COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

RECORDS 1956, No. 144

ELECTRIC LOGGING TESTS

AT MORWELL, VICTORIA

by

W. A. WIEBENGA

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ABSTRACT

This report describes electrical logging tests carried out in bore holes on the brown coal fields near Morwell, in response to an application by the State Electricity Commission of Victoria. The equipment used was a two-channel, single-electrode Widco logger. The principle of the methods and some interpretation techniques are discussed. On some logs the resistivity values in the clay sections are slightly higher than those in the brown coal section (e.g. at Maryvale 1111 and Narracan 1555) but on most logs the resistivity values for clays, sandy clays or fine sands are about the same as those for brown coal.

Some sandy clays or clays show small to moderate self-potential anomalies. Small self-potential anomalies are sometimes found in the brown coal sections.

The porosity and permeability ranges, and hence the resistivity and self-potential ranges, for brown coal, clays, sandy clays and fine sands overlap. It is therefore impossible to formulate consistent interpretation rules to distinguish brown coal from clays, sandy clays and fine sands on electrical logs.

1. INTRODUCTION

The Victorian State Electricity Commission, which controls the development and utilisation of the Gippsland brown coal deposits, carries out a continuous drilling programme to assist in exploration for further deposits. In October, 1954, the Commission applied to the Bureau of Mineral Resources for electric logging tests to be carried out in several drill holes near Morwell. The objects of the tests were to determine whether it is possible, by electric logging, to indicate the depth to, and thickness of, the brown coal deposits, and to indicate the presence and thickness of clay, shale and sand layers within the brown coal.

The logging was carried out by the Geophysical Section of the Bureau in 1954 and 1955.

2. EQUIPMENT

The instrument used was a "Widco" two-channel logger (model XDM) manufactured by the Well Instrument Developing Company, Bellaire, Texas, U.S.A. The instrument uses a single electrode and records continuously the variations of resistivity and self-potential (S.P.) The resistivity and S.P. logs are recorded simultaneously side by side on a paper chart.

The logger consists essentially of the following components :-

(a) Recorder : Brown "Electronik" recording potentiometer, oscillator, two amplifiers and convertors, and control panel.

(b) Reel : Cable reel (to accommodate 2500 ft. of cable), $\frac{1}{4}$ h.p. motor, clutch, cable, electrode and collector.

(c) Paper drive : Sheave wheel, associated gearing and depth scales.

Power for the recorder is supplied by an "Onan" 120 volt A.C. generator.

The depth scales are 20 and 50 ft/inch; the S.P. scales are 20,50, 100 and 200 mV/inch and the resistivity scales 2.5, 5, 10, 25, 50 and 100 ohms/inch. The logging cable is a single-conductor, stranded, steel cable with a tensile strength of 600 lbs. and is covered with neoprene. The normal winding speed is about $1\frac{1}{2}$ ft. per second.

For further details of the instruments, the reader is referred to the operation manual supplied by the Well Instrument Developing Company.

3. METHODS

(a) Single-electrode Resistivity Logging.

Single-electrode resistivity logging consists of continuously recording the variations in resistance between the logging electrode, which is raised or lowered in the hole, and the ground electrode situated at the surface, usually in the mud pit. Nearly all the resistance in the circuit is in the immediate neighbourhood of the electrodes. As the ground electrode is stationary, its resistance may

be assumed to be constant during the measurements and the changes of resistance recorded are therefore due to variations in the resistivity of the materials around the logging electrode.

The amplitude of the variation in resistivity depends mainly on the bore diameter, the resistivity of the mud, and the resistivity and thickness of the beds opposite the logging electrode. The recorded variations, due to differences in resistivity between adjacent beds, are not linearly related to the above parameters. Variations in the higher ranges of resistivity have a smaller effect than similar variations in the lower ranges. This factor has the effect of compressing the resistivity record in the higher ranges and makes it impossible to estimate the true resistivity of a bed from the resistivity log.

The resistivity of a rock depends mainly on the following factors :-

(i) Porosity,

(ii) Shape and arrangement of pores,

(iii) Degree of saturation of pores with solutions, and

(iv) The resistivity of the solution.

Rocks below groundwater level are usually saturated. Disregarding factors of minor importance, the resistivity of the pore solution is inversely proportional to the salinity of the solution. The resistivity of a rock is also inversely proportional to the porosity.

(b) Self-potential (S.P.) logging.

The self-potential log is obtained by measuring continuously the potential difference between the logging (moving) electrode and the ground electrode. As the ground electrode is at a constant potential, variations of potential shown on the record represent the variations of potential in the bore hole.

Laboratory experiments have shown that the total electromotive force (E) generated by electro-chemical reactions in a bore can be represented by the empirical formula :-

$E = K \log_{10} R_m / R_w$ (Schlumberger, 1949), in which

R_m = resistivity of the mud

R_w = resistivity of the pore solution in a porous rock, and K is a constant depending on the nature of the rock.

For clean sands and a pore solution of sodium chloride, with E expressed in millivolts, K equals about 70. For sands containing clay, i.e. sands of lower permeability, K is lower.

(c) Interpretation techniques.

Though it will be seen from the results (see Section 4 below) that no specific interpretation rules can be given for the logging under review, the general principles discussed below will help to familiarise the reader with this type of work.

(i) Shales and Clays.

The S.P. value of shales anc clays is customarily used as a zero reference line. Because shales and clays have high porosities, their resistivity is usually the lowest in the section. The resistivity of the brown coal at Morwell is about equal to, or less than, that of shales and clays.

(ii) Sandstone and conglomerates.

Conglomerates and unsorted, coarse sandstones, because of their high permeability and low porosity, show high S.P. values and high resistivities. They mark the water yielding formations (aquifers). Well-sorted, fine-grained sandstones, because of their lower permeability and higher porosity, are characterised by moderate to high S.P. values and moderate resistivities.

(iii) Brown coal at Morwell.

The brown coals at Morwell are characterised by low S.P. values and low resistivities. These characteristics are adequately explained by low permeability and high porosity. The resistivity curves have an irregular saw-tooth appearance, indicating small but rapid changes in porosity.

4. RESULTS

The locations of the drill holes are shown on Plate 1, and the individual logs are reproduced on Plates 2 to 6. Appendices 1 and 2 contain the drilling logs and chemical analyses of drill hole samples respectively, as supplied by the Commission.

Before discussing the results, it should be noted that electric logging of the type used at Morwell could be carried out only below ground-water level because :-

(a) Most of the drill holes were not filled with conditioned mud (or bentonite) to make the wall of the hole impermeable. Solution above ground-water level would therefore seep away rapidly.

(b) The upper part of most holes was cased.

Because of these reasons, it was not possible in most of the holes to log the transition from overburden to coal, which usually occurs near the surface. Also, most holes were not logged to total depth because of partial caving.

The logs of individual holes are discussed in detail below.

(i) MARYVALE 1111 (Plate 2).

The driller's log shows brown coal between 36 ft. and 190 ft., inferior coal at 190 to 194 ft., and clay between 194 and 204 ft.

The S.P. log shows little variation throughout its length.

The resistivity log shows a break at 108 ft., indicating a discontinuity within the coal section. A formation of relatively high resistivity is found between 193 and 206 feet. Apparently the clay between 193 and 206 feet shows up by a slightly higher resistivity than brown coal, on the resistivity log.

Chemical analysis indicates that the moisture content of the coal ranges from 58 to 67 per cent, and that of clay is 53 per cent.

(ii) MARYVALE 1115 (Plate 2).

The driller's log indicates brown coal from 80 to 316 feet. The S.P. log shows little variation. The resistivity log has an irregular appearance, with breaks at 147 and 200 feet. There are no special features in the driller's log corresponding to these breaks. The moisture content of the coal is between 63 and 66 per cent.

(iii) NARRACAN 1554 (Plate 3).

The driller's log indicates sand from 41 to 46 feet and coal from 46 to 215 feet. The S.P. log is featureless, and the resistivity log has an irregular saw-tooth appearance. No geological explanation can be given for the small, but rapid variations in the resistivity logs.

(iv) NARRACAN 1555 (Plate 3).

The driller's log indicates sandy clay above 46 ft., brown coal below 46 ft. The S.P. log shows little variation. The resistivity log shows a sudden drop in resistivity below 43 ft. and apparently the sandy clay has a higher resitivity than the brown coal.

(v) NARRACAN 1561 (Plate 4).

This hole was drilled with a "Failing" rotary drill and bentonite mud. The S.P. curve shows peaks between 201 and 205 ft., 302 and 314 ft., and 445 and 449 ft. These probably represent the more permeable zones in the section. However, the driller's log shows that the first peak falls within "brown clay", the second within "brown sand, silt and clay", and the third corresponds to a bed of "brown clay and silty clay" within the coal section. As clays usually have very low permeability, either the description on the driller's log or the interpretation of the S.P. log is at fault.

Reversal of the features normally recorded on the S.P. log indicates that the resistivity of the pore solution is greater than that of the drilling mud, which probably means that the salinity of the pore solutions is less than that of the drilling mud. This can clearly be seen by study of the formula on p.2.

The resistivity log has an irregular appearance, with several features. The driller's log describes the section between 189 and 249 feet as clay, whereas the resistivity log shows no appreciable difference from the overlying brown coal. The resistivity is generally lower below 246 feet than above 246 feet, with the exception of the section between 290 and 320 ft.

According to the driller's log, alternate layers of coal and clay are present between 246 and 290 ft., clay, silt and fine sand between 290 and 320 ft., and brown coal below 320 ft. to the end of the log at 600 ft.

The chemical analysis shows that the moisture content of the brown coal above 188 ft. ranges between 66 and 73 per cent, and at 190 ft. it is 67 per cent. Inferior coal between 271 and 281 ft. has a moisture content of 61 per cent.

The evidence obtained from this bore hole clearly illustrates that the difference in resistivity between clay and brown coal is so small, and the variations in the electrical properties of clay and brown coal are so large, that it is impossible to make consistent interpretation rules to distinguish between them on electric logs.

(vi) NARRACAN 819 (Plate 5).

This hole was drilled with a "Failing" rotary drill.

On the S.P. log, small features above 100 feet probably indicate permeable zones within the brown coal. Between 203 and 210 ft. a S.P. anomaly corresponds with ligneous clay shown on the driller's log, and also coincides with a small anomaly on the resistance log.

Between 255 and 285 ft. a S.P. anomaly corresponds with sandy clay on the driller's log and with a general lower resistivity.

Between 384 and 420 ft., S.P. anomalies correspond with grey and brown silty clay on the driller's log.

The S.P. anomalies indicate more permeable zones. As in Narracan 1561, the features are reversed, indicating that the salinity of the pore solutions is lower than that of the drilling mud. The resistivity log shows a decrease in resistivity below 260 ft. The driller's log to a depth of 420 ft. shows two main coal zones. The first of these is between 45 and 175 ft. with a relatively high resistivity, and about 68 per cent moisture content, and the second between 287 and 389 ft., with a relatively low resistivity and 54 to 60 per cent moisture content. A large part of the clay zones cannot be distinguished from brown coal on the electrical logs. As at Narracan 1561, the evidence obtained from this bore hole shows that it is impossible to make consistent interpretation rules to distinguish between clay and brown coal on electric logs.

(vii) TANJIL EAST 1109 (Plate 6).

The drilling log indicates brown coal between 24 and 68 feet. The resistivity log shows a rapid increase in resistivity above 54 feet which is probably due to a decrease in water content in the overburden above ground-water level. No other conclusions can be drawn from the electric logs.

(viii) TANJIL EAST 1110 (Plate 6).

The feature in the S.P. log at 67 feet is probably associated with the bottom of the coal zone. The troughs and peaks in the S.P. log between 67 and 100 feet (bottom of hole) indicate permeable and impermeable zones respectively, and can be interpreted as alternating clay and sand layers. The resistivity log has an irregular appearance from 40 to 100 feet with no special features. The drilling log indicates brown coal from 19 to 75 feet and brown clay from 75 to 100 feet.

(ix) TANJIL EAST 1111 (Plate 6).

This hole was logged to only 60 ft. The electric log does not indicate the presence of brown coal, and the data are insufficient for interpretation.

(x) TANJIL EAST 1135 (Plate 6).

The driller's log shows sandy clay to 25 ft. and coal

from 25 to 225 ft. The S.P. log shows a few features below 130 ft. and the resistivity curve has an irregular appearance below 20 feet. The evidence from this log shows that the variation in electrical properties of the brown coal is such that no consistent interpretation rules can be made.

(xi) TANJIL EAST 1136 (Plate 6).

The driller's log show sandy and grey clay to a depth of 22 ft. and coal from 22 to 195 ft. Electric logs were taken to a depth of 100 ft. The S.P. log shows features at 47, 90 and 96 feet for which no explanation has been found, and the resistivity log has an irregular appearance. No consistent interpretation rules can be made from the evidence of the electric logs.

5. CONCLUSIONS

The rock types encountered in the logging experiments are few, being mainly brown coal, with occasional bands or layers of clay, silty clay and fine sand.

Brown coal and fine sands or sandy clays show S.P. anomalies in a few places though not consistently. The S.P. anomalies cannot therefore be used to distinguish between brown coal and non-brown coal formations.

The resistivity ranges (as measured by the resistivity logs) of brown coal and clays overlap, due to the fact that the moisture content of brown coal ranges between 55 and 75 per cent and that of clays often exceeds 50 per cent.

Summarising, it may be said that it is not possible to make consistent interpretation rules or to distinguish clays and fine sands from brown coal on S.P. and resistivity logs in the Morwell brown coal area.

From the experiments, it appears that the boundary between brown coal, and clays and sands could not be unambiguously determined.

6. REFERENCE

Schlumberger Well Surveying Corporation, 1949 - Review of Schlumberger well logging and auxiliary methods, p. 34.

APPENDIX 1

DRILLER'S LOGS.

MARYVALE 1111

Location. Zone 7, Co-ordinates 1,318,552E/854,926N.

Particulars of Core	Thickness (feet)	Struck at (feet)
Clay filling	3	0
Mottled Clay	12	3
Mottled Silty Clay	3	15
Clayey Silt	7	18
Clayey Sand	3	25
Mottled Clay	2	28
Grey Clay	4	30
Brown Clayey Silt	2	34
COAL - wet	9	36
- brown	12	45
- woody	2	57
- brown	27	59
- woody	1	86
- brown	18	87
- wet & woody	3	105
- brown	16	108
- woody	3	124
- brown	6	127
- wet & woody	1	133
- brown	11	134
- woody	3	145
- brown	8	148
- soft	3	156
- brown	22	159
- wet & woody	3	181
- brown	5	184
- soft	1	189
Inferior Coal	4	190
Brown Clay	10	194
Brown Silty Clay	4	204
COAL - brown	18	208
Ligneous Clay	2	226
Brown Clay	2	228
Ligneous Clay	2	230
COAL - soft	5	232
- brown	3	237
- soft woody	2	240
Ligneous Clay	1	242
Brown Clay	5	243
COAL - brown	60	248
- woody	1	308
- brown	43	309
- soft woody	3	352
- brown	69	355
- woody	3	424
- brown	72	427
Sandy Clay	1	499
COAL - brown	39+	500

MARYVALE 1115

Location Zone 7, Co-ordinates 1,318,612E/852,819N.

Particulars of Core	Thickness (feet)	Struck at (feet)
Road Filling	2	0
Sandy Clay	1	2
Mottled Clay	6	3
Mottled Sandy Clay	7	9
Sand	4	16
Sandy Clay	13	20
Mottled Sandy Clay	2	33
Mottled Clay	5	35
Sandy Clay	2	40
Mottled Clay	2	42
Sandy Clay	2	44
Coarse Sand	4	46
Sandy Clay	6	50
Mottled Sandy Clay	1	56
Sandy Clay	11	57
Inferior Coal	1	68
Sandy Clay	6	69
Ligneous Clay	5	75
COAL- brown	12	80
- woody	17	92
- brown	34	109
- woody	17	143
- brown	120	160
- woody & damp	2	280
- brown	5	282
- woody & damp	2	287
- brown	27	289
Ligneous Clay	10	316
Inferior Coal	4	326
COAL - brown	42	330
- damp	2	372
- brown	16	374
Inferior Coal	9	390
Ligneous Clay	8	399
Grey Clay	5	407
Inferior Coal	8	412
Ligneous Clay	4	420
Brown Clay	3	424
Sandy Clay	2	427
Ligneous Clay	1	429
Brown Clay	6	430
Sandy Clay	7	436
Brown Clay	4	443
Inferior Coal	3	447
COAL - brown	48	450
- damp	8	498
- brown	5	506
- damp	9	511
- brown	2	520
- damp	2	522
- brown	165	524
Brown-Clay containing Coal	2	689
COAL - brown	29+	691

NARRACAN 1554

Location. Co-ordinates 1,301,162E/866,565N

Particulars of Core	Thickness (feet)	Struck at (feet)
Soil	1	0
Mottled Sandy Clay	40	1
Sand	5	41
COAL	169	46
Grey Clay	15	215
Ligneous Clay	5	230
COAL	12	235
Silty Clay	12	247
Ligneous Clay	3	259
COAL	4	262
Silty Clay	8	266
Inferior Coal	2	274
Silty Clay	3	276
Inferior Coal	1	279
Silty Clay	10	280
COAL	53	290
Grey Clay	17	343
Sand	6	360
Sandy Clay	46	366
COAL	2	412
Silty Clay	23	414
COAL	2	437
Silty Clay	18	439
Silt	20	457
Sand	9	477
Brown Clay	5	486
Sand	10	491
Grey Clay	12	501
Sand	5	513
Brown Clay	9	518
COAL	8	527
Grey Clay	6	535
COAL	3	541
Grey Clay	5	544
COAL	29	549
Inferior Coal	20	578
COAL	62	598
Inferior Coal	8	660
Silt	4	668
Inferior Coal	7	672
Grey Clay	22	679
Brown Clay containing Coal	23	701
Grey Clay	22	724
Sand	11	746
Brown Clay	4	757
Grey Clay	8	761
COAL	7	769
Grey Clay	8	776
COAL	78	784
Ligneous Silty Clay	2	862
Grey Clay	2	864
COAL	6	866
Inferior Coal	3	872
COAL	4	875
Brown Silty Clay	4	879
Grey Clay	12+	883

NARRACAN 1555.

Location. Co-ordinates 1,297,912E/863,055N.

Particulars of Core	Thickness (feet)	Struck at (feet)
Soil	1	0
Mottled Sandy Clay	45	1
COAL	111	46
Ligneous Clay	2	157
Brown Clay cont. coal	13	159
Grey Silty clay	17	172
Brown clay cont. coal	12	189
Ligneous Clay	3	201
COAL	5	204
Sandy Clay	7	209
Ligneous Clay	4	216
Brown Silty clay	15	220
COAL	55	235
Brown silty clay	62	290
Grey sandy clay	41	352
Brown clay	9	393
Grey sandy clay	7	402
Grey clay	35	409
Grey sandy clay	24	444
COAL	147	468
Ligneous clay	23	615
Sand	13	638
Ligneous clay	6	651
Grey clay	3	657
Brown sandy clay	22	660
COAL	96	682
Clay	14	778
Cemented sand	2+	792

NOTE: Coal not yet confirmed by analysis.

NARRACAN 1561

Location. Co-ordinates 1,303,586E/860,316N

Particulars of Core	Thickness (feet)	Struck at (feet)
Soil	2	0
Mottled Silty Clay	8	2
Grey Silt	2	10
Gravel	5	12
Grey Sandy Clay	2	17
Grey Silt & Sand	2	19
Inferior Coal	3	21
COAL - DRY	26	24
COAL - WET	80	50
COAL - BROWN	59	130
Brown Clay	17	189
Brown Silty Clay	43	206
Brown Clay & Coal	4	249
COAL - BROWN	2	253
Brown Clay	8	255
COAL - BROWN	1	263
Brown Clay & Coal	1	264
Brown Clay	7	265
Brown Clay & Coal	1	272
COAL - BROWN	3	273
Brown Clay & Coal	4	276
COAL - BROWN	8	280
Brown Clay	9	288
Brown Clay & Silt	5	297
Brown Clay	2	302
Grey Clay	2	304
Brown Sand, Silt & Clay	11	306
Fine Sand	5	317
COAL - BROWN	124	322
Brown Clay	3	446
Brown Silty Clay	2	449
COAL	51	451
Fine Sand	3	502
COAL	135	505
Brown Clay	2	640
Grey Clay	5	642
Ligneous Clay	5	647
Grey Clay	4	652
Coarse Sand	2	656
Grey Clay	2	658
COAL	1	660
Ligneous Clay	2	661
Grey Clay	15	663
Brown Silty Clay	12	678
COAL	165	690
Brown Silty Clay	2+	855

NARRACAN 819

Location. Co-ordinates 1,303,686E/862,604N.

Particulars of Core	Thickness (feet)	Struck at (feet)
Soil	1	0
Mottled sandy clay	40	1
Coal	134	41
Clay	28	175
Coal	1	203
Ligneous clay	14	204
Coal	1	218
Grey clay	41	219
Sandy clay	27	260
Coal	102	287
Brown silty clay	4	389
Grey silty clay	16	393
Brown silty clay	25	409
Clayey sand		434

End of electrical logging at 431',
bore continues to 906'.

TANJIL EAST 1109.

Particulars of Core	Thickness (feet)	Struck at (feet)
Soil	1	0
Mottled Sandy Clay	21	1
Ligneous Clay	.2	22
Coal	44	24
Ligneous Silty Clay	11	68
Brown Clay	4+	79

TANJIL EAST 1110.

Particulars of Core	Thickness (feet)	Struck at (feet)
Soil	1	0
Mottled Sandy Clay	18	1
Coal	56	19
Brown Clay	26	75
Grey Clay	5+	101

TANJIL EAST 1111.

Particulars of Core	Thickness (feet)	Struck at (feet)
Soil	1	0
Mottled Sandy Clay	16	1
Inferior Coal	35	17
Coal	66	52
Silty Clay	17	118
Coal	22	135
Grey Clay	13	157
Coal	5	170
Grey Clay	7	175
Coal	6	182
Grey Clay	12+	188

TANJIL EAST 1135

Particulars of Core	Thickness (feet)	Struck at (feet)
Soil	1	0
Sandy Clay	24	1
Coal	200+	25

TANJIL EAST 1136.

Particulars of Core	Thickness (feet)	Struck at (feet)
Soil	2	0
Sandy Clay	6	2
Grey Clay	14	8
Coal - hard	173	22
- brown	+	195

APPENDIX 2.

CHEMICAL ANALYSES OF DRILL HOLE SAMPLES AND CORES.

STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1111 Maryvale

	Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis)					Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis)	
				C	H	O + N by diff.	S	Ash		Volatile Matter	Fixed Carbon
BL	36–45	60.2	8.6								
BL	45–50	62.4	2.6								
BL	50–60	67.2	2.0								
BL	60–70	67.4	1.9	63.8	4.6	27.4	0.5	3.7	10,700	52.7	43.6
BL	70–80	67.4	1.9								
BR	80–90	66.6	2.7								
BL	90–100	67.2	2.5								
BL	100–110	66.7	2.7								
BL	110–120	66.9	2.0	65.6	5.0	26.9	0.3	2.2	11,070	52.4	45.4
BL	120–130	66.9	2.2								
BL	130–140	67.3	2.2								
BL	140–150	66.8	2.2								
BL	150–160	66.3	2.2								
BL	160–170	66.1	2.6	65.8	4.8	26.2	0.4	2.8	10,970	51.4	45.8
BL	170–180	65.7	2.8								
BL	180–190	67.2	4.2								
	190–192	58.6	28.7		Inferior Coal						
	192–194	61.9	23.8		"		"				
	B/8–B/8										
BL	208–220	64.8	4.4								
BL	220–226	64.2	8.3								
	226–227	53.8	40.7		Lignoous Clay						
	B/8–B/8										
	230–232	53.2	41.3		Lignoous Clay						
	232–242	62.8	7.8								
	B/8–B/8										
	248–260	63.2	4.7								
	260–270	62.1	3.7								
	270–280	60.9	2.6	66.6	4.8	25.1	0.4	3.1	11,080	51.4	45.5
	280–290	61.0	2.8								
	290–300	62.9	2.4								
	300–310	62.1	2.5								
	310–320	61.6	2.5								
	320–330	62.4	2.6	66.9	4.7	25.6	0.3	2.5	11,040	50.7	46.8
	330–340	60.6	2.5								
BR	340–350	60.3	3.0								
BL	350–360	62.5	2.7								
BL	360–370	63.6	2.5								
BR	370–380	59.8	2.9	67.3	4.7	25.3	0.3	2.4	11,300	50.4	47.2
BR	380–390	60.3	2.5								
BR	390–400	61.8	2.3								
BL	400–410	62.5	2.7								
BR	410–420	59.7	2.9								
BL	420–430	63.5	2.2	67.7	4.6	24.9	0.3	2.5	11,260	49.3	48.2
BL	430–440	61.1	3.0								
BL	440–450	60.4	3.2								
BL	450–460	61.6	3.4								
BL	460–470	59.1	3.3								
BL	470–480	59.6	4.1	67.0	4.6	23.5	0.8	4.1	11,180	48.1	47.8
BL	480–490	58.4	3.6								
BL	490–499	58.6	7.1								
	B/8–B/8										

Nitrogen % (Dry basis) From aggregate sample:—

Remarks:—

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1115 MARYVALE

	Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
	B/B.										
	60-69	49.1	14.8			Inferior Coal					
	B/B-B/B.										
	70-80	54.9	3.4			Lignecus Clay					
	80-90	64.1	1.7								
	90-100	63.6	2.2								
	100-110	63.4	1.6	65.2	4.6	27.8	0.4	2.0	10,660	52.3	45.7
	110-120	62.9	2.9								
	120-130	63.4	1.8								
	130-140	63.0	2.3								
	140-150	63.2	1.8								
	150-160	63.8	1.8	65.6	4.6	27.6	0.3	1.9	10,790	52.1	46.0
	160-170	64.6	1.6								
	170-180	63.4	1.4								
	180-190	63.5	1.3								
	190-200	63.8	1.3								
	200-210	64.9	1.5	66.1	4.6	27.5	0.2	1.6	10,730	50.7	47.7
	210-220	63.8	1.9								
	220-230	64.5	1.7								
	230-240	65.3	1.6								
	240-250	65.2	1.4								
	250-260	65.4	1.3	66.6	4.6	27.1	0.3	1.4	10,900	50.3	48.3
BL	260-270	64.8	1.4								
BL	270-280	64.7	1.5								
BL	280-290	65.9	1.5								
BL	290-300	63.8	1.8								
BL	300-310	56.3	1.8	65.7	4.7	26.8	0.2	2.6	10,860	50.6	46.8
BL	310-316	64.2	6.8								
	B/8-B/8.										
BL	330-340	63.9	2.6								
BL	340-350	64.0	2.2								
BL	350-360	61.9	2.2	66.4	4.9	26.1	0.3	2.3	11,020	52.2	45.5
BL	360-370	62.2	2.0								
BL	370-380	62.0	2.3								
BR	380-390	62.1	2.7								
	390-399	58.8	16.0				Inferior coal				
	B/8-B/8.										
	416-420	61.2	11.5				Inferior coal				
	B/8-B/8.										
	447-450	57.9	22.4				Inferior coal				
BR	450-455	58.3	5.2								
BL	455-460	58.7	4.6								
BL	460-470	57.8	2.9	66.7	4.8	25.3	0.3	2.9	11,110	51.3	45.8
BL	470-480	59.0	2.3								
BL	480-490	58.4	1.9								
BL	490-500	59.0	2.1								
BL	500-510	59.0	1.7								
BL	510-520	57.9	1.7								
BL	520-530	59.8	1.6	67.5	4.8	25.8	0.2	1.7	11,200	50.7	47.6
BL	530-540	58.3	1.8								
BL	540-550	58.9	1.8								

/Contd.

Nitrogen % (Dry basis) From aggregate sample:—

Remarks:—

Symbols on left apply to colour of dried coal -
BL = Black
BR = Brown

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1115 MARYVALE

	Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
BL	550–560	59.7	1.6								
BL	560–570	59.9	1.5								
	570–580	57.8	1.7	67.6	4.8	25.8	0.2	1.6	11,180	50.1	48.3
	580–590	58.7	1.7								
	590–600	58.7	1.5								
	600–610	56.9	1.6								
	610–620	56.9	1.7								
	620–630	57.6	1.7								
	630–640	57.2	2.0	68.0	4.9	25.1	0.2	1.8	11,410	50.2	48.0
	640–650	57.4	2.1								
	650–660	58.9	1.8								
	B/B.										

Nitrogen ..... % (Dry basis) From aggregate sample:—

Remarks:—

Symbols on left apply to colour of dried coal -
BL - Black
BR - Brown

SENIOR RESEARCH OFFICER

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1554 Barrcom

Depth in Feet N/S.	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
46-55	69.5	1.5								
55-65	69.4	1.2								
65-75	69.5	1.0	66.7	4.6	27.2	0.2	1.3	11,130	50.6	48.1
75-86	69.3	1.3								
86-96	69.1	1.3								
96-107	66.1	2.1								
107-117	68.4	2.6								
117-128	68.2	2.7	66.2	4.6	26.8	0.2	2.2	10,850	51.0	46.8
128-138	65.7	1.7								
138-148	66.9	1.5								
148-158	64.3	1.6								
158-169	64.0	1.8								
169-179	64.6	1.7	66.6	4.7	26.5	0.4	1.8	11,090	52.2	46.0
179-189	65.1	1.6								
189-199	65.2	2.0								
199-210	66.5	2.5								
210-215	66.5	4.0								
N/S-N/S										
235-247	65.6	5.3								
N/S-N/S										
262-266	65.7	5.1								
N/S-N/S										
274-276	59.6	22.8	Inferior Coal							
N/S-N/S										
279-280	64.0	10.9	Inferior Coal							
N/S-N/S										
280-292	62.2	5.2								
292-302	60.6	1.8								
302-312	58.5	1.8								
312-322	58.5	1.6	67.0	4.6	26.3	0.4	1.7	11,200	52.2	46.1
322-333	58.5	1.5								
333-343	59.5	1.6								
N/S-N/S										
531-535	53.5	3.2								
N/S-N/S										
541-544	52.0	3.0								
N/S-N/S										
549-557	52.6	3.2								
557-567	51.7	4.2	65.9	4.5	26.1	0.3	3.2	10,960	50.6	46.2
567-578	51.5	3.8								
578-588	50.6	12.5	Inferior Coal							
588-598	50.0	12.5	"							
598-608	53.3	3.0								
608-619	52.9	3.1								
619-629	53.6	2.9	66.6	4.6	25.4	0.3	3.1	11,190	50.0	46.9
629-639	53.4	2.9								
639-649	54.8	3.5								
649-660	54.8	3.4								
660-668	49.9	24.4	Inferior Coal							
N/S-N/S										
672-679	49.0	25.8	Inferior Coal							
N/S-N/S										

Nitrogen % (Dry basis) From aggregate sample:-

Remarks:-

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY -- RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1554 Harrocca

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis)					Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis)	
			C	H	O + N by diff.	S	Ash		Volatile Matter	Fixed Carbon
795–803	54.2	3.9								
803–813	53.8	3.9	67.1	4.6	23.8	0.3	4.2	11,220	47.3	48.5
813–823	54.3	4.9								
823–833	53.7	6.0								
833–843	52.6	5.0								
843–853	52.1	4.0	67.8	4.7	23.6	0.3	3.6	11,370	47.6	48.8
853–863	52.2	3.9								
863–873										
873–883	48.9	6.9								

Nitrogen % (Dry basis) From aggregate sample:--

Remarks:—

Senior Research Officer

1/11/54

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STATE EL. TRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

See separate report for analysis of ash.

ANALYSIS OF BORE No. 1555 Barraca

	Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis)					Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis)	
				C	H	O + N by diff.	S	Ash		Volatile Matter	Fixed Carbon
BR	52–55	66.2	1.3								
BL	55–65	68.1	1.1								
BL	65–75	68.2	1.1	66.6	4.8	27.5	0.2	0.9	11,160	51.7	47.4
BL	75–85	68.1	0.8								
M	85–95	68.9	1.4								
M	95–106	68.8	1.2								
BR	106–116	66.3	1.2								
BR	116–126	66.7	1.3								
BL	126–136	69.4	2.3	66.2	5.1	25.8	0.4	2.5	11,250	53.6	43.9
BL	136–147	69.4	2.0								
BL	147–157	68.1	4.3								
	B/S–B/S										
BR	204–209	62.6	2.6								
	B/S–B/S										
BR	235–240	62.2	2.5								
BL	240–250	62.5	2.5								
BR	250–260	60.6	1.5	66.5	4.8	26.4	0.5	1.8	11,080	52.5	45.7
BL	260–270	60.8	1.8								
BR	270–280	60.8	1.6								
BR	280–290	61.0	1.8								
	B/S–B/S										
BL	468–475	54.4	4.6								
BL	475–485	54.6	4.1								
BL	485–496	54.1	4.9	65.6	4.7	26.2	0.3	3.2	10,980	52.0	44.8
BR	496–506	54.2	2.8								
BR	506–516	54.3	2.6								
BL	516–526	54.7	2.8								
BL	526–537	54.4	2.8								
BR	537–547	54.8	2.3	66.7	4.7	25.8	0.3	2.5	11,100	51.9	45.6
BR	547–557	55.4	2.3								
BR	557–567	57.0	2.2								
BR	567–578	56.9	2.2								
BR	578–588	53.8	2.9								
BL	588–598	53.4	2.9	66.9	4.9	24.5	0.3	3.4	11,220	51.8	44.8
BL	598–608	54.4	4.4								
BL	608–615	54.7	5.3								
	B/S–B/S										
BL	682–692	55.8	6.2								
BL	692–701	55.1	5.8								
BL	701–712	–	7.2	64.1	4.5	22.2	0.9	8.3	10,670	47.1	44.6
BL	712–722	56.2	9.1								
BL	722–732	56.7	9.4 *								
BL	732–742	56.7	7.7								
BL	742–753	56.6	8.3								
BL	753–763	53.5	7.9								
BL	763–773	53.4	7.2	64.7	4.5	22.5	0.5	7.8	10,810	46.0	46.2
BL	773–778	53.2	7.8								
	B/S–B/S										

Symbols on left apply to colour of dried coal –
BL = Black
BR = Brown
M = Mixture – black & brown

Clay Samples

Depth in ft.	% Moisture	Drillers Description
127–132	51.1	–
132–142	58.4	–
142–169	50.0	–
169–201	42.9	Clay containing soil

Nitrogen ____ % (Dry basis) From aggregate sample:—

Remarks:—

Depth in ft.	% Moisture	Drillers Description
201–209	38.3	Lignitic Clay
209–216	33.7	Clay and sand
216–220	34.0	Lignitic clay
220–230	24.6	Brown silty clay
220–235	29.2	Silty clay
290–352	19.2	Brown silty clay
393–402	21.2	Brown clay
402–468	18.8	Grey silty clay

* The sample contained marcasite.

SENIOR RESEARCH OFFICER 25/3/55

STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1561 HAZELCAN

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
33–36	73.4	1.6								
36–46	73.3	1.7								
46–56	70.3	1.7								
56–66	70.9	1.5	66.7	4.6	27.3	0.2	1.2	10,950	50.3	48.5
66–76	69.0	1.5								
76–86	69.1	1.2								
86–97	69.1	1.6								
97–107	68.8	1.4								
107–117	68.9	1.5	66.9	4.7	26.6	0.2	1.6	11,130	50.8	47.6
117–127	70.0	1.7								
127–137	69.8	1.6								
137–148	70.0	1.7								
148–158	65.3	1.6								
158–168	65.4	1.5	66.8	4.8	26.2	0.3	1.9	11,140	51.4	46.7
168–178	66.4	2.3								
178–188	66.1	1.8								
188–189			No sample taken							
189–190 S/S–M/S.	67.4	6.7								
271–281 M/S–M/S.	60.9	22.6	Inferior coal							
281–711			Exploratory drilling – no samples taken							
711–721	56.2	3.2								
721–731	56.3	3.1								
731–741	56.0	3.1	68.6	4.8	23.5	0.3	2.8	11,470	47.8	49.4
741–752	58.4	3.0								
752–762	57.9	3.0								
762–772	58.3	3.2								
772–783	58.1	3.0								
783–793	57.3	3.1	68.9	4.7	23.3	0.3	2.8	11,650	46.3	50.9
793–803	57.4	3.3								
803–813	56.9	3.0								
813–823	57.6	2.9								
823–833	55.2	4.6	68.8	4.8	22.2	0.4	3.8	11,530	46.5	49.7
833–844 M/B.	55.5	4.6								

Nitrogen % (Dry basis) From aggregate sample:—

Remarks:—

SENIOR RESEARCH OFFICER

5/10/55 G39-61

STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 819 HARRACAN

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N % by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
45–46	67.5	1.8								
46–47	66.4	1.8								
47–48	65.8	2.0								
48–49	66.5	2.1								
49–50	66.9	1.8								
50–51	69.6	1.5	66.9	1.8						
51–52	70.5	1.7								
52–53	69.7	1.9								
53–54	68.4	1.5								
54–55	67.6	1.9								
55–56	68.3	1.4								
56–57	68.4	1.6								
57–58	67.7	1.6			Combined sample 45'–75'					
58–59	67.8	1.9	65.8	4.5	27.8	0.2	1.7	10,920	51.2	47.1
59–60	68.6	1.7								
60–61	68.6	1.5								
61–62	69.0	2.4	68.9	1.9						
62–63	68.8	2.0								
63–64	70.2	2.5								
64–65	71.4	2.3								
65–66	68.1	1.1								
66–67	67.7	1.2								
67–68	68.0	1.2								
68–69	68.8	1.2								
69–70	68.8	1.1	68.6	1.2						
70–71	69.5	1.2								
71–72	69.8	1.3								
72–73	69.1	1.2								
73–74	67.4	1.2								
74–75	68.4	1.2								
75–76	68.6	1.1								
76–77	68.6	1.3								
77–78	68.5	1.7								
78–79	67.8	1.4	68.3	1.3						
79–80	67.8	1.5			Combined sample 75'–95'					
80–81	68.0	1.4								
81–82	69.4	1.3	66.6	4.6	27.4	0.2	1.2	11,020	51.3	47.5
82–83	68.3	1.3								
83–84	67.9	1.2								
84–85	68.1	1.3								
85–86	69.2	1.3								
86–87	68.8	1.1								
87–88	69.4	1.2								
88–89	68.8	1.4								
89–90	69.8	1.8	69.5	1.3						
90–91	69.2	1.1								
91–92	72.5	0.9			Woody coal					

/Contd.

Nitrogen % (Dry basis) From aggregate sample:-

Remarks:—

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

2.

ANALYSIS OF BORE No. 819 HARRAGAN

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
92–93	65.6	1.2								
93–94	68.5	1.3								
94–95	71.8	1.4				Woody coal				
* 95–96	63.7	1.5								
96–97	67.2	1.2								
97–98	68.0	1.2								
98–99	68.4	1.2								
99–100	68.3	1.2								
100–101	68.1	1.2	68.0	1.2						
101–102	68.0	1.2								
102–103	67.7	1.2								
103–104	67.8	1.2								
104–105	68.7	1.3								
105–106	69.2	1.3								
106–107	67.9	1.2								
107–108	68.0	1.2								
108–109	68.0	1.2								
109–110	68.0	1.0								
110–111	69.6	1.1	68.7	1.1						
111–112	68.0	1.1								
112–113	67.3	1.1								
113–114	71.9	0.9								
114–115	68.7	1.1								
115–116	68.3	1.0				Combined sample 95'-141'				
116–117	68.6	1.0	66.6	4.7	27.3	0.3	1.1	11,050	51.0	47.9
117–118	67.4	1.0								
118–119	68.6	0.8								
119–120	70.0	1.0	68.6	1.1						
120–121	67.1	1.1								
121–122	66.6	1.2								
122–123	66.8	1.2								
123–124	66.2	1.4								
124–125	68.0	1.5								
125–126	67.0	1.3								
126–127	69.4	1.5								
127–128	67.5	1.1								
128–129	67.0	1.3								
129–130	66.0	1.4	68.6	1.3						
130–131	65.7	1.4								
131–132	67.3	1.4								
132–133	68.9	1.2								
133–134	68.0	1.4								
134–135	71.0	1.0								
135–136	68.2	1.1								
136–137	69.8	1.0								
137–138	69.4	1.0								
138–139	67.6	1.1	68.1	1.1						

Nitrogen % (Dry basis) From aggregate sample:-

/contd.

Remarks:—

* Not included in moisture average as sample had dried out.

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STATE ELECTRICITY COMMISSION OF VICTORIA

3.

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 819 HARRAGAN

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
139-140	67.0	1.2								
140-141	67.0	1.3								
141-144			Coal not sampled							
144-145	65.6	1.6								
145-146	67.0	1.5								
146-147	67.7	1.4								
147-148	68.8	1.4	67.6	1.2						
148-149	68.0	1.1								
149-150	68.1	1.1			Combined sample			144'-175'		
150-151	68.2	1.1	66.8	4.9	26.0	0.3	2.0	11,220	53.0	45.0
151-152	66.3	1.1								
152-153	67.4	1.2								
153-154	67.6	1.1								
154-155	66.8	1.3								
155-156	68.2	1.3								
156-157	68.8	1.4								
157-158	69.8	1.4								
158-159	69.7	1.4								
159-160	69.0	1.4	67.6	1.5						
160-161	67.0	1.5								
161-162	66.3	1.5								
162-163	66.6	1.5								
163-164	65.7	1.6								
164-165	64.9	1.7								
165-166	68.0	1.8								
166-167	69.5	2.4								
167-168	68.7	2.6								
168-169	67.0	2.2								
169-170	68.2	2.4	67.7	3.4						
170-171	68.3	2.5								
171-172	66.9	2.5								
172-173	67.0	3.2								
173-174	66.6	5.2								
174-175	66.8	9.0								
R/S-N/S.										
203-204	64.0	8.6								
R/S-N/S.										
218-219	67.4	9.1								
R/S-N/S.										
287-288	62.2	2.4								
288-289	62.0	2.2								
289-290	60.2	9.3								
290-291	60.8	3.1								
291-292	61.6	2.3	61.3	2.9						
292-293	61.0	2.1								
293-294	63.9	1.6								
294-295	60.6	1.9								

/contd.

Nitrogen ... % (Dry basis) From aggregate sample:—

Remarks:—

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 819 NARRACAN

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
			Average Moisture %	10' Value Ash C.B. %						
295–296	60.4	1.9								
296–297	60.4	2.1								
297–298	60.7	2.2								
298–299	64.4	1.7								
299–300	60.0	2.0								
300–301	62.1	1.7	61.0	1.9						
301–302	59.9	1.9								
302–303	60.0	1.8								
303–304	60.0	1.8								
304–305	61.6	1.8			Combined sample			287' – 337'		
305–306	61.4	1.8	66.6	4.6	26.1	0.5	2.2	11,180	51.8	46.0
306–307	60.3	1.8								
307–308	62.4	1.8								
308–309	60.5	2.1								
309–310	68.0	5.9								
310–311	64.0	4.5								
311–312	60.2	1.7	61.9	2.7						
312–313	60.8	1.8								
313–314	60.6	1.9								
314–315	60.6	1.9								
315–316	61.4	2.4								
316–317	60.7	2.1								
317–318	60.0	2.1								
318–319	60.3	2.2								
319–320	59.5	6.6								
320–321	60.6	2.5								
321–322	60.4	2.0								
322–323	60.4	2.0								
323–324	60.3	2.0	60.2	2.4						
324–325	60.3	2.0								
325–326	60.6	2.6								
326–327	60.2	2.1								
327–328	60.8	2.1								
328–329	60.2	2.0								
329–330	60.2	1.9								
330–331	60.5	2.2								
331–332	60.2	2.1	59.5	1.8						
332–333	59.2	1.7								
333–334	58.9	1.8								
334–335	58.6	1.6								
335–336	58.2	1.6								
336–337	58.3	1.5								
337–338	58.6	1.9								
338–339	58.4	1.9								
339–340	58.0	2.3								
340–341	59.0	1.9								
341–342	59.0	1.8	59.2	1.9						
342–343	59.2	1.9								

/contd.

Nitrogen %. (Dry basis) From aggregate sample:-

Remarks:-

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

5.

ANALYSIS OF BORE No. 819 MARRAGAH

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
			Average Moisture %	10' Volatile Ash C.V.						
343-344	58.0	1.8	Combined sample 337'-373'							
344-345	57.9	1.8	66.9	4.9	24.7	0.5	3.0	11,410	53.0	44.0
345-346	58.4	1.7								
346-347	58.2	1.7								
347-348	58.3	1.6								
348-349	58.8	1.8								
349-350	59.4	2.1	59.8	2.0						
350-351	60.6	2.4								
351-352	60.3	2.2								
352-363	58.4	1.8								
363-373	57.2	6.6								
B/S-N/S.										
517-527	54.6	3.4								
527-537	53.7	3.1								
537-547	54.2	4.5	66.6	4.6	25.3	0.3	3.2	11,000	50.4	46.4
547-557	54.2	3.5								
557-568	55.0	2.7								
568-578	54.2	2.5								
578-588	54.4	2.6								
588-598	54.6	2.7	67.2	4.6	25.3	0.3	2.6	11,250	49.4	48.0
598-608	55.6	2.4								
608-619	55.1	2.8								
619-629	54.6	2.5								
629-639	55.0	2.6								
639-650	53.5	2.7	67.8	4.7	24.9	0.3	2.3	11,290	49.9	47.8
650-657	55.3	2.7								
B/S-N/S.										
773-783	48.3	2.6								
783-793	48.2	2.6	68.6	4.6	23.8	0.3	2.7	11,300	50.6	46.7
793-800	48.1	2.7								
800-865			Coal not sampled							
865-875	50.4	9.2								
875-879	51.8	6.0								
B/B.										
879-880	20.5									
880-881	16.0		CLAY SAMPLES							
881-882	20.4									
882-883	18.2									
883-884	16.3									
884-885	16.2									
885-886	16.6									
886-887	18.5									
887-888	16.0									
888-889	16.5									

/Contd.

Nitrogen % (Dry basis) From aggregate sample:

Remarks:-

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY -- RICHMOND

BROWN COAL INVESTIGATION

6.

ANALYSIS OF BORE No. 819 HARRACAN

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
894–895	18.1									
895–896	23.6									
896–897	21.0									
897–898	19.6									

Nitrogen (Dry basis) From aggregate sample::

Remarks:--

Saraswanath
SENIOR RESEARCH OFFICER

24/5/57

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RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1109 YARRA EAST

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis)					Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis)	
			C	H	O + N by diff.	S	Ash		Volatile Matter	Fixed Carbon
24-34	-	10.0								
34-45	-	10.3	Inferior Coal							
45-55	53.5	7.6								
55-68	54.0	8.5								
R/S-R/B										

No further tests required

Nitrogen ... % (Dry basis) From aggregate sample:- -

Remarks:—

SENIOR RESEARCH OFFICER

23/5/35

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1110 Tanjil East

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis)					Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis)	
			C	H	O + N by diff.	S	Ash		Volatile Matter	Fixed Carbon
23-33	49.8	3.7								
33-44	49.4	4.1								
44-54	52.3	3.8	67.7	4.9	22.9	0.4	4.1	11,420	47.7	48.2
54-65	51.8	3.6								
65-75	49.6	6.2								
E/S-E/B.										

Nitrogen % (Dry basis) From aggregate sample:—

Remarks:—

(Sgd.) G. Baragwanath (2/6/55

SENIOR RESEARCH OFFICER

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1111 Yanjil East

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
23-33	44.0	24.1			Inferior Coal					
33-43	45.3	24.7			"	"				
43-53	44.4	22.0			"	"				
53-65	52.4	5.4								
65-75	54.6	7.7								
75-86	55.2	5.5	66.6	5.0	21.4	0.7	6.3	11,400	47.9	45.8
86-96	54.4	6.0								
96-106	53.2	8.8								
88/88										
135-145	51.6	14.6			Inferior Coal					
145-157	52.2	10.6			"	"				
88/88										

Nitrogen % (Dry basis) From aggregate sample:--

Remarks:--

SENIOR CHEMIST'S OFFICE

G39-61

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STATE ELECTRICITY COMMISSION OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1135 TARWIL EAST

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
25–30	52.7	4.6								
30–40	50.5	5.8								
40–50	52.5	5.5	65.9	4.6	23.4	0.6	5.5	11,050	49.1	45.4
50–60	52.3	5.8								
60–70	52.2	3.2								
70–80	50.4	3.2								
80–90	50.2	3.6								
90–100	51.2	4.1	67.7	4.8	23.6	0.4	3.5	11,360	49.4	47.1
100–110	51.9	3.7								
110–120	52.0	3.2								
120–130	51.3	3.4								
130–140	51.8	3.8								
140–150	52.1	6.3	66.5	4.8	22.5	0.9	5.3	11,300	48.9	45.8
150–160	52.1	6.3								
160–170	51.9	6.2								
170–180	51.5	3.3								
180–190	51.3	3.6								
190–200	53.4	4.1								
200–210	53.6	3.9	66.7	4.6	23.5	0.5	4.7	11,100	47.7	47.6
210–220	50.0	6.0								
220–225	52.3	7.2								
E/B.										

Nitrogen (Dry basis) From aggregate sample: -

Remarks:

SENIOR RESEARCH OFFICER

5/10/55 G39-61

STATE ELECTRICITY COMMIS .ON OF VICTORIA

RESEARCH DEPARTMENT

FUEL RESEARCH LABORATORY — RICHMOND

BROWN COAL INVESTIGATION

ANALYSIS OF BORE No. 1136 TANJIL EAST

Depth in Feet	Moisture % (As recd.)	Ash % (Dry basis)	Ultimate Analysis % (Dry basis) C	H	O + N by diff.	S	Ash	Calorific Value (Gross dry) B.Th.U./lb.	Proximate Analysis % (Dry basis) Volatile Matter	Fixed Carbon
22–30	50.0	9.9								
30–40	49.4	7.2								
* 40–50	49.8	8.0	64.3	4.3	24.0	0.9	6.5	10,550	47.4	46.1
50–60	48.9	6.2								
60–70	49.3	5.8								
70–80	51.6	10.2				Inferior coal				
80–90	52.0	7.2								
90–100	52.2	6.1								
100–110	51.5	15.0				Inferior coal				
110–120	48.0	17.0				"		"		
120–130	49.0	14.5				"		"		
130–140	45.3	20.6				"		"		
140–150	48.8	7.4								
150–160	50.3	4.2								
160–170	50.7	4.3								
170–180	50.3	5.3	67.2	4.9	22.6	0.7	4.6	11,360	50.5	44.9
180–190	50.9	5.0								
190–195 E/B.	49.0	3.2								

* This sample was too small for correct combining

Nitrogen % (Dry basis) From aggregate sample:--

Remarks:

Penetration (hardness) test in mm. at 60'–70' = 3.2
100'–110' = 3.9
140'–150' = 4.4
180'–190' = 3.3

SENIOR RESEARCH OFFICER

5/11/55

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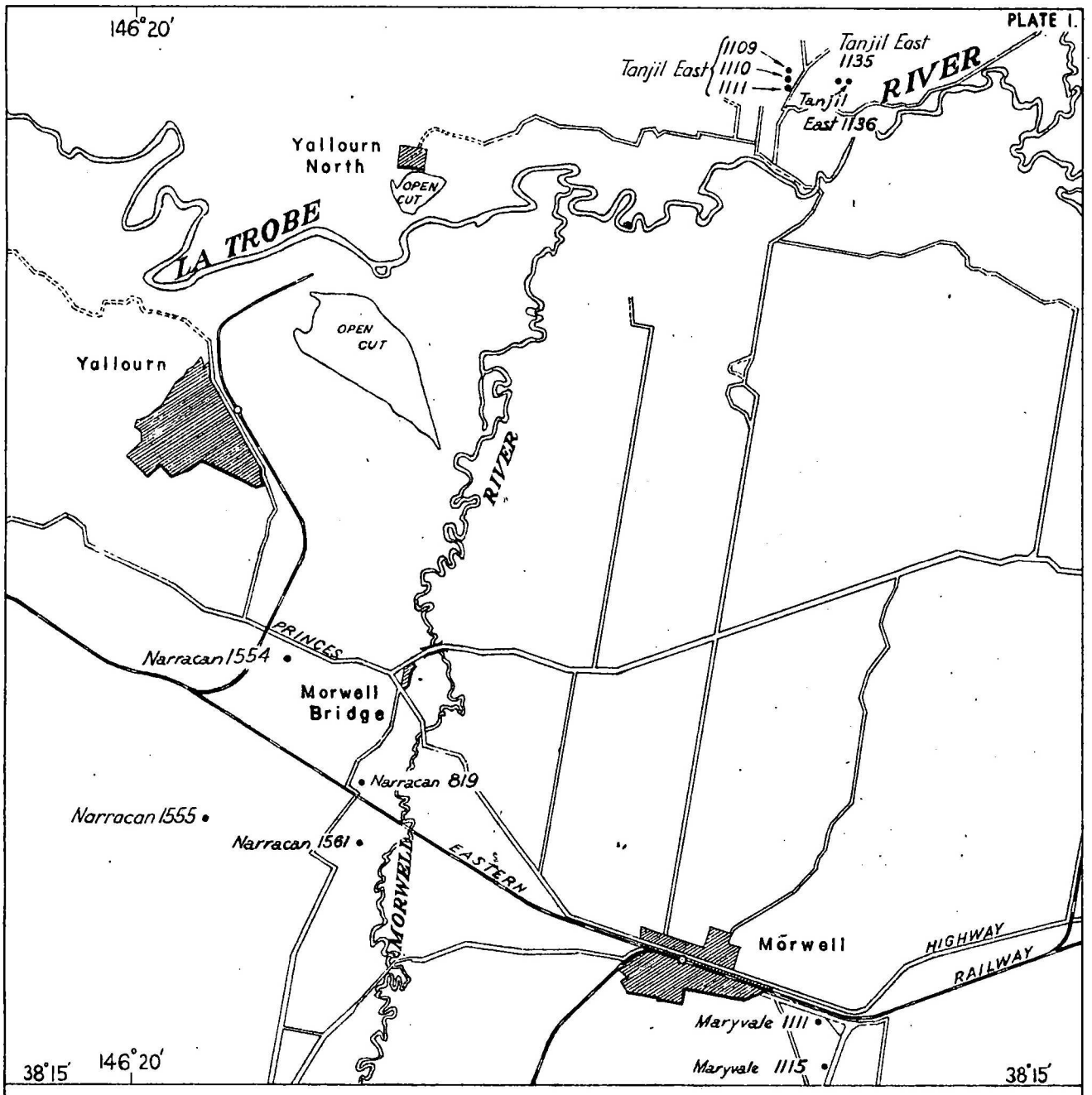
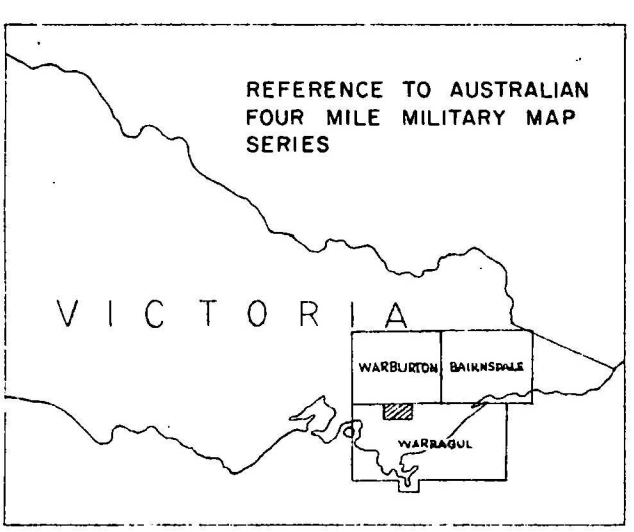
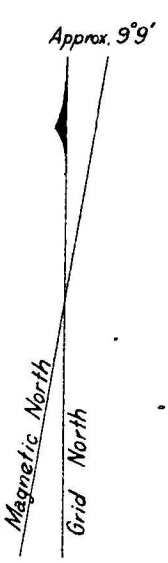
PLATE I.







SCALE IN MILES

1 0 1 2 3

ELECTRIC LOGGING TESTS AT MORWELL, VICTORIA

LOCALITY MAP

G39-46

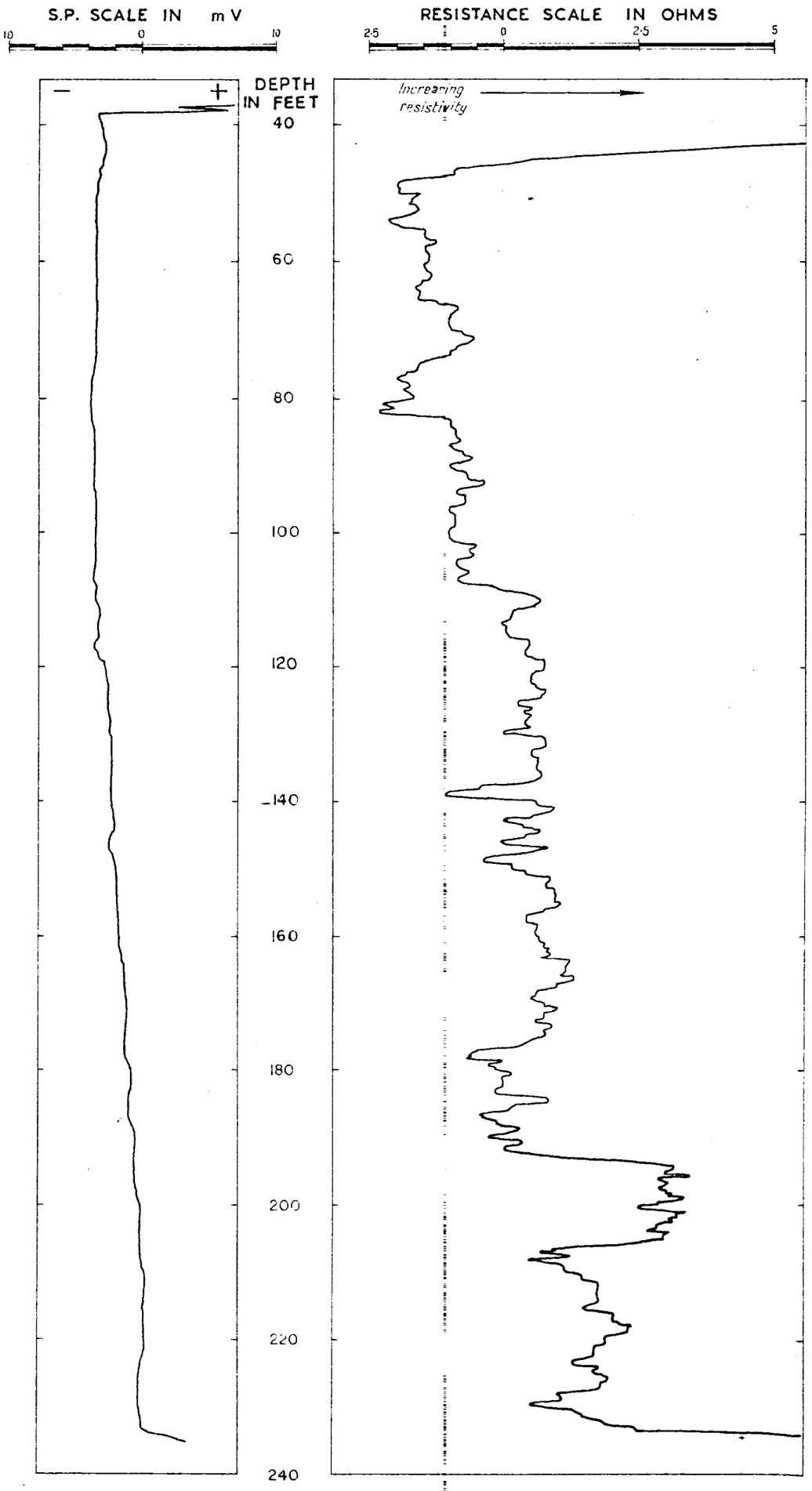
Geophysical section, Bureau of Mineral Resources, Geology and Geophysics.

ELECTRICAL LOGGING TESTS, MORWELL, VICTORIA

S.P. AND SINGLE-ELECTRODE RESISTANCE LOGS

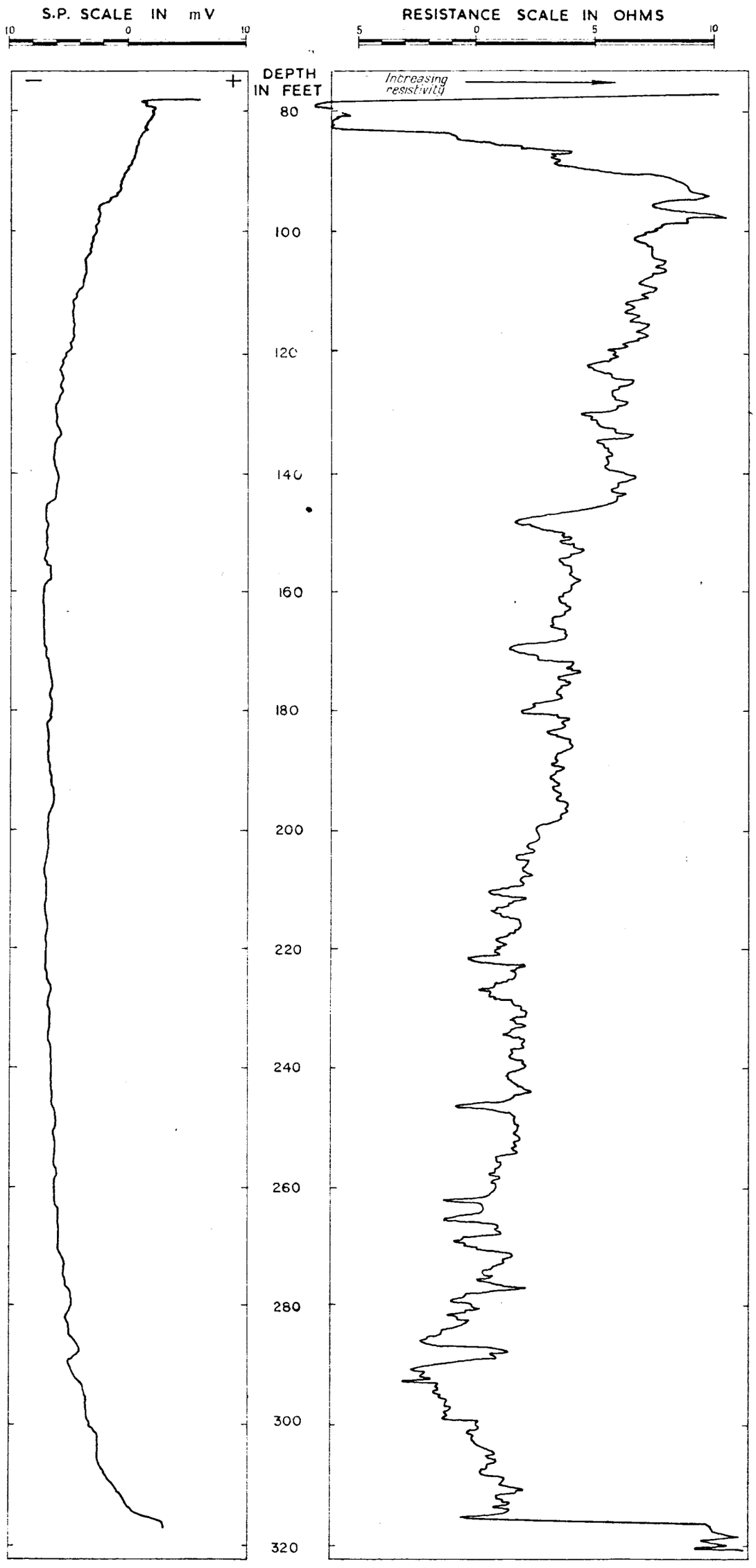
MARYVALE 1,111

30-11-54. BIT DIAMETER 6″



MARYVALE 1,115

30-11-54 BIT DIAMETER 6″

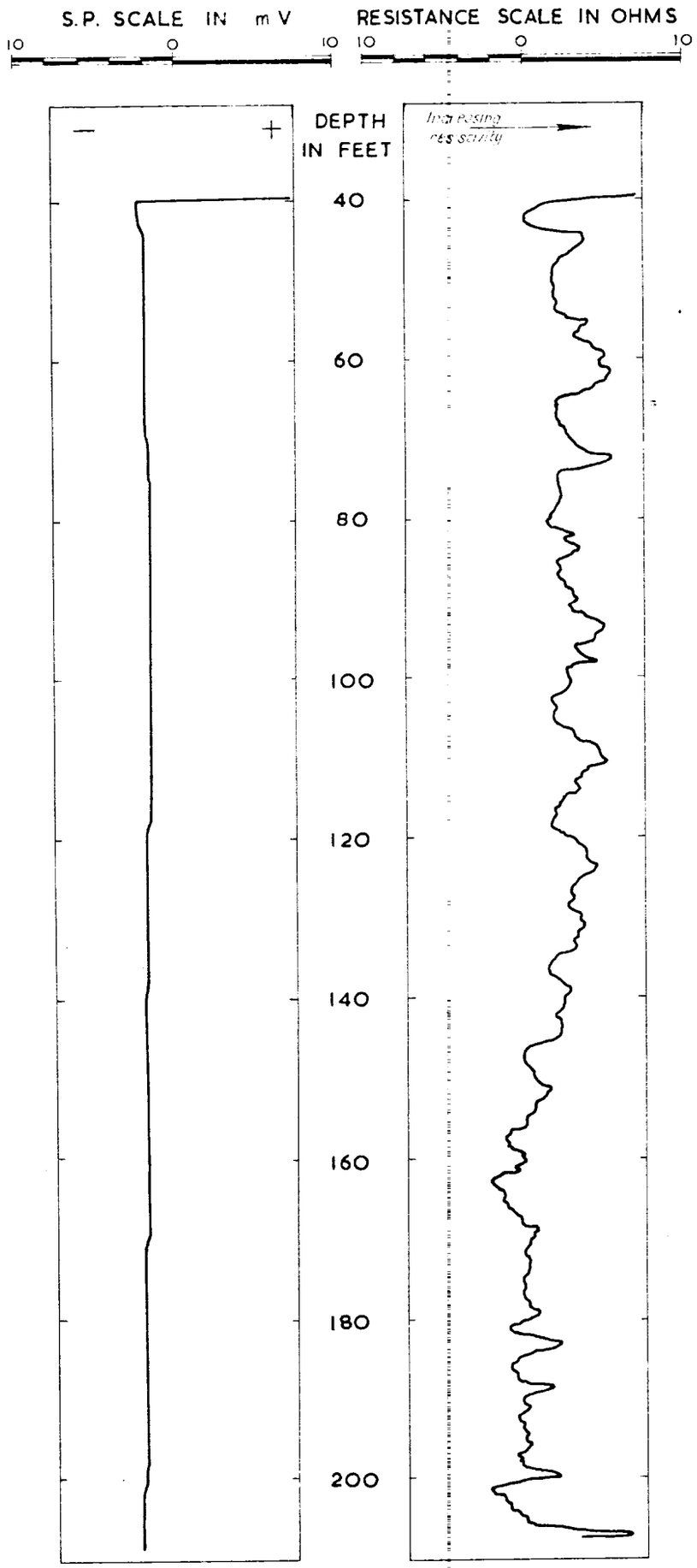


ELECTRICAL LOGGING TESTS, MORWELL, VICTORIA

S.P. AND SINGLE-ELECTRODE RESISTANCE LOGS

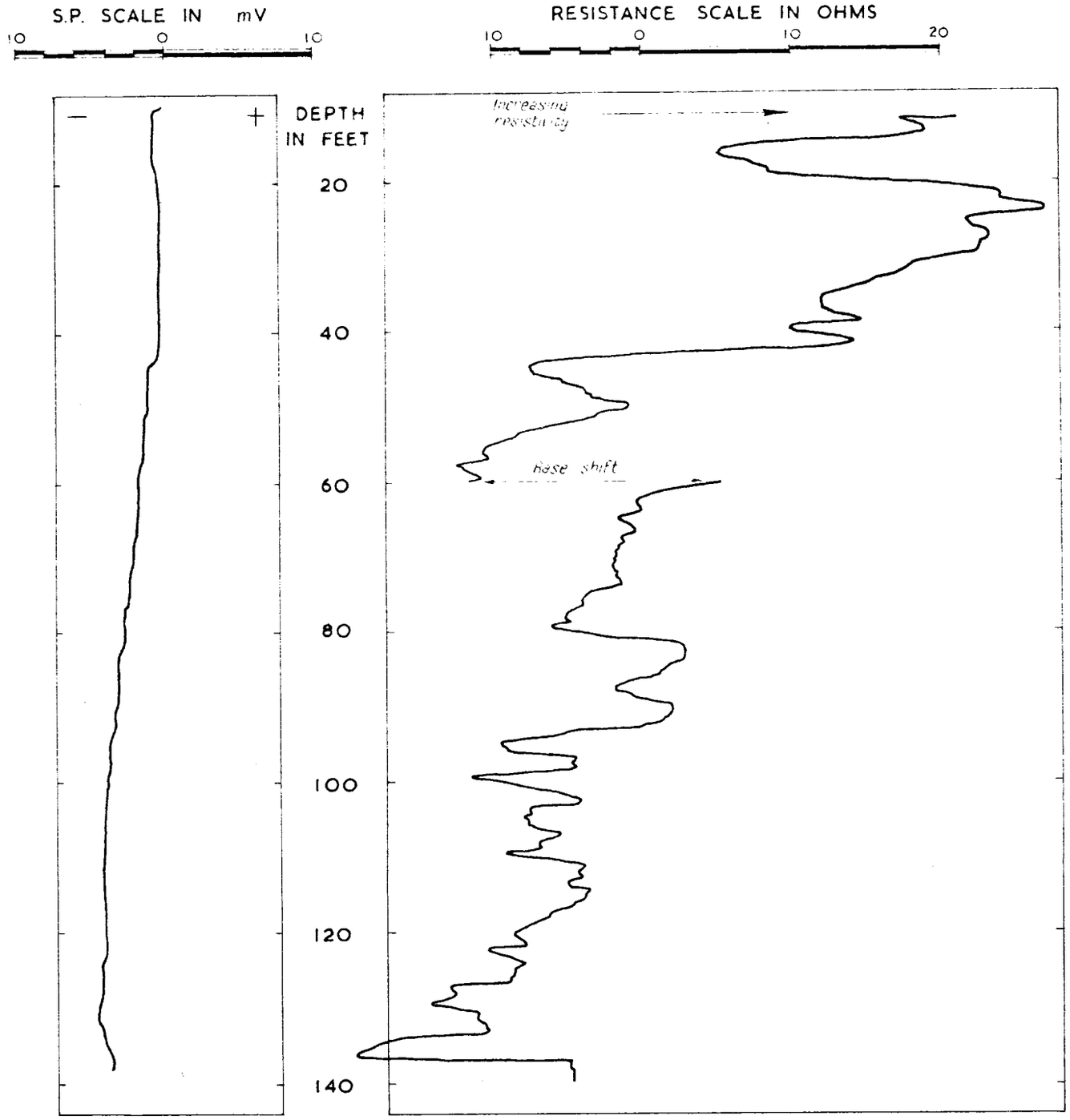
NARRACAN 1,554

1-12-54. BIT DIAMETER 6″



NARRACAN 1,555

1-12-54. BIT DIAMETER 6″



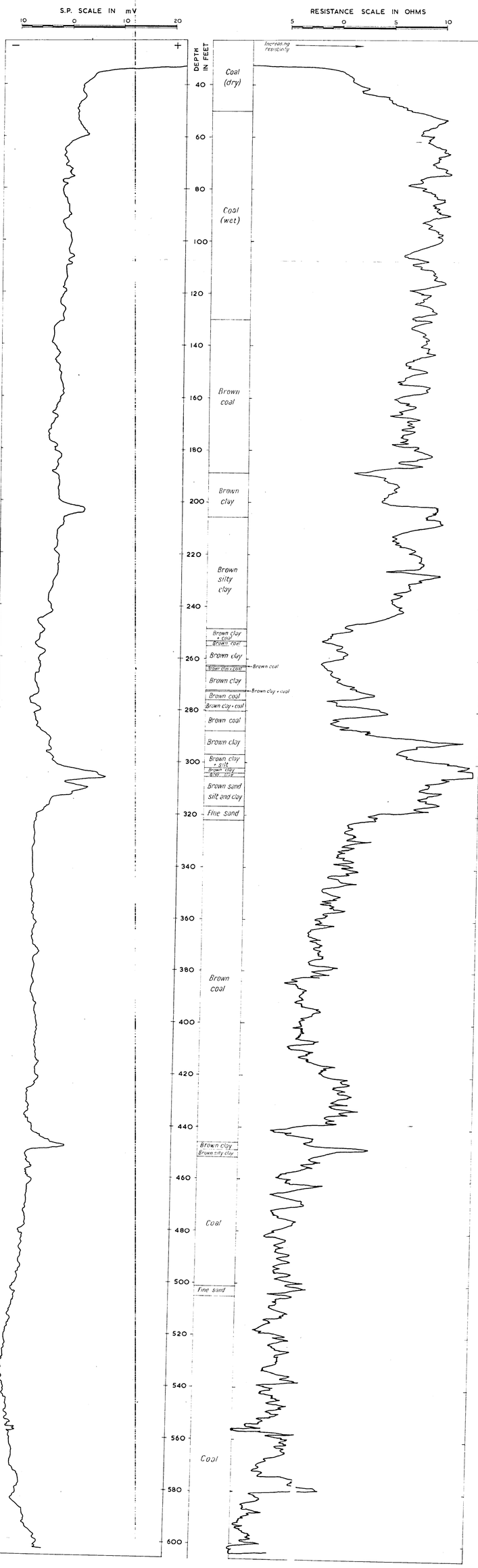
ELECTRICAL LOGGING TESTS, MORWELL, VICTORIA

S.P. AND SINGLE-ELECTRODE RESISTANCE LOGS

NARRACAN 1561

18-5-55. BIT DIAMETER 6"

DRILLED WITH ROTARY DRILL. LOG TAKEN AFTER BENTONITE MUD WAS DILUTED WITH WATER



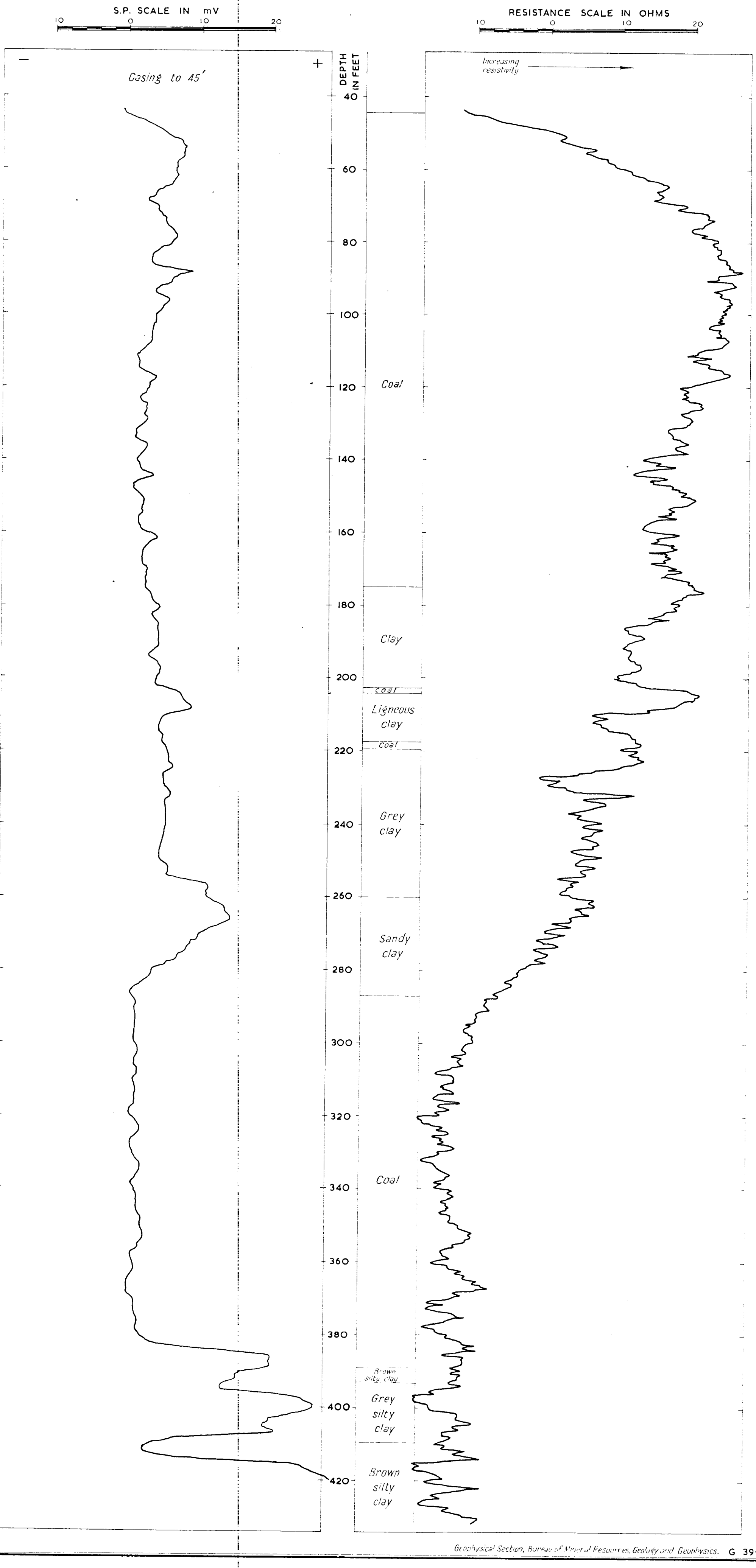
ELECTRICAL LOGGING TESTS, MORWELL, VICTORIA

S.P. AND SINGLE-ELECTRODE RESISTANCE LOGS

NARRACAN 819

27-6-55. BIT DIAMETER 7″

DRILLED WITH ROTARY DRILL AND BENTONITE. HOLE BLOCKED AT 430 FEET

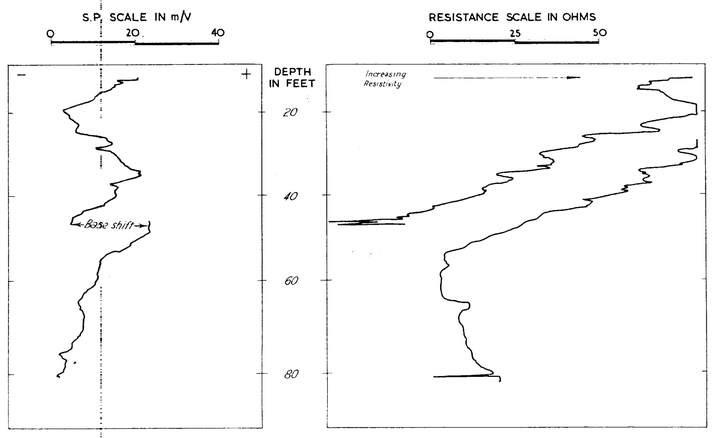


ELECTRICAL LOGGING TESTS, MORWELL, VICTORIA

S.P. AND SINGLE-ELECTRODE RESISTANCE LOGS

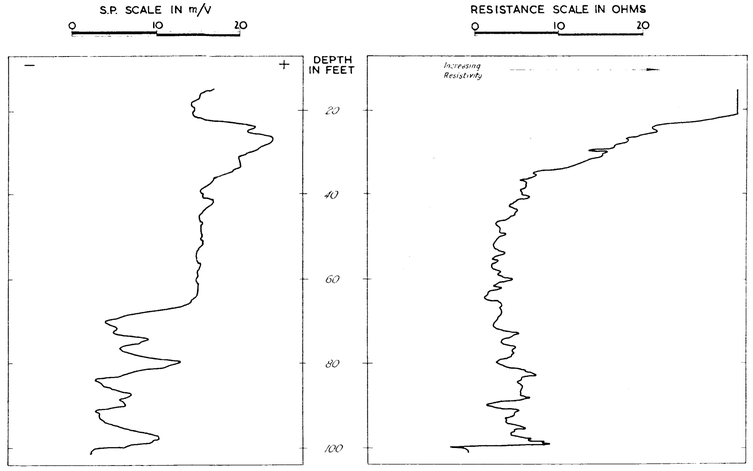
TANJIL EAST 1109

2-5-55. BIT DIAMETER 4".



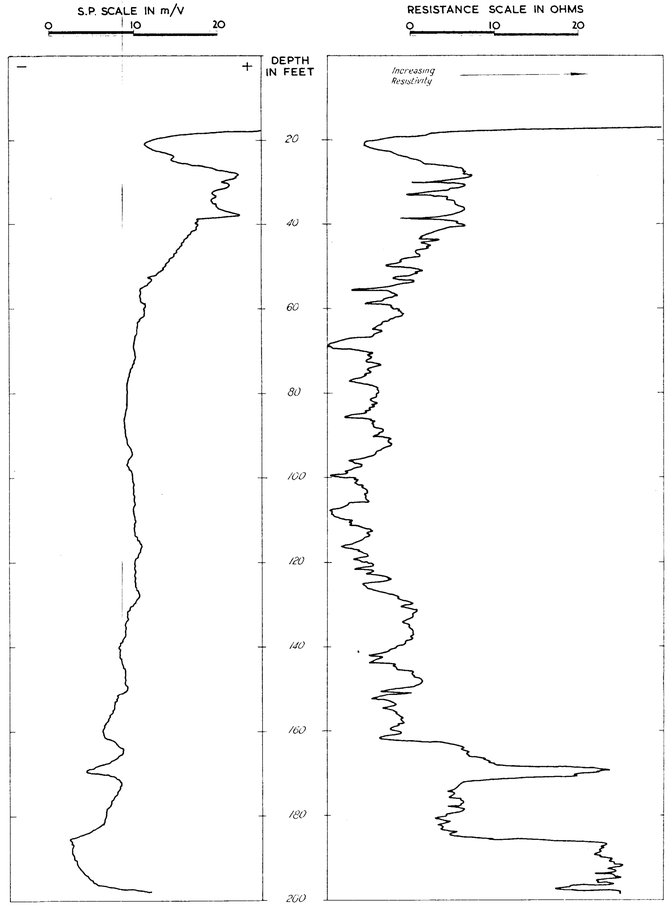
TANJIL EAST 1110

2-5-55. BIT DIAMETER 4".



TANJIL EAST 1135

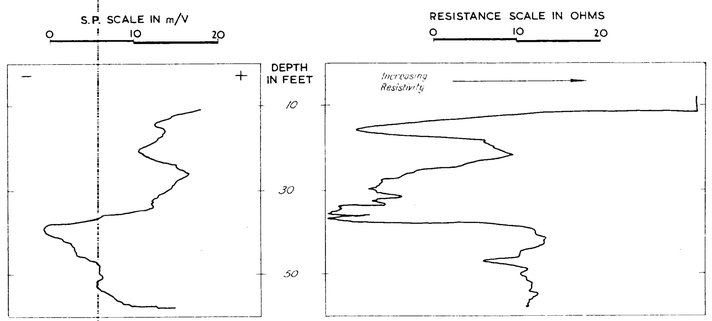
18-5-55. BIT DIAMETER 5".



Hole blocked at 198 feet

TANJIL EAST 1111

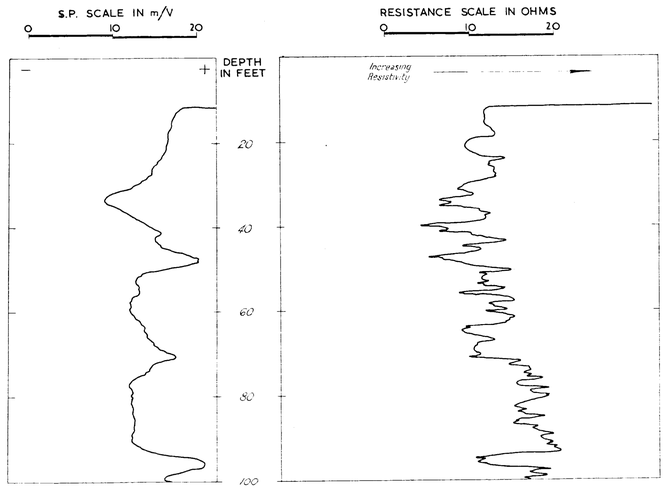
2-5-55. BIT DIAMETER 4".



Depth of hole approx. 200 feet
Hole blocked at 60 feet

TANJIL EAST 1136

18-5-55. BIT DIAMETER 5".



Hole blocked at 100 feet

GEOPHYSICIST