Rept. Bk. No. 55/104
G.S. No. 2475
D.M. 1307/59
HYD. No. 1386

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

HYDROLOGY SECTION

REPORT ON GROUNDWATER PROSPECTS

COOBER PEDY AREA

Pastoral Lease 2005 Blks. 738-743
Pastoral Lease 2020 Blks. 739-742

by

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INTRODUCTION:

Following a request made by the Engineering & Water Supply Department to this Department for further investigations into the groundwater prospects in the Coober Pedy area, a follow-up survey to that of Mr. E.S. O'Driscoll and Mr. C. Bleys in 1959 was carried out by the author from 27/9/62 to 3/10/62. This survey has been incorporated in a regional hydrological survey of the Great Australian Artesian Basin and its fringe areas in South Australia, which has been continuing since May 1961.

As a result of the drought stricken condition of the country in this area, and with the increasing population due to the current high demand for opal, the water problem has once again become acute. As the town supply 500,000 gallon rainwater tank is now dry, water is being carted from Mount Willoughby Station some hundred miles to the north, at considerable cost to consumers and general inconvenience. It is understood this water is being partially supplemented in some instances by freshwater from Mr. F.H.C. Kunoth's private "Willow" bore some ten miles northwest of the township.

As far as is known these are the only current sources of water for Coober Pedy at present being used. Apart from the drilling of a bore one and a half miles north of the township, none of the other recommendations made by O'Driscoll and Bleys in 1959 have been acted upon.

LOCATION AND TOPOGRAPHY:

Situated 159 miles north of Kingoonya and 100 miles west of Anna Creek on the main Port Augusta - Alice Springs road, Coober Pedy township occupies the escarpment of part of Stuart's Range. The crest of this irregular escarpment provides the water divide between the easterly Lake Cadibarrawirracanna and westerly Lake Phillipson, Lake Woorong drainage systems. Because of the steepness of the escarpment there is a greater density of major streams to the east than to the west. Apart from the range, the country is very open, gently undulating, almost treeless, and gibber strewn.

Erratic rainfall is reported to give an annual average of 5 inches.

GEOLOGY:

Bore log information has helped provide considerable additional data to supplement the limited outcrop of the older rock systems. The sequence in the Coober Pedy area is generally as follows:

1. Lower Cretaceous

   (a) Multi-coloured gypsiferous opalised shales, sandy shales and agglomerate.

   Approximately 100-150 feet thick.

   (b) Lower blue marine pyritiferous shales with limestone and minor sandy horizons - very gypsiferous on weathered outcrop.

2. Jurassic

   Fine to coarse quartz sands and gravels with some re-worked Permian carbonaceous sediments.

3. Permian

   Carbonaceous and coaly shales.

4. Pre-Cambrian

   Granite.

A regional study shows the occurrence of granite at shallow depth at No. 8 bore on Mount Penrhyn about 28 miles to the south. Mesozoic sediments thicken gradually from this locality to the north to Coober Pedy where they overlie Permian carbonaceous shales. "Sabrina" Bore, an abandoned bore, of total depth 243 feet and approximately ten miles northeast of the township, between Stuart's Range Bores No. 1 and No. 2, intersected granite at 214 feet. It is considered that this information is sufficient indication of the limits of the continuous and effective extent of this fringe basin to the east and to the south.

Permian sediments have been reported from Stuart's Range Bores No. 1 and No. 2 at 447 feet and 253 feet respectively. The suggestion is made however that as water was cut in sands at 343 feet to 364 feet in No. 2 Bore that possibly these represent the Jurassic sands containing some re-worked Permian sediments.

The Jurassic sands appear widely distributed in a number of bores from Mount Penrhyn to Stuart's Range No. 1 Bore, and also probably in a line of bores from "Rock Hill" to "Cotton Bush" and "Honeymoon" Bores on Mount Clarence.

Dark blue shales of Lower Cretaceous age overlie the Jurassic sands in varying thickness, but generally of 200 to 300 feet in the area. The 100-150 feet of sandy clays and opalised agglomerate forming the Stuart's Range are also of Lower Cretaceous age, but these distinctive beds are limited in occurrence to west of the erosional escarpment.

The surface of either Lower Cretaceous outcrops are liberally strewn with gibber on rather gypsiferous and occasional crab-holey country.

HYDROLOGY:

A strategic density of bores penetrating Jurassic sands over a fairly wide area round Coober Pedy, all show the presence of highly saline non-pressure water. It is considered that this is a result of what may be regarded as a hydrologically isolated basin which is provided with poor or no intake. The floor or bottom of this basin is in some places provided by granite and in other places by the somewhat erratic distribution of Permian sediments.

Nowhere in this general area is it known that water occurs within a sand of the blue Lower Cretaceous shale. The rather clayey blue nature of the sands from bores north of a line from Rock Hill to Mount Clarence homestead, and their non-pressure nature suggests this possibility, but it is not an established fact.

However, recent drilling as at Willow Bore and also at Mount Clarence homestead, shows that very limited supplies of good quality water may be found in carefully chosen localities at comparatively shallow depth, below the sandy shales and opalised agglomerate, and above the distinctive blue shales. Apparently the lower permeability of the lower strata is such as to provide a favourable horizon for groundwater occurrence at the contact of these two units. Willow Bores No. 1 and 2 at about 150 feet apart are about 140 feet deep and together obtained 1,500 gallons a day of potable water. Further drilling in the area adjacent was not successful hence showing the very limited and local extent of such water. However, these bores are at the head of a small watercourse where it is considered that intake would be limited.

Three sites were chosen further down the same water-course and below the major tributary junctions, in places where crab-holes existed. It is considered that there is a moderate chance that similar pockets of water may be available at similar depths of about 150 feet on top of the blue shale. While the

combined total intake should be greater at each of these localities than at the head of the watercourse, the water quality may not be as good. The gypsiferous nature of the clays very rapidly adversely affects quality. Therefore it is recommended that site No. 1 be drilled first, site No. 2 second and No. 3 third. Drilling however should only be contemplated if it is considered that useful supplies of fresh or brackish water in this vicinity, approximately seven miles from the town, would be economical for carting or possibly piping.

If piping is considered in the event of a successful bore, the approximate aneroid estimated differences in elevation from the crest of the range at the town site and sites given are as follows:

Site No. 1 - 50 ft. lower than town site
" " 2 - 65 " " " " "
" " 3 - 80 " " " " "

If water were piped to the base of the escarpment the lifts would each be reduced by about 80 to 100 feet, as the escarpment is lower than several of the bore sites.

Each of these sites must be regarded largely as test sites, as no guarantee to success can be given, there being no uniform, extensive or useful aquifer. But there is no geological reason why similar conditions such as occur at Willow Bores and at Mount Clarence homestead could not also occur here. It is recommended that an agreement be reached with the lessee Mr. F.H.C. Kunoth before drilling is commenced.

Should water be required solely for cooling and domestic purposes other than drinking and cooking, a recommendation can be made that a bore of depth approximately 300 feet be drilled at the base of the escarpment in the town area or approximately 380 feet at the crest of the escarpment if reticulation is required. This water would be highly saline, being about 1300 grains per gallon total salts, but should be available in good supply. This water would have to be supplem-

ented with drinking water and hence would not solve the acute problem completely, unless the procuring of a de-salinating plant is considered.

A further recommendation is that the current long distance carting could be reduced by supplementing this transported freshwater with water from Stuart's Range No. 2 bore which as mentioned by O'Driscoll and Bleys could be used for most purposes.

It is also strongly recommended again that a further underground water tank be built in a separate catchment area as previously recommended.

CONCLUSIONS AND RECOMMENDATIONS:

The possibility of obtaining underground water other than of highly saline content in and around the immediate vicinity of Coober Pedy is considered negligible. Abundant supplies of saline water at 300 to 380 feet depth in the township area are reasonably assured. It is considered that the closest reasonable chance of obtaining fresh or brackish water is at no less than seven miles distant on the major watercourse shown on the accompanying plan. Drilling on the sites shown should be done on a test basis and only if economical carting or possibly piping is contemplated. Any supply is likely to be limited and the quality may or may not be quite as good as obtained at Willow Bores. The depth anticipated is not likely to be much greater than 150 feet, but drilling should cease as soon as uniform dark blue shale is penetrated.

Recommendations can be made as follows in order of preference.

(1) Test drilling of three sites selected.

(2) Supplementary carting of useful water from Stuart's Range No. 2 bore.

(3) Building of a further underground tank in a separate catchment area as recommended by O'Driscoll and Bleys in 1959.

(4) Drilling of a 300-390 ft. bore in the town area to provide bulk saline water for general and cooling purposes.

(5) Economic consideration given to the procuring of a small de-salinating plant to provide limited fresh drinking water.

(6) Before all possibilities for fresh ground water prospects can be regarded as being exhausted, because of the unpredictable nature of the shallow water occurrence, further test drilling in some of the similar drainage depressions west of the escarpment may be necessary. But should the sites of recommendation No. 1 be failures, only limited hope for success can be held.

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