DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 81/19

TUCKEY NO. 1
WELL COMPLETION REPORT

By

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D.M.E. No. 125/77

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Figure 1 Polda Basin showing the location of Tuckey No. 1. Plan No. S15227

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SUMMARY

Based on results of several seismic refraction surveys conducted by the South Australian Department of Mines and Energy, a stratigraphic hole, Tuckey No. 1, was drilled as part of an investigation programme to determine the coal potential of the Polda Basin.

The section encountered during drilling consisted of 16 m of Quaternary Bridgewater Formation, 110.3 m of Tertiary Poelpena Formation and 87.1m of Jurassic "Polda Formation". The latter figure is a minimum thickness because: a) the Jurassic top was not clearly delineated, b) the full section was not penetrated.

The presence of the "Polda formation" in the hole considerably extends eastwards the known distribution of the unit.

PREVIOUS INVESTIGATIONS

Central Eyre Peninsula has been the subject of geological, geophysical, and hydrological investigations for many years. Beaney (1962) summarised hydrogeological investigations over the period 1911 to 1937; Nelson (1974),

reviewed geophysical work over the western portion of the area, and Morgan (1974) described the regional geology. Seismic refraction investigations have been undertaken (McInerney (1977)) in the eastern and western areas, to study the subsurface Polda Basin.

The term Polda Basin was first used by Harris and Foster (1974) to describe the subsurface Late Jurassic sedimentary accumulation. The term Polda Freshwater Basin had long been used for the associated ground water which supplements the reticulated freshwater supply on Eyre Peninsula.

Mineral investigations by exploration companies and the search for coal by the South Australian Department of Mines and Energy (SADME) and the Electricity Trust of S.A. (ETSA) have greatly increased geological knowledge of the onshore Polda Basin (Bryan, 1971, 1972; Morgan, 1974; Gatehouse, 1980).

REGIONAL GEOLOGY

The Polda Basin is a narrow east-west intracratonic trough bounded in the south-west by ?Precambrian conglomerate and sandstone resting on older granite (Harris and Foster, 1974). Precambrian sedimentary, metamorphic, and igneous rocks limit the present northern and eastern boundaries (Johns, 1957a, b). The southern limit is obscured by younger sediments but an approximate limit is indicated by gravity contours (McInerney, 1977, plan number S12606). The northern margin may be fault bounded as indicated by gravity and aeromagnetic gradients (Gerdes pers. com. 1980).

The Polda Basin contains glacigene sediments of Permian age (Cooper, 1980a). Their distribution is unknown other than that they occur extensively beneath the Lock coal deposit.

The distribution of Late Jurassic sediments also is not well known. Harris and Foster (1974) show four bore holes and one shaft where they were intersected. Since then a large number of holes have been drilled which pass through rocks of this age (Gatehouse, 1980).

Tertiary sediments are known to be wide spread. They are mostly of Eocence age, however, sediments originally thought to be Miocene (Harris, 1973) but which Harris (pers. comm.) now regards as Pliocene occur near Tuckey No. 1.

Quaternary aeolianite (Bridgewater Formation) overlies a large area of the Polda Basin being thickest near the west coast, and thinning eastwards (McInerney, 1977). Within the Bridgewater Formation is the Ripon Calcrete (Firman, 1967), a unit recognizable over parts of central Eyre Peninsula.

GEOPHYSICS

Nelson (1974) reviewed all geophysical investigations of the Polda Basin. He discussed results of aeromagnetic, seismic refraction and reflection, the application of ground magnetic, gravity, and electrical resistivity methods. In 1976 the Department undertook refraction seismic work in the search for subsurface stratigraphic information on potential coal (McInerney 1977). This study is the most detailed report on the subsurface geophysics of the Polda Basin available to date.

A considerable amount of drilling has been done by mineral exploration companies, SADME and more recently ETSA. Down-hole geophysical readings gathered in each of the 136 drillholes in the Lock coal deposit have yet to be interpreted for detailed correlations.

REASONS FOR DRILLING TUCKEY NO. 1

Tuckey No. 1 is a stratigraphic hole drilled to further evaluate the eastern portion of the Polda Basin for its coal-bearing potential (Fig. 1). It was drilled in an area where previous shallow exploration holes were drilled by Chevron Exploration Corporation (Morgan, 1974), however none of these penetrated the complete section.

Seismic work was carried out in October 1976 and preliminary cross-sections prepared to assist in determining the best location of Tuckey No. 1 and Mucka Cudle No. 1 drillholes (McInerney, 1977). Tuckey No. 1 was drilled in December 1976 and the results of drilling were incorporated in McInerney's report.

WELL HISTORY

General

Well Name and No.:	SADM Tuckey No. 1
Unique No.:	-
State No.:	527001801
Location:	Latitude: 33°39'S (approx.) Longitude: 135°59'40"E (approx.) Hd. Murlong adjacent to Section 18 (Located on seismic shot point 66)

Map Reference:	1:250 000 KIMBA S153-7
	1:100 000 TOOLIGIE 6130
Access:	Approx. 25.5 km east of Lock on the south side of the main Lock-Cleve road (hole adjacent to road)
Elevation:	90 m (approximate)
Owners:	South Australian Department of Mines, 191 Greenhill Road, Parkside. 5063.
	The Electricity Trust of South Aust., 220 Greenhill Road, Eastwood. 5063.
Spudded:	13-12-76 at 0800 hrs
Completed:	19-12-76 at 1700 hrs
Total Depth:	Driller: 213.40m
	Logger: 213.40m
Time to Total Depth:	Approx. 61½ hrs. (one shift per day, 7 days working week)
Date rig released:	19-12-76
Hole Status:	Plugged and abandoned
Type of Hole:	Rotary
Purpose of Hole:	Stratigraphic information

Drilling Data

Drilling Contractor:	South Australian Dept. of Mines, Mechancial and Drilling Branch, Dalgleish Street, Thebarton. 5031.
Type of Rig:	4 x 4 Failing 1500
Rig No.:	RD 1
Hole Size:	3.78" (approx.)
	(96mm)
	HQ core 16.80 - 213.40 m

Casing and cementing details:	No casing
Plugs:	Backfilled and capped with 3m cement plug.
Drilling water supply:	Permission was granted by the E.&W.S. Department to obtain water by means of a 1" stand pipe inserted in a fire plug in a water pipeline immediately adjacent to the drill site.
Drilling Fluid:	Rotrol/Water mix
Bit Record:	Type: Tungsten
	No. used: 4
	Depths: (1) 16.80 - 80.40 m (63.60)
	(2) 80.40 - 118.40 m (38.00)
	(3) 118.40 - 139.40 m (21.00)
	(4) 139.40 - 213.40 m (74.00)

Sampling

Ditch cuttings were taken at 1 m intervals from surface to 16.80m and at 2 m intervals from 80.40 to 213.40m (T.D.). The deeper samples were taken because of extremely poor core recoveries.

Cores were cut continuously from 16.80 to 213.40 m. A total of 93 core runs were made over the 196.60 m interval for a total recovery of 53.43 m (27.2%).

All cores and cuttings are stored at the Glenside Core Library Complex of the SADME.

Logging

Logs run:	Gamma Ray (runs 1,2,3)
	Neutron (runs 1,2,3)
	S.P. (run 1)
	P.R. (run 1)
Log datum:	Ground Level

LITHOSTRATIGRAPHY

Table 1

Tuckey No. 1 Stratigraphy

Age	Rock	Depth to top below G.L. (m)	Thickness (m)
Quaternary	Bridgewater Formation	Surface	16
Tertiary	Poelpena Formation	16	110.3
Jurassic	"Polda formation"	126.3	87.1

1. Bridgewater Formation (Quaternary)

Surface to 16.0m.

The Bridgewater Formation comprises three members: an upper and a lower sandstone unit, and a middle carbonate unit, the Ripon Calcrete. Both sandstone beds are light to dark brown in colour, fine to medium grained, and with lithic fragments. The upper sandstone in addition contains coarse subangular quartz grains, whereas the lower unit is more silty particularly just below the base of the Ripon Calcrete. This carbonate unit is typically white to pink in colour and hard.

2. Poelpena Formation (Tertiary)

16.0m to 126.3m

This unit consists of about 80% sandstone and gravel and 20% claystone and carbonaceous claystone. The sandstone is variable in colour from grey, light brown, dark brown, to almost black, and apparently occurs as interbeds of coarse, fine and medium grained, generally poorly sorted, quartz sandstone. Indeterminate lithic fragments are common. The matrix is commonly hard

or soft clay and rarely siltstone. Interbedded with the sandstone is clay which is grey, hard, and in part silty. A more detailed lithological description is not available because of poor recovery.

3. "Polda formation" (Late Jurassic)

126.3m - 213.4m (Total Depth)

The section consists of 73% sandstone and 27% claystone, carbonaceous claystone and lignite seams. The four main sandstone units consist of generally grey and brown coarse to very fine grained, rounded to subrounded and poorly sorted quartz, though sorting improves in the younger strata. Clay matrix is a common feature, and scattered mica is present as an accessory mineral. Clay, carbonaceous claystone and lignite are present as four units, the thickest of which is 6m. Minor siltstone occurs within the carbonaceous claystone sections.

GEOLOGICAL SIGNIFICANCE OF TUCKEY NO. 1

Stratigraphic information obtained from the drilling of Tuckey No. 1 confirms the presence of the Late Jurassic "Polda formation" near the eastern end of the Polda Basin (see Table 1). Both the Bridgewater Formation and Poelpena Formation are interpreted lithologically as being present also as shown in Table 1. Harris (1973) indicated the presence of an unnamed Miocene unit overlying the Eocene Poelpena Formation in this area. A palaeontological study of Tuckey No. 1 neither proves nor disproves the occurrence

of this unit (Harris, Appendix 1, this report; Cooper, 1980b). More recent work by Harris (Harris, pers. comm., 1980) has led him to consider that this unit may in fact now be of Pliocene age.

The thick Jurassic section of Tuckey No. 1 proves the lateral extent of the "Polda formation" over a distance of at least 85 km with a known width of 10 km. The presence of carbonaceous claystone intervals in Tuckey No. 1 indicate the widespread occurrence of potential coal-bearing sediments at the eastern end of the Polda Basin.

CONCLUSIONS

Tuckey No. 1 well was drilled to a depth of 213.4m below ground level. Within the Jurassic section four intervals of clay and carbonaceous clay were intersected. These represent potential coal-bearing horizons. There is no evidence to suggest that the full Jurassic section was penetrated.

CGG:AF

C. G. GATEHOUSE

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APPENDIX 1

Report on the palynology of Tuckey No. 1

Samples of core from this stratigraphic hole were taken in order to determine the age of sediments. Of 13 samples taken seven proved to be barren while four were of Jurassic age. Attached is a list of samples with sample numbers, intervals and age determination. Sample preparation and age determination was carried out by W.K. Harris.

Sample No.	Depth Interval	Age
S4236	24.63 - 24.70 m	Barren
S4337	24.74 - 27.85 m	Barren
S4238	28.75 - 28.86 m	Barren
S4294	45.70 - 45.79 m	Barren
S4295	56.80 - 56.88 m	Barren
S4296	62.46 - 62.48 m	Barren
S4297	74.65 - 74.72 m	Barren
S4239	94.70 - 94.81 m	Barren
S4240	126.78 -126.89 m	Late Jurassic
S4241	130.35 -130.44 m	Late Jurassic
S4242	144.42 -144.52 m	Late Jurassic
S4243	181.84 -181.98 m	Late Jurassic
S4244	184.75 -184.87 m	Barren

APPENDIX 2

Composite Well Log

COMPOSITE WELL LOG

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

TUCKEY No 1

STATE: SOUTH AUSTRALIA PETROLEUM TENEMENT: NONE 1:250000 MILE SHEET: KIMBA BASIN: POLDA

WELL STATUS: Plugged and abandoned

LOCATION: Lat. 33°38'58" (Approx)
Long. 136°04'06" (Approx)

ELEVATION:

DATE SPUDDED: 13/12/76
DATE DRILLING STOPPED: 18/12/76
DATE RIG RELEASED: 18/12/76
TOTAL DEPTH: 213.40 m

HOLE SIZE: INCHES FROM TO
8½"-0 0.0 213.40 m

CASING: INCHES DEPTH CEMENTED TO FROM

CEMENT PLUGS:

DRILLED BY: S.A. DEPARTMENT OF MINES
DRILLING METHOD: ROTARY
LOGGED BY: S.A. DEPARTMENT OF MINES

TYPE OF LOG	18" IN NORMAL 8" IN NORMAL	8FT LATERAL	S.P.	NEUTRON	GAMMA RAY
DATE OF RUN		18/12/76	18/12/76	18/12/76	18/12/76
FIRST READING		213.40	212.60	213.00	213.40
LAST READING		0.80	0.80	0.50	0.40
INTERVAL MEASURED		212.60	211.80	212.50	213.00
CASING LOGGER					
CASING DRILLER					
DEPTH REACHED		213.40	212.60	213.00	213.40
BOTTOM DRILLER		213.40	213.40	213.30	213.30
MUD TYPE		ROTROL			
DENSITY/ VISCOSITY					
PH/ FLUID LOSS cc					
MUD RESISTIVITY					
RECORDED BY					
WITNESSED BY		B.J. TRAEGER			

OTHER SURVEYS TYPE FROM TO

LITHOLOGICAL REFERENCE

Shale claystone	Sandstone	Kaolinitic
Sandy shale	Granular	Glauconitic
Silty shale	Pebbly	Garnet
Siltstone	Lithic	Calcareous
Argillaceous siltstone	Anhydrite	Dolomitic
Sandy siltstone	Pyrite	Oolitic
Calcilutite	Micaceous	Fossiliferous fragmental or Indeterminate
Dolomite	Carbonaceous	Feldspathic
Coal	Ferruginous	Gypsum Gypsiferous
Quartzite	Carbonate fragments	Manganese
Quartz grains	Dolomite pebbles	

WELL SYMBOLS

CORE INTERVAL AND NUMBER
PLUGGED INTERVAL
CORE CORE LOSS
CASING SHOE
FLUORESCENCE
CUT WITH CCl_4

LITHOLOGY BY C.G. Gatehouse, A.J. Krebs
COMPILED BY C.G. Gatehouse
DRAFTED BY M.R.
DRAWING NUMBER: 81-3

BIT RECORD: TUNGSTEN CARBIDE CORE HEAD

DRILLING RATE: MINUTES / METRE (0, 10, 20, 30, 40)

LITHOLOGY % OF CUTTINGS: TRACE

HYDROCARBONS

LITHOLOGICAL DESCRIPTION

SOIL - Light brown, mod. coarse, calcareous.
SAND - Light brown, v. fine - fine, minor coarse grained, subangular qtz. White, red, black lithic fragments.
CALCRETE - White, pink, hard.
SANDSTONE - Light to dark brown, very fine, grained, silty in part, quartz, bcal/cred lithic fragments.
CLAYSTONE & SANDSTONE (Interbedded) - Claystone: Dark grey to black, carbonaceous, with qtz grains and lithics. Sandstone - fine to med. grained, pebbly, subrounded quartz, carbonaceous, clay matrix.
SANDSTONE - Dark brown, black, carbonaceous, gravelly near top, quartz.
CLAYSTONE - Grey, brown, sandy.
SANDSTONE - Grey, fine - medium grained quartzose, clay matrix.
SANDSTONE - Light grey, medium - coarse grained, gravel (32.8 - 34.7 m), quartz, clay matrix.
SANDSTONE - Grey, hard, fine, v. coarse grnd, subangular, poorly bedded, clayey, black lithic fragments.
SANDSTONE - Grey, hard, mod - coarse, sub angular, clayey, quartz.
CLAYSTONE -
SANDSTONE - Light grey, medium to coarse, rarely very coarse, grained, subangular, frosted, quartz.
CLAYSTONE - Grey, silty, laminated.
SANDSTONE - Grey, hard, med - coarse and v. coarse, grained, quartz, clay matrix.
CLAYSTONE - Silty, quartz, black lithics.
SANDSTONE - Grey, medium - coarse and very coarse grained, subangular - subround - ed, quartz, occasionally rose coloured, clay matrix, micaceous.
CLAYSTONE - Grey, silty, qtz, sandy, clay in part.
SANDSTONE - Grey, medium to coarse to very coarse, subrounded, rounded, quartz, clay and silt matrix, yellow and black lithics, micaceous.
CLAYSTONE - Silty.
SANDSTONE - Grey, laminated (cross - bedded ?), very fine to fine grained, frosted, occasionally coarse and pebbly, quartz. Yellow and black lithics, micaceous.
CLAYSTONE - Silty, brown, micaceous.
SANDSTONE - Grey, coarse, grained, subrounded, micaceous, quartz, minor black lithics. Silt and clay matrix.
SANDSTONE - Grey, coarse to very coarse, subangular, subrounded, quartz, minor black and yellow lithics, clay matrix.
CLAYSTONE - Carbonaceous, scattered lignite fragments, silty.
SANDSTONE - Grey, medium to coarse grained, subangular, subrounded, quartz, minor black lithics, minor clay matrix.
CLAYSTONE - Dark brown, carbonaceous, micaceous, with lignite bands.
SANDSTONE - Light grey, coarse to very coarse, quartz. Minor black lithics.
CLAYSTONE - Dark grey / brown, lignitic, micaceous, scattered lignite blocks.
CLAYSTONE - Light brown / grey, silty, micaceous, very fine grained.
SANDSTONE - Light grey, very coarse and granular, quartz, black lithics, micaceous.
CLAYSTONE - Dark brown, silty, sandy, carbonaceous.
SANDSTONE - Light grey, white, very coarse, granular, subangular, quartz, minor black lithics, occasional scattered boulders. Cemented with silica in places.

TOTAL DEPTH 213.40 m.

DEPTH (METRES): 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200

GAMMA: 5 c p s

CORES (RECOVERIES): CUTTINGS

INTERPRETED LITHOLOGY

PALYNOLOGY: Coarse - XDC; ? ; Barren; Barren; Barren; Barren; Barren; Barren; Barren; Jurassic; Jurassic; Jurassic; Jurassic; ?

NEUTRON: 50 c p s; 426 c p s; 50 c p s

TD 213.4 m

STRATIGRAPHIC COLUMN

QUATERNARY
PLEISTOCENE - RECENT
BRIDGEWATER FMN
KUNDA CALCILITE

TERTIARY
POELPENA FORMATION

JURASSIC
POLDA FORMATION

APPENDIX 3

Geophysical Logs

SOUTH AUSTRALIAN DEPARTMENT OF MINES

GEOLOGICAL SURVEY

TYPE OF LOG (S): GAMMA and NEUTRON

DATE: 15-12-76

TIME: / / /

AREA: TUMBY

LOCATION: Lat. Long.

WELL: Neal

ELEVATION G.L.: Log from 0 metres above G.L. Depth Scale: 1cm = 2.5 metres

RUN NUMBERS: 1 / 2 / / /

CASING SHOE DEPTH (cm): LOG metres DRILL metres TOTAL DEPTH: LOG 216.0 metres

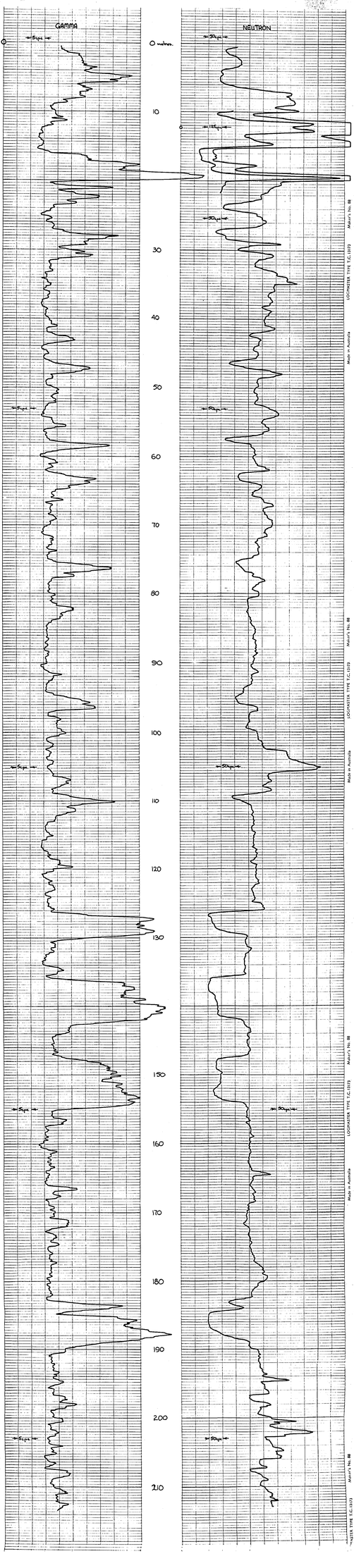
DRILL 216.4 metres

MUD: Type RESISTIVITY: Ohm metres @ °C

OPERATING TIMES: / / / /

RECORDED BY: B.J.Metcher.

REMARKS:



SOUTH AUSTRALIAN DEPARTMENT OF MINES

GEOLOGICAL SURVEY

TYPE OF LOG (S): SP and PR.

DATE: 19-12-75 TIME: / / /

AREA: TUCKEY LOCATION: Lat. Long.

WELL: No.1.

ELEVATION G.L.: Log from 0 metres above G.L. Depth Scale: 1cm repr. 2.0 metres

RUN NUMBER: 1 / / / /

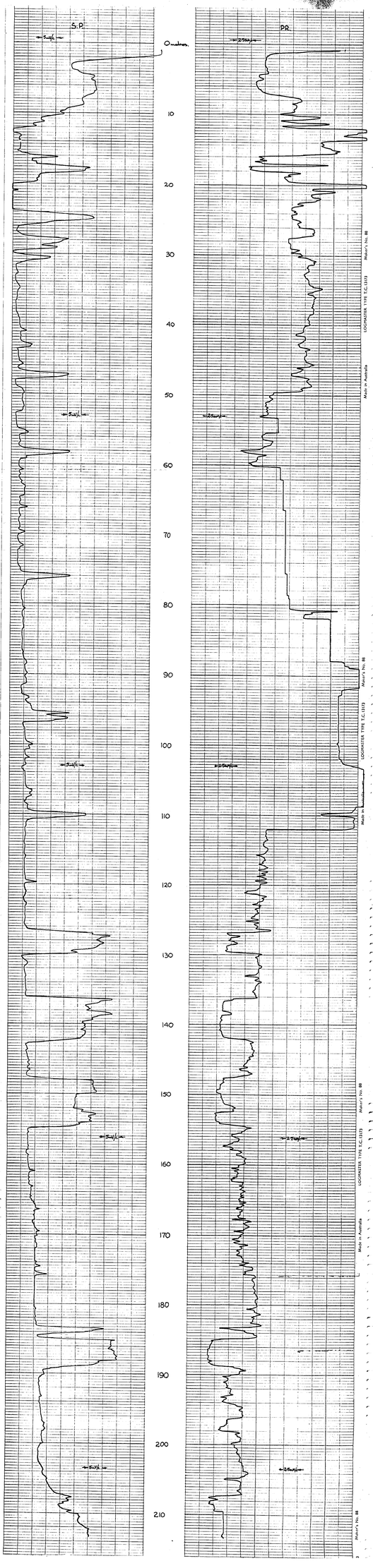
CASING SHOE DEPTH (cm): LOG metres DRILL metres TOTAL DEPTH: LOG 204 metres DRILL 204 metres

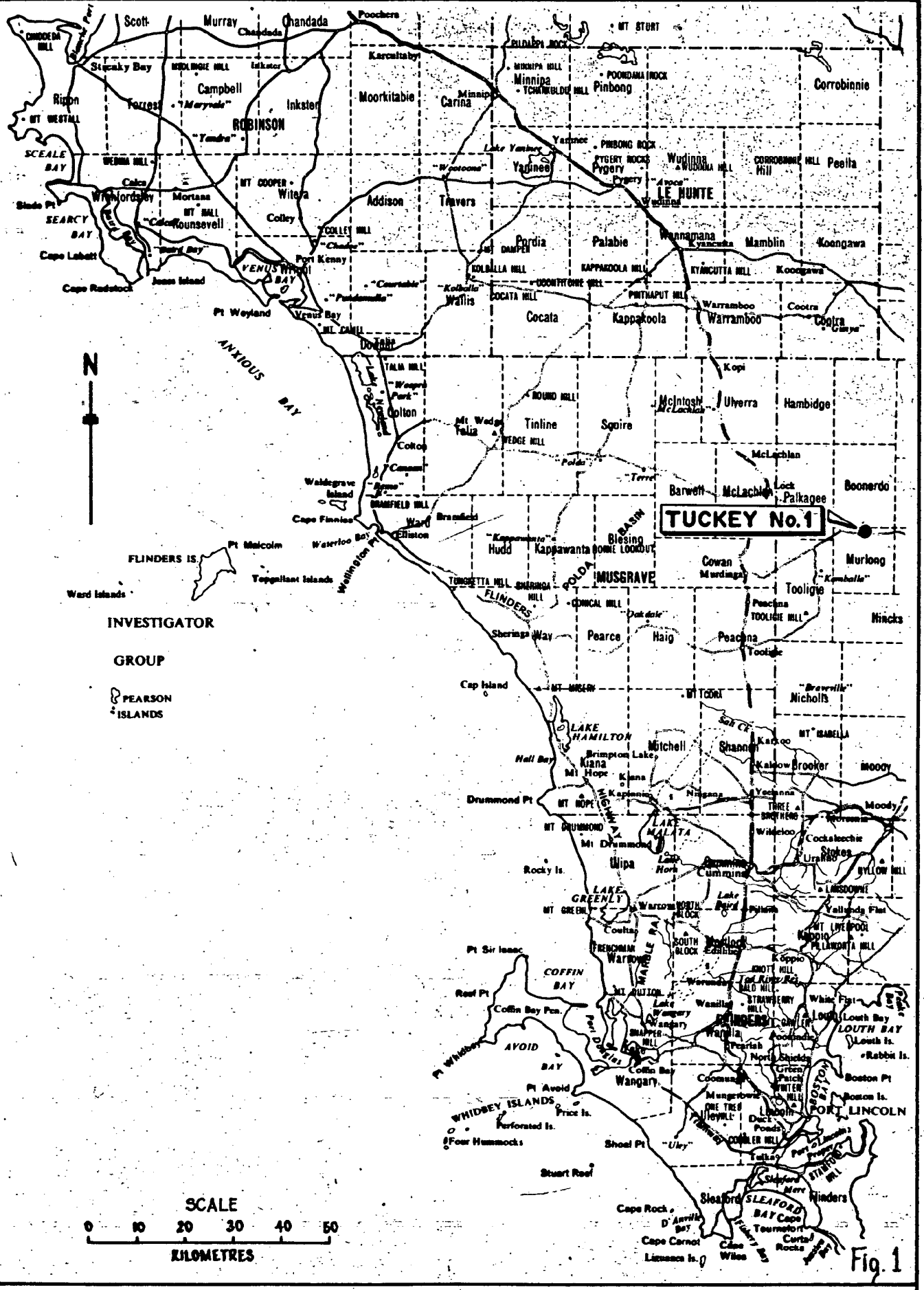
MUD: Type RESISTIVITY: Ohm metres @ °C

OPERATING TIMES: / / / /

RECORDED BY: B.J. TROEGER.

REMARKS:





DEPARTMENT OF MINES AND ENERGY – SOUTH AUSTRALIA

COMPILED: C. Gatehouse	TUCKEY No.1 STRATIGRAPHIC WELL	DATE: Jan. 1981
DRN. M.R. CKD.	LOCALITY PLAN	PLAN NUMBER. S 15227
14/6/81		