COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1966/52

COPY 3

PAYNESVILLE BORE LOGGING,

VICTORIA 1959

by

W.J. LANGRON

Bureau of Mineral Resources, Geology & Geophysics

RECORD No. 1966/52 (Paynesville Bore Logging, Victoria 1959; by W.J. Langron)

ERRATA

In page 1, paragraph 8, please delete the existing paragraph and insert the following:

Table 1 shows a summary of the lithological log. These data were supplied by Messrs J.J. Jenkin and W. Esplan of the Victorian Department of Mines, and have since been published in Department of Mines Underground Water Investigation Report No. 6 entitled "Underground Water in East Gippsland" by J.J. Jenkin (1962). Messrs Jenkin and Esplan also supplied the geological succession in Table 1. A more detailed geological succession now appears in Unpublished Report 44/1965 of the Geological Survey of Victoria. ("A Stratigraphic Breakdown of Bairnsdale No. 6 Bore, East Gippsland", by J.B. Hocking).

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ILLUSTRATIONS

SUMMARY

Electric (single-point, short-normal, and long-normal resistivity and self-potential), gamma ray, and temperature logs were taken in the Victorian Department of Mines Borehole No. 6, near Paynesville, Victoria. The electric logs indicate two zones of increased permeability; these are between 400-600 feet and below about 1825 feet. The gamma-ray log contains a sharp "kick" at a depth of 57 feet; the significance of this feature is not known but it could be useful as a formation marker.

1. INTRODUCTION

This report describes the electrical, gamma-ray, and temperature logging of a bore drilled by the Victorian Department of Mines, near Paynesville, Victoria. The logging was done by the Geophysical Branch of the Bureau of Mineral Resources at the request of the Department of Mines.

The bore, which is referred to as 'Parish of Bairnsdale Bore No. 6', was at a depth of 1954 feet at the time of the logging operations. Its coordinates on the Bairnsdale four-mile military map series are 626/243.

The geophysical party, consisting of the author (geophysicist) and N. Jackson (senior radio technician) started logging operations on 2nd September 1959. Because of the frequent need to clean out the hole and recirculate the mud and because of equipment trouble, operations were not completed until 7th September 1959. At this juncture, it was decided to deepen the hole to 2000 feet, but the additional section was not logged.

2. TECHNICAL ASPECTS

The equipment used was a Failing Logmaster, which provides electric, radiometric, temperature, and caliper logs. The various logs are made by using different probes, each probe being suspended on a shielded three-core cable, which is raised and lowered in the borehole by a power-driven winch. The logs are recorded on the paper chart of a recorder connected electrically through slip-rings to the cable.

The purpose of the logging was two-fold:

(1) To detect and appraise potential fresh-water leads and to assist generally in the geological log of the hole.

(2) To test thoroughly the newly assembled logging unit.

As standard practice it was decided to log going down the hole at a scale of 20 feet to the inch, and at a scale of 50 feet to the inch when coming up the hole.

The logging cable was found to stretch at the rate of 9 inches per 1000 feet; the depth counter was adjusted to compensate for this during logging. All depth measurements were made from the rotary table, which was one foot above ground level. Surface level at the drill site was approximately 82 feet above sea level.

A summary of the lithological log is shown in Table 1. This information was supplied by the geologist in charge of the drilling operation, W. Esplan of the Department of Mines, Victoria.

3. INTERPRETATION OF LOGS

A caliper log was not attempted during the present operations.

Gamma-ray log

An instrument time-constant of 2 seconds and a logging speed of 40 ft/min were used during the recording. The log is in general featureless and only two portions of it are shown in Plate 1. Because of a blockage in the hole, the probe could be lowered only to a depth of 1800 feet.

The only marked feature is a sharp 'kick' (of about 0.015 milliroentgen/hour) occurring at a depth of 57 feet, i.e. within the casing. No likely explanation can be offered for this feature.

TABLE 1

Department of Mines Bore No. 6, Parish of Bairnsdale, Victoria

Position

On the Bairnsdale golf links. From the south-east corner of allotment 135A, Parish of Bairnsdale, 1216 feet north, then 550 feet east.

Surface level

Approximately 82 feet above sea level.

Summary of lithological log

	Feet
Clay, sandy clay, and sand	0 - 251
Grey shelly marl with hard limestone bands	251 - 600
Hard bryozoal limestone	600 - 1130
Marly limestone and marl	1130 - 1600
Grey friable marl	1600 - 1774
Ligneous mudstone, sandy in part, with some glauconite	1774 - 1846
Hard glauconitic sandstone	1846 - 1849
Silty sand, fine sand, and gravel	1849 - 1891
Fine silty sand and ligneous clay	1891 - 1896
Silty sand, fine sand, and gravel	1896 - 1917
Sandy carbonaceous mudstone with glauconite	1917 - 2011

Geological succession

Pleistocene and Upper Pliocene (post-Kalimnan)	0 - 251
Lower Pliocene (Basal marl Jemmy Point - Tambo River Series)	300 - 400
Upper Miocene (Top Gippsland Limestone)	400 - 600
Lower Miocene (Top Longford Limestone)	1130
Oligocene (Janjukian)	1846
Upper Eocene (Glenarian)	1891

The only other feature on the log is a plateau of slightly higher readings between 1550 and 1750 feet, corresponding with a thickness of 'grey friable marl' described in the lithological log (Table 1).

Temperature log

The log (Plate 2) was taken approximately 10 hours after mud circulation had ceased and immediately after two electrical logs had been obtained. It shows the temperature distribution along the mud column.

It may be presumed that at this stage the mud had reached approximate temperature equilibrium with the formatien. Also there is no obvious correlation between temperature distribution and change in bore hole size. The minimum temperature occurs at a depth of approximately 275 feet and is unlikely to be related to the change of hole size at 258 feet.

Electric logs

Plate 3 shows the single-point resistivity and self-potential logs. The resistivity log is relative to an arbitrary base line and is a plot of the resistance between a single electrode in the borehole and an electrode in the mud pit at the surface. The variations are due to changes in resistivity of the formations in the immediate vicinity of the borehole electrode.

Plate 4 shows the self-potential log together with the short-normal resistivity curve (where the electrode spacing was 16 inches). Plate 5 shows the long-normal resistivity curve, for which the electrode spacing was 63 inches.

With all logs, the particular sensitivity setting for the log was determined either by a 'trial run' beforehand or by noting the variation of the resistivity or self-potential during the run down the hole.

All the resistivity logs show an overall decrease in resistivity with depth. All indicate a band of higher resistivity between 400 and 600 feet, which could correspond to part of the 'grey shelly marl with hard limestone bands' described in Table 1. The fact that there is a slight and broad self-potential negative anomaly also located between 400 and 600 feet suggests that the beds here are permeable. A similar relation between the resistivity and self-potential logs exists below about 1825 feet, again suggesting the presence of highly resistive bands (e.g. hard glauconite sandstone) within a permeable section.

Similar correlations on a smaller scale occur at other depths (e.g. at 875 feet, around 1100 feet, at 1200 feet, etc.).

Such beds must be reasonably thick (e.g. greater than one foot) because the change in resistivity is registered more significantly on the short-normal log than on the single-point log. However, the beds are too thin to be registered adequately on the long-normal log.

4. CONCLUSIONS

Two zones (between 400 and 600 feet and below 1825 feet) could be significant as potential fresh-water beds and therefore warrant further investigation. Smaller features on the electrical logs could also be associated with source beds and could be useful in providing detail within the broad classification of Table 1.

Any core from a depth of about 57 feet should be examined for radioactivity. A sharp 'pip' occurs on the gamma-ray log, even though the hole is cased at this depth. Although shallow, this feature may prove to be a suitable marker for correlating with formations in other bores in the area.

Most of the trouble experienced with the equipment proved to be mechanical and has been rectified for subsequent work.

PLATE I

GAMMA-RAY LOG

COMPANY	VICTORIAN DEPARTMENT OF MINES
WELL	BORE NO. 6
AREA	PARISH OF BAIRNSDALE
STATE	VICTORIA

COORDINATES	626. 243 BAIRNSDALE 1 MILE MILITARY SERIES
ELEVATION	K.B. GL 82 FEET ABOVE SEA LEVEL
Instrument	FAILING
Logged by	N. JACKSON

Date	7. 9. 59
First Reading	13' 10"
Last Reading	1804'
Footage Logged	1790' 2"
Bottom (Driller)	1954'
Casing (from Log)	
Casing (Drilling)	258'
Casing Size	10 inch to 22 ft; 8 inch to 258 ft
Bit Size	7⅜ inch 258-1170'; 5⅝ inch 1170-1524'; 4½ inch 1524-1954'
Cable Stretch	9 inches per 1000'

MUD	
Nature	BENTONITE
Density	
Viscosity	
Resistivity	
Res at B.H.T.	
pH	
Circ. Temp.	13° CENT.
B.H. Temp.	
Water Loss	

REMARKS: DEPTHS WITH REFERENCE TO ROTARY TABLE ROTARY TABLE 1 FOOT ABOVE GROUND 1804 FEET MAXIMUM DEPTH REACHED

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GEO. E. FAILING CO., ENID, OKLAHOMA

PLATE 2

TEMPERATURE LOG

COMPANY VICTORIAN DEPARTMENT OF MINES
WELL BORE NO. 6
AREA PARISH OF BAIRNSDALE
STATE VICTORIA

COORDINATES	626.243 Bairnsdale 1 mile Military Map
ELEVATION	K.B. G.L. 82 Feet above sea level

Instrument	Failing
Logged by	N. Jackson

Date	2.9.59
First Reading	14' 4"
Last Reading	1870'
Footage Logged	1855' 8"
Bottom (Driller)	1954'
Casing (from Log)	
Casing (Driller)	258'
Casing Size	10 inch to 22 ft; 8 inch to 258 ft
Bit Size	7⅝ inch 258–1170'; 5⅝ inch 1170–1524'
Bit Size	4½ inch 1524–1954'
Cable Stretch	9 inches per 1000'

MUD	
Nature	BENTONITE
Density	
Viscosity	
Resistivity	
Res. at B.H.T.	
pH	
Circ. Temp.	13° Cent.
B.H. Temp.	
Water Loss	

REMARKS: DEPTHS WITH REFERENCE TO ROTARY TABLE
ROTARY TABLE 1 FOOT ABOVE GROUND
1870 FEET MAXIMUM DEPTH REACHED

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To Accompany Record No. 1966/52

Branch,

PLATE 3

ELECTRIC LOG

SELF-POTENTIAL AND SINGLE-POINT RESISTIVITY

COMPANY VICTORIAN DEPARTMENT OF MINES
WELL BORE NO. 6
AREA PARISH OF BAIRNSDALE
STATE VICTORIA

COORDINATES	626.243 BAIRNSDALE 1 MILE MILITARY SERIES
ELEVATION	K.B. G.L. 82 FEET ABOVE SEA LEVEL
Instrument	FAILING
Logged by	N. JACKSON

Date	2. 9. 59
First Reading	1954'
Last Reading	50'
Footage Logged	1904'
Bottom (Driller)	1954'
Casing (from Log)	258'
Casing (Drilling)	258
Casing Size	10 inch to 22' 8 inch to 258'
Bit Size	7 3/8 inch 258-1170'
Bit Size	5 5/8 inch 1170-1524' 4 1/2 inch 1524-1954'
Cable Stretch	9 inchs per 1000'

MUD	
Nature	BENTONITE
Density	
Viscosity	
Resistivity	26.79 OHM-METRES
Res. at B.H.T.	
pH	
Circ. Temp.	13° CENT.
B.H. Temp.	
Water Loss	

REMARKS: DEPTHS WITH REFERENCE TO ROTARY TABLE
ROTARY TABLE 1 FOOT ABOVE GROUND

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PLATE 4

ELECTRIC LOG

SELF-POTENTIAL AND 16-INCH SHORT-NORMAL RESISTIVITY

COMPANY	VICTORIAN DEPARTMENT OF MINES
WELL	BORE NO. 6
AREA	PARISH OF BAIRNSDALE
STATE	VICTORIA

COORDINATES	626.243 BAIRNSDALE 1 MILE MILITARY SERIES
ELEVATION	K.B G.L 82 FEET ABOVE SEA LEVEL

Instrument	FAILING
Logged by	N. JACKSON

Date	2.9.59
First Reading	[illegible]4'
Last Reading	49' 4"
Footage Logged	1904' 8"
Bottom (Driller)	1954'
Casing (from Log)	258'
Casing (Drilling)	258'
Casing Size	10 inch to 22' 8 inch to 258'
Bit Size	7⅜ inch 258-1170' 5⅝ inch 1170-1524
Bit Size	4½ inch 1524-1954
Cable Stretch	9 inches per 1000'

MUD	
Nature	BENTONITE
Density	
Viscosity	
Resistivity	26.79 OHM-METRES
Res. at B.H.T	
pH	
Circ. Temp.	13° CENT.
B.H. Temp.	
Water Loss	

REMARKS: DEPTHS WITH REFERENCE TO ROTARY TABLE
ROTARY TABLE 1 FOOT ABOVE GROUND

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PLATE 5

ELECTRIC LOG

63-INCH LONG-NORMAL RESISTIVITY

COMPANY	VICTORIAN DEPARTMENT OF MINES
WELL	BORE NO. 6
AREA	PARISH OF BAIRNSDALE
STATE	VICTORIA

COORDINATES	626. 243 BAIRNSDALE 1 MILE MILITARY SERIES
ELEVATION	K.B. G.L. 82 Feet above sea level

Instrument	Failing
Logged by	N. Jackson

Date	6. 9. 59
First Reading	1950'
Last Reading	46'
Footage Logged	1904'
Bottom (Driller)	1904'
Casing (from Log)	258'
Casing (Drilling)	258'
Casing Size	10 inch to 22' 8 inch to 258'
Bit Size	7⅜ inch 258-1170' 5⅝ inch 1170-1524'
Bit Size	4½ inch 1524-1954'
Cable Stretch	9 Inches per 1000'

MUD	
Nature	BENTONITE
Density	
Viscosity	
Resistivity	19.14 OHM-METERS
Res. at B.H.T.	
pH	
Circ. Temp.	15° CENT.
B.H. Temp.	
Water Loss	

REMARKS: DEPTHS WITH REFERENCE TO ROTARY TABLE
ROTARY TABLE 1 FOOT ABOVE GROUND

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