COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORDS 1961 No. 15

MITCHELL No. 2 BORE LOGGING, QUEENSLAND 1960

by

F. Jewell and E.E. Jesson

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ABSTRACT

Temperature and radiometric logs were made of the Mitchell No. 2 Bore and are discussed with reference to the probable artesian aquifers.

Zones of low radioactivity correspond with water-bearing sandstone beds. The distribution of temperature indicates the zones in which water enters the bore.

Water production is from sandstone at depths between 2548 and 2700 ft.

1. INTRODUCTION

The Mitchell No. 2 Bore is located at latitude 147°57'41" E., longitude 26°29'32" S. It was drilled by the percussion method in 1960 for the Mitchell Shire Council, to provide an alternative water supply for the town. Water was obtained at the various horizons noted in the driller's log. After the bore reached the contract depth of 2800 ft it was deepened to 2920 ft in the hope of obtaining water supplies under greater pressure, but there was no noticeable change in the pressure.

The bore was cased to the bottom, but the casing between 1990 and 2793 ft was slotted. Eight-inch casing was used down to 1020 ft, and six-inch casing from 1000 ft to the bottom. In addition, ten-inch casing was inserted from the surface to 400 ft.

2. EQUIPMENT AND OPERATIONS

The bore was logged by F. Jewell and N.D. Jackson of the Bureau of Mineral Resources, on 24th March 1960. Only radiometric and temperature logs could be made because the hole was cased. A Failing "Logmaster" was used; the two logs were made by suspending two different types of probe on a shielded three-core cable which was raised and lowered in the bore hole by a power-driven winch. The curves were recorded on the paper chart of a recorder connected electrically through slip-rings to the cable.

Artesian water was flowing throughout the six hours of logging. In common with much bore water in Queensland, the water had the distinctive odour of hydrogen sulphide, and it also probably contained considerable carbon dioxide.

3. GEOLOGY

Mitchell is near the eastern side of the Great Artesian Basin in an area where the Roma Formation outcrops at the surface. The geological sequence is believed to be (Whitehouse, 1954) as follows:-

Cretaceous	Rolling Downs Group	Roma Formation
Jurassic	Blythesdale Group	Transition Beds Mooga Sandstone Fossil Wood Beds Gubberamunda Sandstone
	Walloon Coal Measures	
Triassic	Bundamba Group	

The driller's log is shown on Plate 1, and a sludge sample log is given below.

The Blythesdale Group is a sequence of arenaceous rocks, and contains the youngest series of aquifers in the Great Artesian Basin. However, on geological grounds it appears more likely that this bore would tap useful aquifers in the Bundamba Group than in the Blythesdale Group.

The following is a generalised version of the sludge sample log prepared by the Queensland Department of Development and Mines :-

100	-	210 ft	Mudstone
210	-	230 "	Calcareous mudstone
230	-	290 "	Mudstone
290	-	300 "	Calcareous mudstone
300	-	400 "	Sandy mudstone
400	-	480 "	Sandstone and sandy mudstone
480	-	520 "	Mudstone
520	-	570 "	Sandy mudstone
570	-	580 "	Mudstone
580	-	600 "	Calcareous mudstone.
600	-	620 "	Mudstone
620	-	690 "	Calcareous mudstone
690	-	750 "	Sandy mudstone
750	-	770 "	Sandstone
770	-	840 "	Mudstone
840	-	870 "	Sandy mudstone
870	-	1660 "	Sandy mudstone and sandstone
1660	-	2060 "	Mudstone
2060	-	2780 "	Sandstone
2780	-	bottom	Schist

4. INTERPRETATION OF LOGS

Temperature Log (Plate 1)

The temperature log has such an unusual appearance that it would normally be considered unreliable, with the possible exception of the sharp change between 2580 and 2660 ft. The appearance and magnitude of this change, in relation to the rest of the log, suggest that even if the log is generally unreliable there may be some truth in this feature.

However, from a consideration of other data relating to this area it is believed that the temperature log is basically correct, with the exception of :-

(a) a periodic variation, repeating at about 60-ft intervals and with an amplitude of up to 1°F, which is apparent for the full length of the log. This is attributed to some instrumental effect.

(b) a slight instrumental drift suggested by the part of the log between about 1300 and 2000 ft where the temperature rises as the depth decreases.

The analysis of the other data relating to the area is not complete, but will be considered in a future report.

The change in temperature between 2580 and 2660 ft suggests that water entering the bore from the aquifer marked "A" on the gamma log is mixing with cooler water from aquifer "B" and possibly also from aquifer "C". It is noted that the temperature difference between aquifers A and B is unusually large in relation to their difference in depths.

It has been suggested that the temperature log indicates a transfer of water to this bore from the nearby No. 1 Bore. This is considered very unlikely; the two bores are of similar depth and size, and presumably tap the same aquifers, where the pressure of water is so great that water flows from the bores. Headworks on the No. 1 Bore may create a slight back pressure but it is hard to imagine this being sufficient to force water from the bore into the aquifer for transfer to No. 2 Bore.

Radiometric Log (Plate 1)

The driller's log, which is shown in diagrammatic form on Plate 1, shows that the Bore penetrated a succession of sandstone, shale, and sandy shale beds. The shale corresponds with the more highly radioactive regions shown on the radiometric log. The depths of the contacts between sandstone and shale are not accurate in the driller's log; for example, the shale marked on the driller's log between 2529 and 2540 ft is shown by the radiometric log to lie between 2512 and 2548 ft. The region between 2548 and 2773 ft is shown by the radiometric log to be sandstone with thin bands of shale at 2590-2600 ft, 2650-2670, 2720-2729 ft, and 2755-2765 ft. The inflow of water which the temperature log shows to occur between 2548 and 2700 ft is evidently from this thick sandstone sequence.

Regions of low radioactivity correspond with the water-bearing beds at 2600-2650 ft, 2252-2285 ft, 2090-2110 ft, 2020-2035 ft, 1850-1885 ft, 710-740 ft, and 199-204 ft and show that these beds are also sandstone. The sequence between 1230 ft and 1685 ft is not as homogeneous as the driller's log suggests; the many regions of low radioactivity indicate that parts of this sequence are probably sandy shale.

The low level of radioactivity above 400 ft is due to the shielding of the ten-inch casing.

There are only two major changes in the level of radioactivity which can be correlated with major changes in formations; one is at 2780 ft, below which the radioactivity increases as the bore enters basement rock. This estimate of depth to basement agrees with the sludge sample log.

The radiometric log shows that shale and sandstone alternate more rapidly than is shown by either the sludge sample or the driller's log.

5. REFERENCES

WHITEHOUSE, F.W., 1954 Artesian water supplies in Queensland; Appendix G - The geology of the Queensland portion of the Great Artesian Basin. Govt. Printer, Brisbane.

PLATE I

MITCHELL No. 2 BORE COMPOSITE LOG

DEPTHS RELATIVE TO TOP OF CASING, 1 FOOT ABOVE GROUND LEVEL.
BORE WAS FLOWING DURING LOGGING.
SURFACE ELEVATION 1110 FEET ABOVE SEA LEVEL.

MILLI ROENTGEN/HOUR

0·0 0·01 0·02

GAMMA RAY LOG

TEMPERATURE (°F)

122° 126° 130° 134°

TEMPERATURE

DRILLER'S LOG

LEGEND

- Shale
- Sandstone
- Sandy Shale
- Limestone
- Coal
- Metamorphic Rock

WATER

?

?

WATER

WATER

WATER

WATER

WATER

WATER

C

B

A

0'
500'
1000'
1500'
2000'
2500'
3000'

TEMPERATURE (°F)

122° 126° 130° 134°

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics 988

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