. F. Pittman, in “The Mineral Resources of New South Wales,” says that in geological text-books the conditions necessary for the occurrence of artesian water in an ideal artesian basin are generally described as follow:—



SECTION OF AN IDEAL ARTESIAN BASIN.

“There must be a series of porous strata, sands and gravels occupying a basin-shaped depression, and dipping on all sides from the margin of the basin towards the centre. The porous beds must outcrop at the margin of the basin at a higher altitude than that of the surface of the ground where it is proposed to bore for artesian water. The porous beds must be underlaid by some impervious rock which will form a watertight floor for the basin, and they must also be overlaid by impervious strata to serve as a water-tight covering, and prevent the leakage of the water in an upward direction; in short, the porous stratum must be sandwiched in between the impervious floor and an equally impervious roof. The porous rocks, where they outcrop at a higher level on the margin of the basin, act as the intake bed. A considerable proportion of the rain which falls on the surface at these high altitudes is absorbed by the intake beds, and gradually sinks down in them in the direction of their dip, accumulating in the centre of the basin, and in course of time the porous rocks are in the condition of a sponge saturated with water. But the water thus confined must necessarily occur under considerable hydrostatic pressure, the amount of pressure or “head” at any point depending upon the altitude of the intake bed above that point. When a bore is put down and intersects the water-bearing stratum at a low level, the pressure at that point is relieved, and the water will rise through the bore and above the surface to a height somewhat less than that of the outcrop of the intake bed, the deficiency in the height being chiefly due to the resistance offered by the sand or gravel to the percolation of the water.

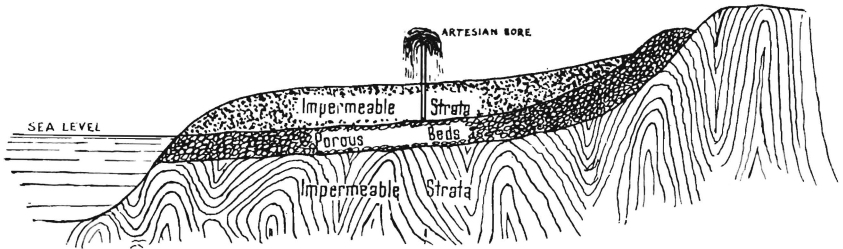


MAP OF  
**AUSTRALIA**  
 SHOWING THE EXTENT AS FAR AS KNOWN OF THE  
 GREAT ARTESIAN BASIN

SCALE OF STATUTE MILES  
 0 25 50 100 150 200 250 300 350 400

Note. Contour lines of upper surface of water bearing strata reduced to Sea level shown thus

“Most of the artesian basins of the world, however, are really one-sided or half basins, the porous strata out-cropping at only a portion of



SECTION OF A ONE-SIDED ARTESIAN BASIN (WITH LEAKAGE TO SEA).

their circumference, and having a more or less regular and continuous dip to the other side, instead of dipping towards a central point as in the case of an ideal basin. The Great Artesian Basin of Australia is of the one-sided type, the intake beds outcropping along its eastern and north-eastern sides only, while the remainder of the water-bearing formation is hidden under the superficial deposits forming the plains of the interior of the States.”

The Great Artesian Basin of Australia has, in the opinion of some writers on the subject, ocean outlets in the neighbourhood of the Gulf of Carpentaria to the north and towards the Great Australian Bight to the south. Some support is lent to these conclusions by the map compiled by the Geological Department of Queensland, based on the data obtained from the various bores, which shows the upper surface of the water-bearing strata as coming near, or even reaching, the surface on a line extending east and west from Woolgar to the Cloncurry, in Queensland, the water-bearing strata appearing to dip towards the Gulf of Carpentaria in the north and towards Lake Eyre and the Great Australian Bight in the South.

Professor Gregory, however, in his recently published work (1906), entitled “The Dead Heart of Australia,” says:—“The only available outlet is northward over a rock barrier into the Gulf of Carpentaria, or possibly eastward to the South Pacific.



“The fact that the Main Artesian Basin has no regular outlet, and is enclosed by a rim complete to west and south, and has only a narrow, shallow lip to the north, and perhaps another to the east, shows that the deep central waters are old accumulations. The wells are the modern artificial outlets from a vast reservoir, which is almost entirely enclosed, and the waters discharged from it must have been collected during the course of centuries, and probably of past millenniums. Nature has stored up a vast but probably a limited supply in a safe underground reservoir. That water, if prudently saved, would probably last till Central Australia were so well occupied that it could afford to provide a more costly supply.”

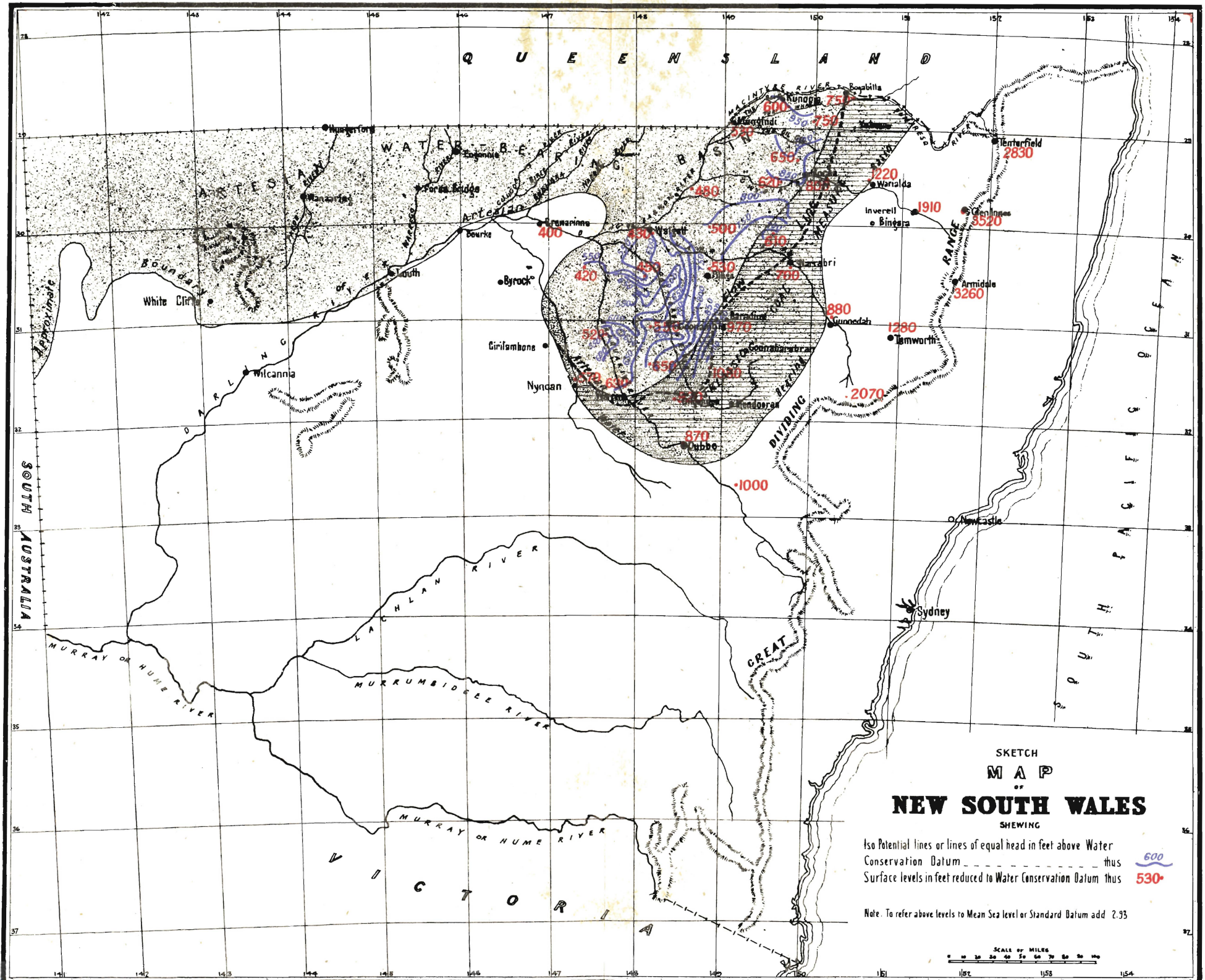
Professor Gregory also holds that the flowing wells are due to compressed gas, which, when set free by a bore, expands and forces the water to the surface.

As bearing on the question of the extensive leakage from the basin, Mr. Pittman says :—

“Any accumulation of water, whether underground or on the surface, must eventually become salt unless it has an outlet, since the water will continue to dissolve saline matter from the rocks or soil ; it is reasonable to conclude, therefore, that all artesian basins from which potable water is obtained must have leakage, either direct to the ocean or through valleys of denudation which have cut through the overlying strata and exposed the porous beds. It follows, therefore, that these basins would be hydraulic and not hydrostatic.”

#### ARTESIAN BASIN IN NEW SOUTH WALES.

The Artesian Basin in New South Wales forms part of the Great Australian Artesian Basin, which has a total estimated area of 569,000 square miles, and is said to be the largest yet discovered in the world—376,000 square miles being situated in Queensland, 110,000 square miles in South Australia, and the balance of 83,000 square miles in New South Wales. The area of intake beds is estimated at 50,000 square miles in Queensland, as against 18,000 square miles in New South Wales. It will thus be noted that whilst this State has the smallest area of basin, yet it has a much higher ratio of intake bed to basin than Queensland, viz., 1 square mile of intake bed to 4·6 square miles of basin, as against 1 to 7½ in Queensland ; and if it be conceded that the rainfall and water from streams absorbed by these intake beds provide the artesian water, it can readily be followed how comparatively well-favoured New South Wales is in regard to the potentialities of the supply.



### INTAKE BEDS IN NEW SOUTH WALES.

The Government Geologist describes the intake beds in New South Wales as "extending from the neighbourhood of Dubbo in a north-north-easterly direction to the Queensland border, outcropping on the western flanks of the Dividing Range, and occupying elevations of 1,200 feet or more above sea level in the foothills of the range for an average width of about 60 miles. The beds have a gentle dip to the westward and probably extend underneath the western plains within the limits of the portion of the Artesian Basin within the State." Taking the annual rainfall at 25 inches per annum, and assuming 20 per cent. to be absorbed by the intake beds, Mr. Pittman has estimated the supply of water in the part of the Artesian Basin in New South Wales at 3,580,273,977 gallons per diem; a quantity sufficient, it may be remarked, to fill to overflowing in six days, the new reservoir at Cataract.

### DISCOVERY OF ARTESIAN WATER IN NEW SOUTH WALES.

The first actual discovery of artesian water was made in 1879 on the Kallara pastoral holding, between Bourke and Wilcannia, a supply being obtained at a depth of 140 feet, which rose in the pipes to a height of 26 feet above the surface of the ground. Mr. W. W. Davis, the owner of Kerribee Station, was, however, the first in this State to demonstrate the success of artesian boring on an extensive scale, the first bore put down by him, to a depth of 1,073 feet, yielding 350,000 gallons of water per day.

The first Government bore was sunk in 1884, at Goonery, on the Bourke-Wanaaring road, to a depth of 89 feet, with a resulting flow of 24,000 gallons per diem. From 1884 onwards the potentialities of the artesian source of supply have been gradually conceded, and in spite of the great difficulties of transport and the cost of boring in the earlier stages, no less than 412 bores have been sunk in this State, of which 54 are sub-artesian, requiring mechanical means for raising the water to the surface. Of the total of 412, but 41 have to be recorded as failures, which speaks well for those responsible for the location of bores, more especially as in the failures are included test bores and bores put down against expert advice to the contrary.

Of the 412 bores so far sunk in New South Wales, 130 have been put down by the Government, as against, approximately, 120 in a total of 1,132 in the State of Queensland, which shows that the Government of this State compares very favorably with the neighbouring State in its endeavour to open up the back country and provide against drought in the interest of the smaller settlers of the State.

### “ MINERAL WATER ” WELLS.

Although not coming within the true definition of an artesian well, flowing wells are sometimes due to the presence of gas (such as sulphuretted hydrogen or carbonic acid) in the water under high pressure, which when set free by a bore expands and forces the water above the surface, in the same way as soda-water overflows a bottle when uncorked. The water from such wells is called “mineral water,” and is often valuable for its medicinal properties. An example of this class of well is at Ballimore, near Dubbo, whence the supply of “Zetz” Spa, sold in this State, is drawn.

### GOVERNMENT BORES.

The Government bores in this State have been sunk under the provision of the Public Watering Places, Artesian Wells, and Water and Drainage Acts.

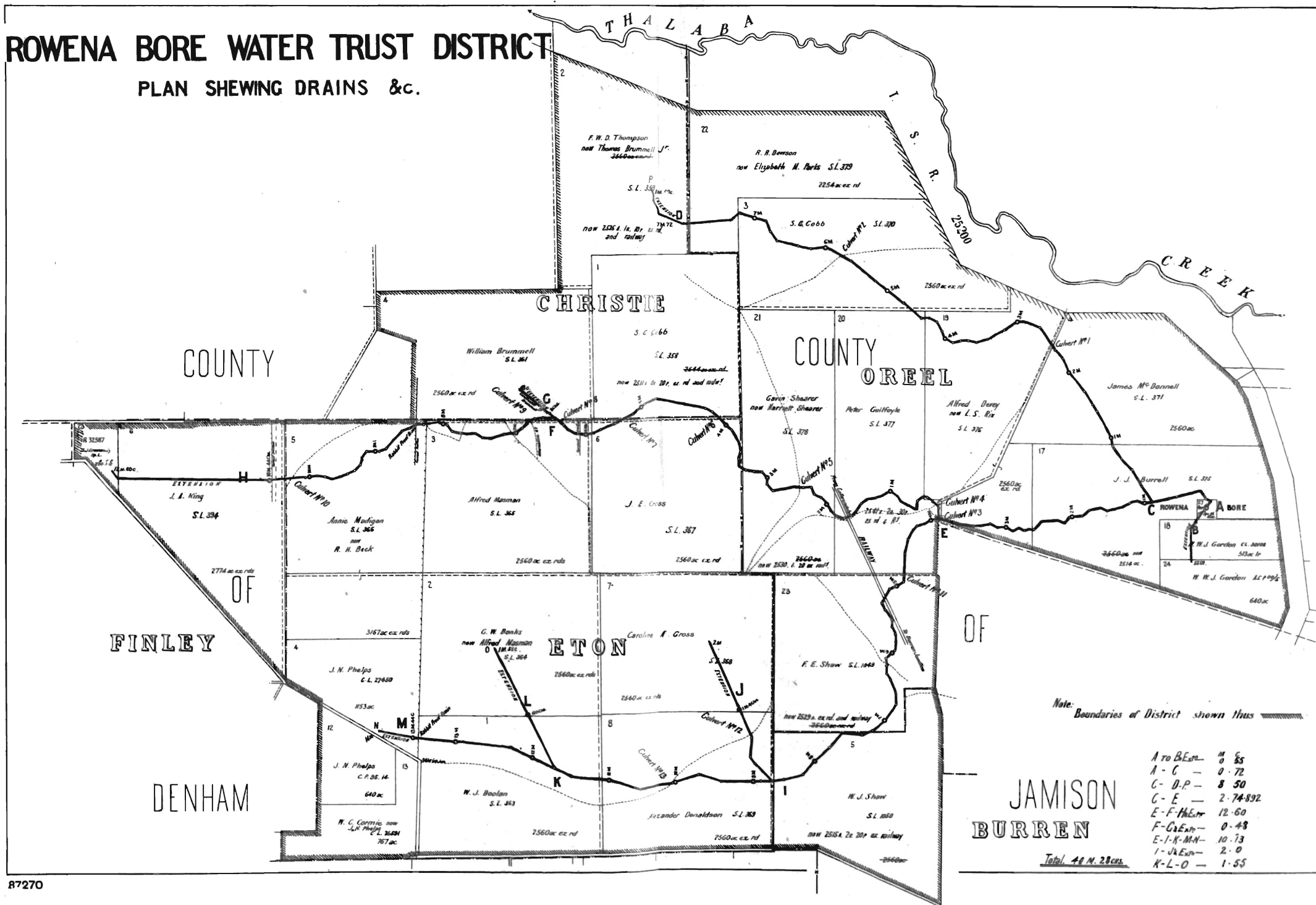
Bores under the Public Watering Places Act have been sunk with the object of opening up travelling stock routes and roads which, without the provisions of an ample supply of water, could not be travelled. These bores, with an area of land generally speaking of 1,280 acres, are let by tender on long leases, the lessee being, in terms of the Act, allowed to charge certain specified rates for the watering of stock.

The Artesian Wells Act, under which a number of bores have been sunk, provides that any group of occupiers may petition the Minister to put down a bore and construct the necessary channels. Upon the completion of the works the Local Land Board assesses the charges to be paid by each holder, but so that the total of the assessment shall not exceed a maximum of 6 per cent. on the total cost of the works. The occupiers have, in addition, to efficiently maintain the channels passing through their individual holdings under a penalty of £50, whilst the maintenance of bore and head-works remains with the Department. The general supervision in regard to the requirements of the Act being observed, devolves upon the Minister, the policy under this Act being consequently central control.

A recent example of a district under the Artesian Wells Act is that of Rowena. This bore was sunk to a depth of 2,669 feet at a cost of £2,475, having a flow of 924,990 gallons per diem, which, by means of 41 miles of distributing channels, constructed at a cost of £844, including head-works, divisors, drops and culverts, waters 21 holdings, embracing an area of 55,405 acres. The total cost of the works has been £3 373 11s. 8d. the benefit derived therefrom by the different

# ROWENA BORE WATER TRUST DISTRICT

## PLAN SHEWING DRAINS &c.



Note: Boundaries of District shown thus

JAMISON  
BURREN

A to B Est.	0 85
A - C	0 72
C - D - P	8 50
C - E	2 74-892
E - F - H Est.	12 60
F - G Est.	0 48
E - I - K - M - N	10 73
I - J - K Est.	2 0
K - L - O	1 55

Total 48 A. 28 ac.