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EL 184

GIDDI GIDDINNA CREEK

FIRST QUARTERLY REPORT AND FINAL REPORT

Submitted by

Australian Selection Pty Ltd 1975

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TRANSPARENT CYLINDER. 2556/1.

TENEMENT: E	.L.	184.
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TENEMENT HOLDER: AUSTRALIAN SELECTION PTY. LTD.

REPORT:

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MASON M.G. 1975.

E.L. 184, Murloocoppie Coal Prospect.

First quarterly report;

(Period: March 3rd, to June 2nd, 1975)

pgs. (2-7)

PLANS:

F.1. Murloocoppie Coal Prospect E.L. 184.
Drillhole locations.

(2556-1-1)

REPORT:

MASON M.G. 1975.

Groundwater near Giddi Giddinna Creek, 37km North - Coober Pedy, S.A.

pgs. (8-35)

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REPORT:

MASON M.G. 1975.

E.L. 184. Murloocoppie Coal Prospect S.A.

Final report.

(Period: August, 1975)

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REPORT:

First Quarterly Report
for
Exploration Licence 184.

3rd March to 2nd June, 1975.

The area covered by Exploration Licence 184 was applied for by Australian Selection (Pty) Limited on the 4th December, 1974, and was granted effective as from the 3rd March, 1975 for a period of tenancy of one year.

The licence area, which abuts the north-eastern edge of the Coober Pedy proclaimed opal field, covers an area of 1,789 square kilometres and is centred 30 kilometres N.E. of the Coober Pedy township.

Portion of the licence area is within the Woomera Prohibited area. Access was granted on the 20th March, 1975, and entry permits collected on 7th April, 1975.

A detailed geological reconnaissance was carried out from the 7th to 10th April, 1975. A schramm rotary percussion drill entered the area on 28th April, 1975 and continued drilling until the 29th May, 1975. A total of fourteen(14) holes were drilled for an advance of 1,362 metres. Of these, 10 holes intersected Mt. Toondina Formation between 65 and 110 metres

- 255b

below surface, and two holes intersected Proterozoic granite (with Mt. Toondina Formation absent).

No significant intersections of coal were made in the Mt. Toondina Formation.

The stratigraphic section intersected in most holes was Bulldog Shale from surface to shallow depth. (Cadnaowie Formation outcrops only around Lake Cadibarrawirracanna and to the east and north as a wide strip parallel to the Peake and Denison Ranges). A thin un-named basal silty shale member with thin cone in-cone limestones was present in most holes. Thence sands of the Cadnaowie Formation and the Algebuckina Sandstone. The boundary was often difficult to distinguish. Thence the Mt. Toondina Formation of sandy silts and siltstones generally with fine carbonaceous fragments.

Several sections of coal were intersected in the Cadnaowie Formation. The most significant in hole MU-13 from 56-60 metres where two seams totalling 3 metres were intersected. This coal has been sent to Robertson Research for analysis.

Structurally the area consists of two Proterozoic highs of granite extending from Mt. Woods in the south; one north under Lake Cadibarrawirracanna, the other passing just to the north of Coober Pedy township. The Permian on-laps these highs. The coal formation near the top of the Mt. Toondina Formation has been eroded from the licence area.

The top of the Permian and the overlying units appears to dip very shallowly northwards. No true anticlinal structure can be shown.

Large quantities of generally brackish water were intersected in most holes. The water is not artesian; is contained within the Cadnaowie and Algebuckina Formations; and is separated from the Coober Pedy highly saline waters by a Proterozoic high. The least saline water is centred around Giddi Giddinna Creek and indicates local intake. A north-easterly movement of sulphate-rich waters in this sub-basin of the Great Artesian Basin is suggested. Flows of greater than 2200 cubic metres per day were encountered from an aquifer thickness of about 60 metres.

A detailed report on this groundwater will shortly follows.

Conclusions

Prospects of Permian coal deposits in this area are poor.

The coal-bearing section of the Permian has been eroded over

most, if not all, of the licence area. A full detailed

report will be forwarded as soon as all results are to hand.

P.D. Mehol

M. G. MASON PROJECT GEOLOGIST

Attachments

Drill Hole Location Plan Drill Logs Financial Report

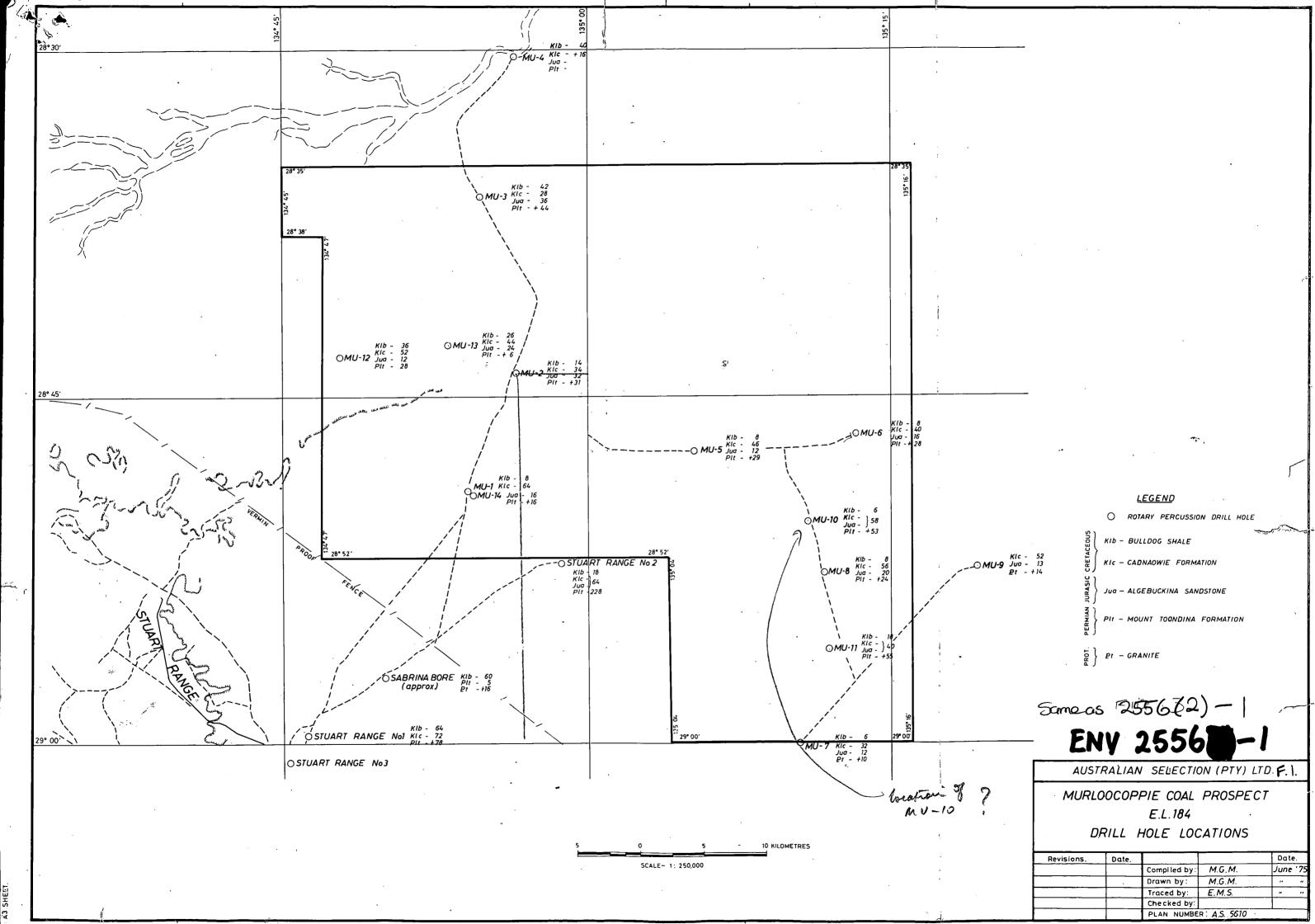
FINANCIAL REPORT

Expenditure to 2nd June, 1975 is as follows

Salaries - Field Salaries - Drafting Maps & Aerial Photos Sample Bags Plan Reproduction External Consulting	4,557 320 102 220 118 606	5,923.00
Field Support Transport Equipment Repairs Mines Dept. Rental	3,453 1,901 54 895	6,303.00
Percussion Drilling	7,367	7,367.00
Drill Equipment Exploration Equipment Including Vehicles and	696	
Office	358	1,054.00
Port Augusta		
Salaries Office Maintenance (Includes power, phone	535	
etc.)	257	792.00
Main Street, Port Augusta as a base for operations within South Australia. Most of our administration costs are generated in Kalgoorlie and Perth. We therefore make application		1,967.00
	Salaries - Drafting Maps & Aerial Photos Sample Bags Plan Reproduction External Consulting Field Support Transport Equipment Repairs Mines Dept. Rental Percussion Drilling Drill Equipment Exploration Equipment Including Vehicles and Office Port Augusta Salaries Office Maintenance (Includes power, phone etc.) We maintain an Office at 3 Main Street, Port Augusta as a base for operations within South Australia. Most of our administration costs are generated in Kalgoorlie and Perth. We therefore make application to have these costs include	Maps & Aerial Photos 102 Sample Bags 220 Plan Reproduction 118 External Consulting 606 Field Support 3,453 Transport 1,901 Equipment Repairs 54 Mines Dept. Rental 895 Percussion Drilling 7,367 Drill Equipment 696 Exploration Equipment Including Vehicles and Office 358 Port Augusta Salaries 535 Office Maintenance (Includes power, phone etc.) 257 We maintain an Office at 32 Main Street, Port Augusta as a base for operations within South Australia. Most of our administration costs are generated in Kalgoorlie and Perth. We therefore make application to have these costs included

Total Expenditure

My Sucho P. R. GRAHAM OFFICE MANAGER



GROUNDWATER NEAR GIDDI GIDDINNA CREEK 37 KMS. NORTH OF COOBER PEDY, SOUTH AUSTRALIA

EL 184

M. G. MASON

SENIOR GEOLOGIST

AUSTRALIAN SELECTION (PROPRIETARY) LTD

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GROUNDWATER NEAR GIDDI GIDDINNA CREEK 37 KMS. NORTH OF COOBER PEDY, SOUTH AUSTRALIA

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Australian Mineral Development Laboratories Water Analysis Report.

APPENDIX 2

Rotary-Percussion Drill Logs (14)

SUMMARY

During the course of an exploration programme for
Lower Permian Coal, in an Exploration Licence area 30
km. north of Coober Pedy, South Australia, a previously
unknown significant occurrence of brackish groundwater
was discovered during rotary-percussion drilling. Flow
rates from individual holes ranged from 330 to 2000
cub. m. per day and salinity ranged from 2600 ppm to
5000 ppm. The Upper Jurassic, Algebuckina Sandstone
and the Lower Cretaceous Cadnaowie Formation form the
aquifer which is overlain, in the E.L. area by Lower
Cretaceous Bulldog Shale. Local recharge along the
fracture-controlled Giddi-Giddinna Creek is considered
to account for the general low groundwater salinity,
relative to surrounding areas.

The groundwater occurrence will be of immediate benefit to the township of Coober Pedy and may be of value to future mineral development in the Lake Phillipson area.

1. INTRODUCTION

Australian Selection (Pty) Limited were granted Exploration Licence 184 on 2nd March, 1975 (Fig. 1) for one year, to explore for coal, in an area centred about 42 km. N.N.E. of Coober Pedy, South Australia. Rotary-percussion drilling was carried out during May 1975, and resulted in the discovery of significant quantities of brackish groundwater.

This report describes the groundwater occurrence.

GEOLOGY

The E.L. area lies central to the Permian Arkaringa Basin near the south west margin of the Great Artesian Basin.

Within the E.L., Lower Permian Mount Toondina Formation sediments are unconformably overlain by Jurassic,
Algebuckina Sandstone and Cretaceous Cadnaowie Formation respectively.

The two units are extremely difficult to tell apart visually in rotary percussion chips. Both are coarse to medium grained, relatively unconsolidated sands with minor fine sand, silts and silty shale layers. The Cadnaowie Formation contains thin calcarenites in the northern part of the Exploration Licence, and has thin woody coal measures in several parts of the profile.

Coarse grits, with round pebbles of pitted porphyritic rhyolite, are common at the top of the unit.

Together, these units form the aquifer and average about 60 metres thick (see Fig. 2).

Overlying the Cadnaowie Formation is the Bulldog Shale; again of Cretaceous age. At the base of the Bulldog Shale is a more silty member which, though only several metres thick, can be recognised over most of the area. This equates to the un-named Transition member of Ludbrook in the Stuart Range No. 3 Bore. Thin calcarenites with cone in cone structure are common to this interval, but do not occur elsewhere in the overlying section. This unit consists generally of khaki, black to grey carbonaceous shales.

The Bulldog Shale outcrops over wide areas. Where the Tertiary silcrete profile is present (e.g. opal workings at Coober Pedy) it is pale brown to off-white silty claystone. However, where the profile has been stripped, which is the case over most of the Exploration Licence, the shales are khaki, dark grey, soft and contain abundant gypsum veins. The land surface is covered with cobbles, generally rounded, of Proterozoic-Archaean age. These are interpreted as being reworked from the Permian sequence (Parkin, 1969). Silcrete pebbles from the dissected silcrete surface are common - several meandering zones of these probably indicating ancient stream channels. Cadnaowie Formation outcrops around

Lake Cadibarrawirracanna, and to the east as a strip parallel to the Peak and Denison Ranges. This area is typified by sand dunes and salinas; with springs near the outcrop edge of the Cadnaowie with the Bulldog Shale.

2.1 Structure

Drilling has shown two basement highs: one under Sabrina bore extending south east, the other under Lake Cadibarrawirracanna and extending south; both joining to the Mt. Woods Lower Protezozoic outcrop area.

Preliminary work indicates the Permian unconformable surface and later units dip gently towards the north from the basement high at the south edge of the Exploration Licence. However, interpretation is hampered by lack of accurate levelling. A weak, broad anticline may be present as shown by the base of the Bulldog Shale in Fig. 3. However, the top of the Permian is more complex. A low is present almost directly beneath the anticlinal structure where the thickest development of aguifer occurs.

Several lineaments have been noted. One passes along a W.S.W. branch of Oolgelima Creek to the N.W. of Sabrina bore. The Sabrina Ridge appears to be affected by this feature becoming less pronounced on the northern side. This lineament lines up with the Karari Fault mapped to the S.W. (Townsend 1973). A similar lineament parallels Giddi Giddinna Creek and the southern edge of Lake

Cadibarrawirracanna.

3. GROUNDWATER

Groundwater was cut at depths which ranged from 40 metres to 3 metres. In holes MU-1, MU-5, MU-7, MU-9, MU-10, MU-11 and MU-14 the water table was static, unconfined within the Cadnaowie Formation. In holes MU-2, MU-3, MU-4, MU-6, MU-8, MU-12 and MU-13 water was cut at the top of the Cadnaowie Formation and rose varying depths into the overlying and confining Bulldog Shale. This could be termed pressure water. A good example was in MU-4 where water rose 24 metres. No artesian flows were recorded. The final static water levels varied from 1.5 to about 35 metres, and averaged 12 metres below surface.

Pressure water will only be encountered where the aquifer is overlain by impermeable Bulldog Shale and for this reason many springs are located close to the limit of Bulldog Shale, e.g. around Lake Cadibarrawirracanna and north to Lake Conway.

This therefore places the limit of artesian waters much further north than previously anticipated. The approximate limit has been noted on Figure 4.

3.1 Supply

Supply rates from drill holes were visually estimated by the amount of water air-lifted from the holes during rotary drilling. In general, supply was fairly constant throughout the basin, reflecting the coarse grained nature of the aquifer. Towards the north and east, supply rates did appear to decrease somewhat, possibly related to finer grain size of the Cadnaowie Formation. Quantities of 1,000 cub. metres per day, or greater, may be expected from the central part of the basin. Since drill times were of about eight hours duration, this period was in effect an eight hour pump test. No lessening of flow was noted with time.

3.2 Salinity

Salinity varied markedly throughout the basin. To the south, and close to the basement highs, salinities of about 15,000 ppm were recorded. The basement highs mark the southern limit of the Giddi Giddinna "Basin". In fact, the aquifer is absent, or thin, above the Sabrina Ridge, and it is doubtful if there is any substantial movement of groundwater across these features.

From the basin edge the salinity rapidly drops to 5,000 ppm and then gradually drops towards the "basin" centre where a minimum value of 2,600 ppm at hole MU-3 was recorded. East, west and north the salinity gradually increases to between 5,000 to 10,000 ppm (see Fig. 4). However, north of Mt. Barry, the salinity decreases as the well known areas of the Great Artesian Basin are approached.

The lower salinity areas of the Giddi Giddinna Basin form two east-west tongues which join near MU-2. These

parallel the upper reaches of Oolgelima and Giddi Giddinna Creeks, but are displaced several kilometres to the north-east.

Water at the top of the Cadnaowie Formation, at its contact with the overlying gypsiferous Bulldog Shale, is generally about 40% more saline than the remainder of the aquifer.

A full water analysis was conducted on a sample from 38 metres depth in MU-2 by AMDEL (Appendix 1). The water is sulphate rich and carbonate poor, as is most water from the south-west part of the Great Artesian Basin. The analysis also showed that measurement of salinity by electrical conductivity methods by the E and W.S. in Coober Pedy was 40% above the true value. This error is mainly due to the high sulphate content of the water. All other salinity measurements were by conductivity methods and have been reduced by 10% to give a more realistic value.

3.3 Source of Groundwater

The sulphate waters of the south-west Great Artesian

Basin must have entered the aquifer from the gypsiferous

surface areas to the south and west. A north-easterly

movement of these sulphate rich waters is in keeping

with the hydraulic gradient, and natural removal of

water from the basin at the large mould springs to

the north-east. These springs form the mixing zone for these western sulphate waters and carbonate water from the east.

However, this simple picture is complicated by the less saline Giddi Giddinna "Basin". This indicates a superimposition of less saline waters on an older, higher salinity regime. That is, local recharge through 4 to 8 metres of Bulldog Shale into the Cadnaowie Formation has occurred in relatively recent times following removal of much of the laterised Bulldog Shale. Major influx has occurred beneath the Giddi Giddinna and Oolgelima Creeks where the shale is very thin and has been affected to some degree by the structural lineaments mentioned before. The displacement of these less saline zones to the north-east suggests a northeasterly movement for the groundwater.

4. CONCLUSIONS

Drilling has indicated a groundwater basin of some magnitude. The good supplies and relatively low salinities should prove of immediate interest to the Coober Pedy opal field and may be of value to large scale developments in the adjacent areas; such as the Lake Phillipson Coal Deposit held by Utah Pty. Ltd.

M. G. MASON SENIOR GEOLOGIST

21 June 1975

REFERENCES

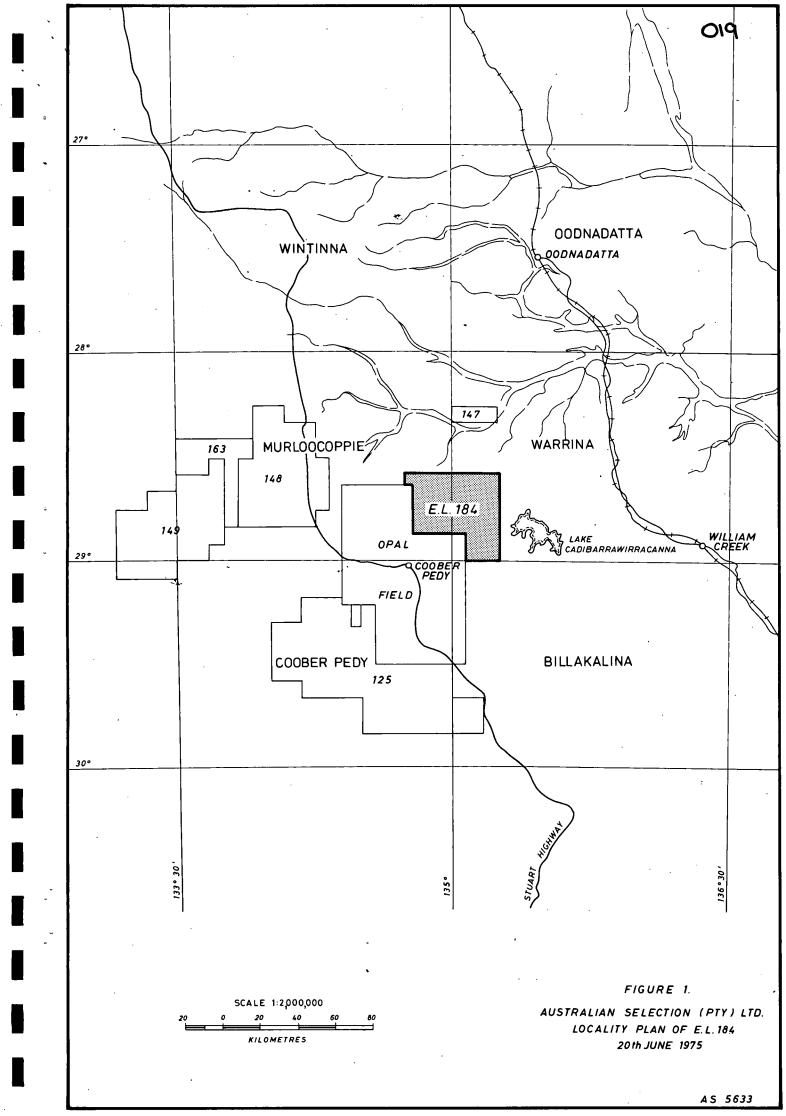
- KER, D. S. 1962 Groundwater Prospects Coober Pedy Area.
 Min. Rev. Adelaide, 117; 17-21.
- CHUGG, R. I. 1957 The Hydrogeology of Portion of the Great Artesian Basin, Near the Peak and Denison Ranges.

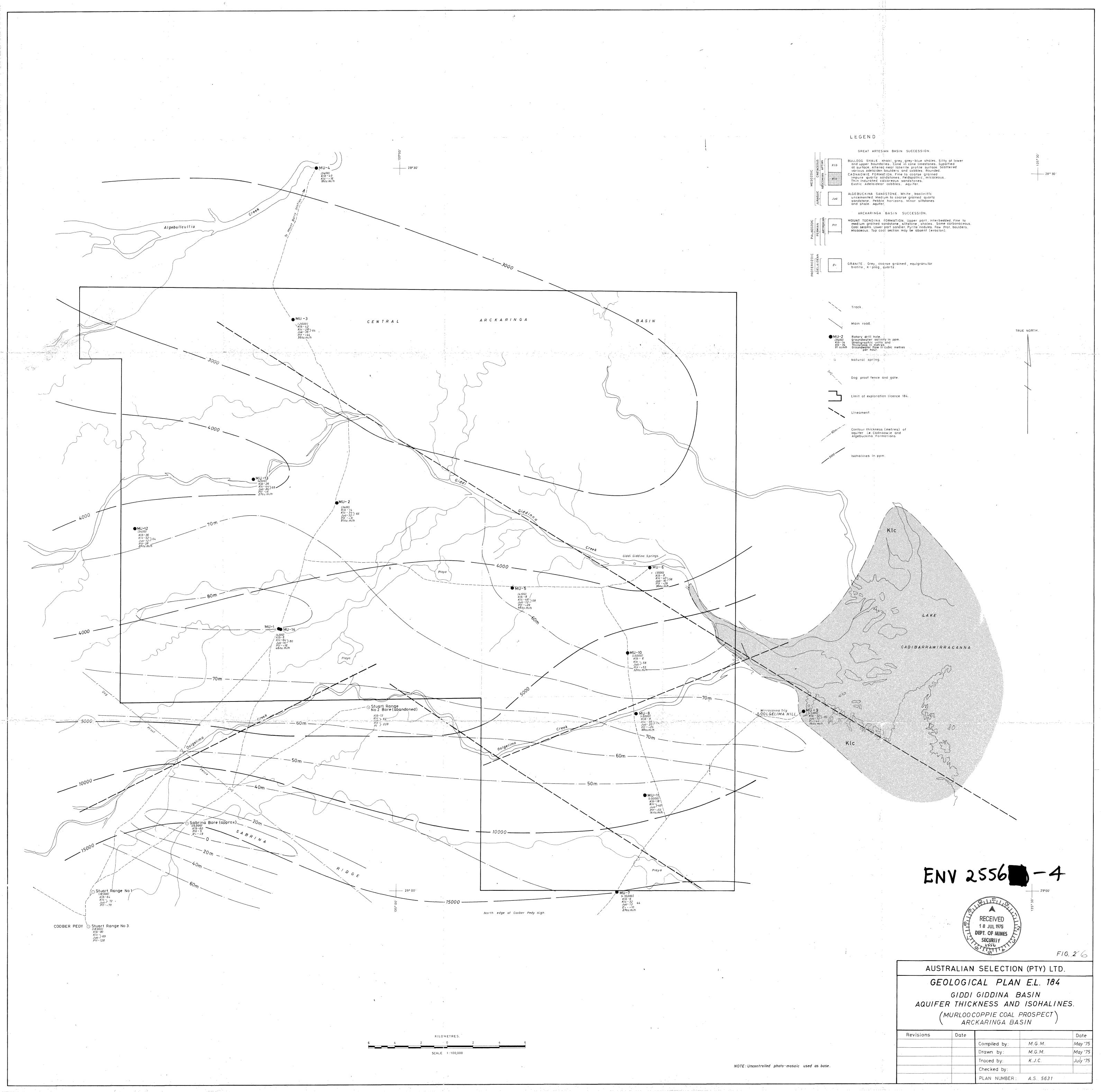
 Report of Investigations 10 Geol.
 Survey South Australia.
- LUDBROOK, N. H. 1965 Stuart Range No. 3 Bore Coober Pedy. Min. Rev. Adelaide, 122:28-32

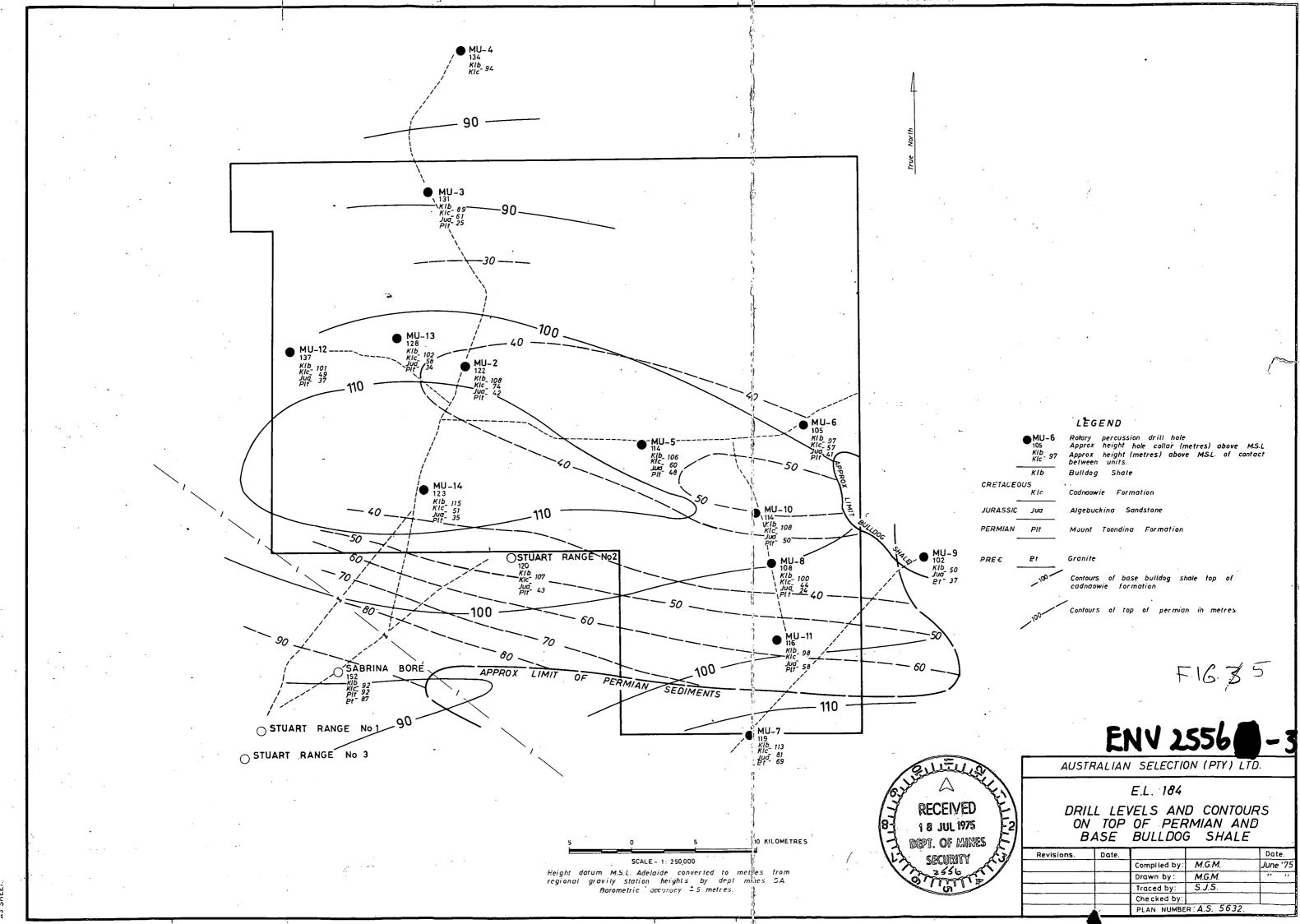
 1961 Permian to Cretaceous Subsurface Stratigraphy between Lake Phillipson and the Peak and Denison Ranges South Australia. Trans Roy. Soc. South Australia, 85:67-80.
- PARKIN, L. W. 1969 Handbook of South Australian Geology. Geol. Survey of South Australia.
- TOWNSEND, I. J. 1973 A Synthesis of Stratigraphic prilling in the Arckaringa Basin 1969-71.

 Department of Mines South Australia.

 Unpublished Report Book No. 73/98.











TACEOUS KID BULLDOG SHALE

CADNAOWIE FORMATION

METASEDIMENTS AND GRANITE

LIMIT OF ARTESIAN WATER

GEOLOGICAL BOUNDARY

GROUND WATER SALINITY IN P.P.M.

MU-9
+ 5000
GROUND WATER SALINITY IN P.P.M.

TRACK

RECEIVED
18 JUL 1975
DEPT. OF MINES
SECURITY
1550

AUSTRALIAN SELECTION (PTY) LTD.

E.L. 184

GIDDI GIDDINA GROUNDWATER "BASIN"
ISOHALINES AND LIMIT OF ARTESIAN WELLS

F1G.4

Revisions	Date			Date
		Compiled by:	M.G.M.	June '75
		Drawn by:	"	" "
		Traced by:	E.M.S.	July '75
		Checked by:	Past of the	
		PLAN NUMBER:	A.S. 5630	

APPENDIX I

WATER ANALYSIS REPORT

JOB NO. 3769-75

NAME : AUSTRALIANS SELECTION LTD.

ADDRESS : MURLOOCOPPIE

DATE COLLECTED : 1ST MAY, 1975.

DATE RECEIVED : HOLE NO. : MU-2

SUPPLY: 20,000 gph

SAMPLE COLLECTED BY : M. G. MASON

WATER CUT: 8 metres

WATER LEVEL: 7.3 metres DEPTH OF SAMPLE : 38 metres

TOTAL DEPTH HOLE: 111 metres

SAMPLE NO. HOLE 2

CHEMICAL COMPOS	SITION	PER	LIGRAM LITRE MG/L		MILLIEQUIVS PER LITRE ME/L
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APPENDIX 2 Lotan Percussion Double Logs.

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9	o COERSE SANDSTONE V. Pale J						minor coal Fragme
300	1 2 55% silty sandstone with 10% from a cool	20m-	-	· · · · · · · · · · · · · · · · · · ·		 	minor kaolin
3000	O Tenses and Fragments	1	9 .				1
	minor sandy siltstone	.].					-
]							1
	18% c.g. Subargular quarty	30m -]
4	<u> </u>					 	4
3,800 86			1::			 	
2	Commence of the second	40 m -]:::				
			! :::			-	-
•	8						_
Š	5% shale a silt bands]: ::				╡.
->	Shale - carbonaceous	50m	∤ *.:•			 	1
4	green-grey to dank grey. 35% quanty silt.		1: -:				
	C. Marian C. Marian C.				1	 	
	Uw uncernewted. Uvague bedding	60-]:::	44]
	1) B 10 = 50mm + high. minor solo carbon account Fragments 50% (one 1055)	00 m	.]·				_
	8 00		1	 		<u> </u>	1
	T						-
		70 m	-			 	-
	5% yellow brown F.g. commuted		j:•.	, , , , , , , , , , , , , , , , , , ,			J
	sand stone						-
	MEDIUM GRAINED SANDSTONE	+			1	+	-
	10% silty sandstone. 10% silty sandstone. 10 2-3% including garnet distinct	80 m	1000	1			Fragmonts
	D 2-3% Including garnet - distinct	ή.				1	 -
	By Brack shales and sandy sill+shest	7	-		1		coal seam o am
	T gamet sand - grey 10% c.g. 25%	y 90 m					0.05 n.
	7 SINTSONE - 45% quarts sit 5% garnet			Tona e	al Fragments		0.05m 86
	1 SINT STONE - 45% querty sirric Rest Uan 10 Sto coal to Transports and print Rest Uan 20% m.g. Sand layers		= = =				0.050.043.
	SILTATONE - grey r.g. 57% R.g. quarter silt. 200 ports 500 mics 5700 r.g. quarter Rost clay - Some shale a gand layers	†3					0.2m.
	2	10011	7-1-]			0.05m.
P. D.	SILTSTONE 2 dark grey 50% F. g. silt quarty 20% min quarty 20% area fragment. 5% mica 2% pyrite 5% karbot Fragments		7-1	· }			
000	Year cing. o' page 12 20.	_	{ :: :	:			
20,02	V. vague 5-10 mm 10% mica 25% class			-}			
·r	END OF HOLE Illmetres	110 11	1 = 1				
	Die of Hotel III/44765		1				
		<u> </u>		DR.	ILL TYPE:	Schremm .	DATE ORILLED:
		:					30 April -2 May
	SCALE 1:500	: ···			ILLER : D.E	PILSTON	30 April -2Ma LOCGED: M.

RC	SF	601 :(1:00:00:00:00:00:00:00:00:00:00:00:00:00		•	250,000 540	1e+ .		TION: - 90"
o c	AT	1011: 48 km. HNE Cooker Pedy CO-ORDS	28	38	4534	•		ion:
cur		DESCRIPTION	OEPTH METRES	LOG	(ppm)	GEOCHEM Cu (ppm)	Zn (ppm)	REMARKS
=	T	KHAKI CLAY F.g. 30% rounded						5% 100mm gypsum veins
		high plasticity moderate swelling. vague layering. 2% canbon fragments.		1.1.1				301
			10 m -					
1975	3 LG	Gray & Khate - 40 % voque layering gray clay. 10% silt quarts. 35% unce Rett clay.		4-1-1 1-1-1 1-1-1				
Nor	エエい	BLACK CLAY Fig. 30% much 5% canbon Fragment's Rest clay 5% quanty silt 2% u.f.g. pyrite.	20m-					
אר קיי		vague Feliation		7-1-				
•	PoG		30 m -					
	おっして	Chay - Dork green-gray, F.g. 15% sult quanty, 3% tourmaine	1					
_ - >		15% sell quants, 30 cambon Fragments 2% Eg. pyritz 30% cambon Fragments 20% Fran. g. muin. Some Feldspan Rest clan (simple polegran, m.g. quantil [pyrite nodulet - coordinate] [CORL SEAM 1. ometre Drown black	40 m	<u></u>				50mm coal seam
3		SINT-SAND - POLE TITLE C. 3 . 20% - ACTO AND						reintively hand
syater		miser Pome condecomo inthich			}			cole comments san
350000	RMATION	congression of the state of the		-				5 bb massive gra
35.	5	Sand becoming carbo - Fragments -	60 m					thin 10mm coal
. :	MOUNG	m.g. andy 20% thin massive dealt gray green strakes possibly carbonaceous. FINE STAND v. pale grey well sorted	1					50mm coal seam
į	3	gogs F.g. sand. 5% m.g. muscowite minor 51. + traction 5% greanshap	70 m	1:::				50mm coal seem
44 006	(i)	medium sphis. pale grey 15% cg. minor silt tradic (103-7) 5% mg. mulcovite 5% carbonaccous shale layers. well spried.						miner coal
9 (2)	SAND ST	becoming coansen a less well somted	80 m					
	NA	20% carbonaceous shale						fine sand
e regional	B UCK	coarior well sorted angular	90 m					minor coal
Š	3 574	FINE SAND - V. pale gray well sorted	1					
	1	traction & sett 50% coming muscourte	100 n	n-				Few m.g. bright coal grains
•	3 0	SILTY SAND - Grey - Goth Fig. subrectional	110 n					minor carbonaceo
	1 475 ST 7500	clay byate promy served	1					
		од на манеран о раск / дво недо вероном (1994 г.). Сего не од Обранција, (1995 година не унивестително до денова нада ве			DR	ILL TYPE:.	Settromm, 1	OATE ORILLED

	LOG OF I	1 4F M			L HOLE		LAR	
						INCLINA	TION: - 90	
00	CATION 55 km NNE Coober Pedy . CO-ORI	95: 286	9. 46	60		DIRECT	10N:	
	·	سسبب			GEOCHEM			
722	DESCRIPTION	OEPTA METRE	1/200-	 _	···	1 7 ()	REMARKS	
Ö	3	METRE 	5 <u> </u>	(com)	Cu.(ppm)	Zn (ppm)		
	CLAY SOIL - Red brown .		37.5				10% gabener.	
	CLAY KHAKI F.g. 20 forounded silt.				<u> </u>			
	Kest day.						4	
3		_			 		-	
•	grey brown	10 m	-15-5-				-	
ξ			1=-		 			
4.22. A	2 1 M		1==-					
	T CARBUNACEOUS SHALE - Eleuk Fig .	_	[=]]	
	T CARBUNACEOUS SHALE Flowth Fig.	20 m]===[
		2011	FEL		1	<u> </u>	1	
			三二		 	ļ	-	
			[==]		 		oin hard band	
			三卦		-	 	1	
	1	নু 30 m	七至十		 	 	1	
	m sanoy sitts one pale gre	=1		• .			1	
	marine industried		1					
<u>د</u> و ب	SILTY CLAY - 35-30% silt -10-20% mic 5% pyrute, minor graphite Rest do	ည်ျ]===[1	
	9		انتنا				1= == ==	
2000ger	oranda. 15th Fg. muscoute Rest Elong muscoute graphics Frags	FLA .			4	 	30% sitty day	
ğ	It minor pyrite, formatine, graphics trags	- I	===		 	 	-	
Ò	1) of mice and coains. Pert clan		.		 		-	
i	few thin gray state larger it am		1	<u></u>	 	 	1	
8	P = that Relators Industrial	50m	12.2.2				-oim cale oriente.	
	0 0 - 517ND-medium minor trin Local layers				 		calconents	
é	0 2 gr 30% silt 1-3m. 1 2% mica, 3% coal fragments. 2 15-30% day 10% c.y. Rost min		1				Calcanenti	
	END OF HOLE . 56 metres .						4	
		60 m	. J.					
		1			ļ	1		
			'4 h			·	7	
							7	
			·4					
		70 m	•					
	Cased 5-30 metres &	70 m	**************************************					
	cased to 30 metres 4	£1						
	cased to 30 metres & squipped for pasteral born	£1						
	cand to 30 metres & agripped for pastoral born by me Barry Station.	£1						
	cased to 30 metres & equipod for pastoral bord by me Barry Station.	-						
	cased to 30 metres & equipod for pastoral bord bord by me Barry Station.	-						
	cased to 30 metres & equipol for pasteral bond by me Barry Station.	-						
	Cand to 30 metres & agripped for pastoral bord bord by me Barry Station.	80 m						
	cand to 30 metres of agripped for pastoral born by me Barry Station.	-						
	cand to 30 metres & equipod for pastoral born by me Barry Station.	80 m						
	cand to 30 metres 4 agrupoid for pastoral bord by me Barry Station.	80 m						
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	cand to 30 metres of agrupoid for pastoral bord by me Barry Station.	80 m						
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	cand to 30 metres of agrupoid for pastoral bord by me Barry Station.	80 m						
	cand 5 30 metres 4 agruped for pastoral born by me Barry Station.	80 m						
	cand 5 30 metres 4 agrupped for pastoral born by me Barry Station.	90 m	n -					
	cand to 30 metres of agripped for pastoral born by me Barry Station.	80 m	n -					
	cand to 30 metres of agrupoid for pastoral bord by me Barry Station.	90 m	n -					
	cand 5 30 metres & agripped for pastoral born ly me Barry Station.	90 m	n -					
	cand to 30 metres of agrupped for pastoral born by me Barry Station.	90 m	n -		OLL TYPE:		DATE CRILLED:	
	cand to 30 metres of agripped for pastoral borne by me Barry Station.	90 m	n -		THE TYPE:		DATE ORILLED: A May 1975	

· }-			ON 40 km NF. Coober Fedy. CO-ORD		· · · · · · · · · · · · · · · · · · ·		GEOCHEM		10N:
. J. 5. 7.	COL		DESCRIPTION	OEPTH METRE!	LOG	(բբու)	Cu (ppm)	Zn (ppm)	REMARK:
		 }	CHAY Khaki 4 dark gray . F.g. 20% Silt quarty 5-10% mica Rest May .	1.	===				
	Č	314	dark grey. 50% graphitel						1
	وارر .	<u>, </u>	30% S. Hy	1] : ·			ļ	1
1	9	- P	SANDY SILTETONE gray 10% mg quanty SEND - light gray 50mm coal seam	10 m -					,
7 140	A Water Ou	13637	quanty niner mice filt rest clay sofosilt						some combonece
. 77	"A	50	SFIND - light gran Some coal sear was found at the sounded bright of sold and sold at the				1		logers .
	Θ	Merinan	reldspathic mino- pelobles pinked great weathend perphyny.	20m-					4
10000		+	SPAID Boro F-m.g. sub-rounded quant?	-	1]
		-	minor sandy siltstone layers		∤∷:				
	-	70						 	j
	2	t		30m -]:::				
_		ORM					-		1
,, F	4600pm	ř.			1				
	24			40 m	∤ :::				1
9		W)			 :: :		<u> </u>		
- 1		2]·∵:			<u> </u>	4
		NO	5% 5mm coal serms	-	1				<u> </u>
		4		50m]:::		·	 	
•			SAND - mig . 20% Koolin matrix Fo%	-	\				}
		ZZ	mg angular quarty No Feldspar some opaline quarty Minor coal, pyrith silt]:::				4
		STOP	cour billion = 2112	60 m	∤ ∷:		 		+
		SACE			1:::]
· · . [.	4	SILTETANE - gran 15% F. m.g. quarty subsoning		1:::			+	
		2	Elettetone gran 15 % F. ra. q. quaity subsound miles pyrfle, 1090 Mica 55% citt. 5% graphite. Rest clay.	70 m					
, .	•	D17AM		1	-		_		- .
7 , .		Oam			1.:			<u> </u>] .
<u> </u>		"	5-10 m.g. 3and 25% clan	_			-	·	-
	Ļ	4220		80 m	1-:-				1
	9600	ign							-
	10,00	ř		•	1				1
	909			90 m	4:7				-
	3	Moor				=			John calcarem
		-	END OF HOLE 95 metres .		<u> </u>				- lens muc ban
				100 n	7				_
						<u> </u>			
				. .	-		_:		
				110 n	7:-				
	'				1				
* .				1	1				

		CT: ARCKPAIRSA BASIN AUSTRA LOG OF P	FROLL	19911	ON DRUI	HOLE	Service of the Post State of the State of th	Nº MU-6
	•	ECT MURLOOCOPPIE COML Name	מיו האיני	50,00	o sheat		INCLINA	LAR
00	ATI	ON 15km NW Oolgelima Hill CO-ORD.	5:2490		*257		DIRECT	10N:
cur		OCCOURTION.	DEPTH	106	-	GEOCHEM		REMARKS
i i		DESCRIPTION	METRES		(ppm)	Cu (ppm)	Zn (pom)	
4.53	-	mica. high plusticity. Rexe day	1	<u> </u>				
† *	34	mica . high plasticity . Keste class		 -	·		ļ. ·	-
53	蓝		1 :	= =		<u> </u>	 	20% c.g. sand.
1		COARSE SAND - Dale gray. Minon	1	\- <u>-</u> -			 	
) 3	NAW.	coffree SAND - pale gray. Minor mich silt, clay. 20% fg. 20% mg. 25% c.g. quanty. Also Faw ponphyny	10 m -	. 125				Som coal sean
٤	201	Debber.		<u>] · · · · </u>		ļ		
ra seco s		pyrite mica . 10% c.g. 20% mg.	1	∤ ∴∶		<u> </u>	 	- ∤' ' ' ' ' ' '
0	201	50% f.g. quartz. Feldspar		∤∙∴∙		 	 	-
	14	common subrounded.	20m-	┤ ∙∵		 		
	FORM] .]
<u>ම</u>]. · ·			ļ	
	DE LE			\ . · .	<u> </u>	ļ		-
0	dΓ	COARSE SAND - Dale arm. MILLOW PHILE!	- 30 m -	 • • •	 		+	1
40.	CADN	coanse sand - pale gray. Million pyrite, sitt day. mico. 30% c.g. 30% m.g.		1.]
•	จี	The second secon]:.:]
				1::	<u> </u>	ļ	<u> </u>	4
		Somm coal seas	40m	-		 		
•				1.	 	-		
				1				
				1]
	Š	cilt. 10% kaolin. Aboreca. 20% ong.	50m	1:	,	<u> </u>	 	
	MACCONNIC	10% F.g. quanty. Some opaline.		1.	·	<u> </u>	 	-
.•	8. I			1:		 	 	-
	BUCKINA			1.			·	
			60 m	1.				
40%	LCE.		1 00 m					_
8000gh.	4	SILTSTONE - area . 15% from a Submanle		+				-
8	NOIL	SILTSTONE - arey . 15% from a subangule quants 55% self 10% mice minor pyrite . 5% carbonaceous Fg. pieces . Post clay .					 -	
(1)	E	carbonaceous 12, pieces . Test cany .	20 -	†- -				
(3)- s	ğ		.70 m]-:-				
3900 pm	A Z			∤ :-				
W.	NNIGNOOL				:}			
	100			1:-	_	-	-	-
	MA		80 m]:-	-			
-	T	END OF HOLE Baneties.		1				4.
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			90 m	' -		1		
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			110 m	n-		- 		
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				1		- ,! 		
ļ			سنيساب		I DR	ILL TYPE:.	Schramm	DATE TORILLED:
ś								.6-7. May 19.

20	JE	TO TO PROGRESS OF STREET	STRAUAN S PERCU				HOLE	
`R0	SP	PECT : MURL OO COPPLE COAL			•		R.L.COL INCLINA	LAR
oc.	ATI	10N:	oros:					10N:
20.7		DESCRIPTION	OEPTH METRE	Lois	(ppm)	GEOCHEM Co (ppm)	Zn (ppin)	REMARKS
	. T	CLAY - Khaki, 25% silt mma		ē	A CONTRACTOR OF THE PROPERTY O			50%.9yp=4-
	1916	m.g. sand, 15% mila. Rest da	>					2090 94914-
	36	SAND - Dole wellow 20% c.g. 4	5%	-		<u> </u>		
		SAND - pale yellow, 20% c.g. 4 mg. Rent f.g. angular quant 5% Feldspan	3 10 m	1:1				
	-					 		
		runer slag. 20% silt. some Feldspar 10% ema. Dent c sub augular quartz.	·2·]:::[
.	7	COARSE SAND. yellow 35% c.	3.					
	3	COMPASE SAND. yellow 35% c. 30% m.g. minor silt clay 9 m Pere F.g. sand. Subangular. Iron oxida coated surface,	uca 2011]:::[
4	8			:::				
	7	MEDIUM SAND . White . 50 mica .		***				
0-	30	MEDIUM SAND. White. 5% mies. subangular: 35% m.g. rumon (Rept F.g., quantz. 10% white	-1. 30m	1]
•	NOR	Feldspar		1: .:			-	
رطو	U			1				
6000	æ1.	meoium sand - white mino mi 10-20% known, 60% F.g. Rest	40 m	վ. ։ .				
8	24.07	opaline quantz quartz Minor		1 . :				
	NPS.				90.0			<u> </u>
	SB	GRANITE grey m. J. 30% bioti	50m	1				35% sand as al
	010	30% quants (grey-blue) d 8 feldspur, equignanular	0%	++	- 30	45	230	Pb 40
	E GO			+++			 	-
. •	PROT	END OF HOLE 60m.	60 m	++		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
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			70 m	.1				
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			110 1	ח -				
		and the second of the second o		1				
					l DR	ILI. TYPE:	Schramm,	OATE ORILLED:
				÷.,				DATE ORILLED: 15-16th May 19
		· · · · · · · · · · · · · · · · · · ·	•		1	ILLER: O. B		LOGGED: M.Mase

PROSPECT: MURLOOCOPPIE GOAL WARRING SHEET 1:250,000 OCATION: CO-ORDS: 3136 4207							INCLINATION: 90°. DIRECTION:		
CUT		DESCRIPTION	DEPTH			GEOCHEM	7_/	REMARKS	
Ü			METRE.	==	(ppm)	Cu (ppm)	Zn (ppm)		
777	۳۵	Medium Grey Fissile Fresh SHALE CLAYSTONE	-	1	 	 		1	
	BULLDO SHA			 -		 		1	
	305	Medium Grey SILTSTONE		1:::					
7		Medium - Coarse Grand Trumsparent QUARTZ + MINOR White FELDS PATULE SAN	P 10 m	ļ	ļ 1				
٠		Medium-Fine Grained Transparent QUARTZ+minor white FELDSRATHIC SAND		1			 	1	
								1	
		Medium - Coarse Granica Transparent						4	
		CHARTZ + Minor white + Medium Greybory FELDSPATHIC SAND Sorteday Secure Atm	20 m	-			<u> </u>	1	
	-	+ minor Hstone		1:::				<u>j</u>	
	•			1:::				1	
		As Above + Bla & Contonaisons Sha minor Muscovite	V.7	1:::::	 			-	
		Medium + Fine Grained Transparent QUARTZ + minor FELDSPATHE SAND	30 m	∃ ∷∷		 	1	j	
	. 1			1]	
	,	+0.22		1:::			ļ	4	
	1/0/	Fine Grained Transparant QUARTZ MINOS FELDS PATHIC SAND + white		1:::	<u></u>	1	-	1	
	7.	SANDY SILTSTONE	40 m	<u> </u>]	
٠	OK	Medium Grained Very Clean Transpara QUARTZ SAND [+minor Salery] to	eux!	- 11.5				1	
•	1	pyritle.		+:::	 		<u> </u>	-	
: •	3	Medium + Coanse Grained Transpare QUARTZ + minor FEDSPATHIC SAM	שני פני	13.2				1	
	Ó.		50m]:			ļ		
	DND	+ minor spharuli pytite	tie	↓ ;;.	· 		1	-	
	JAD!	10		1:::]	
•	10	[프로 위상 음식 설탕	60 m	1] [
		+ MIM De		4	-	·	+	+	
Ė	-	Fine Grained Light Grey QUARTZ		+:::	+		 	1	
19000	1	SAND turnymore very fire	4	1:::]	
00.	, S	1+m man fine gloribed coal fragment from or mile + 7% medium - coarse agrain	20 m	4.	; 			4	
V.	4 5	frequents of black souty as	rat	₹	.}			+	
Λ ζ.	20	+ minor muscovite]::: <i>:</i>	:		<u> </u>		
>	2.4 0.5	1+ miner SOH brown - bla]					
ž	563	thing soft brown - blac crumbly coul t 5-10% pyrite	80 m	1::		-		-	
Vi	ALG	+ 3-10% portion gray		1::::	<u> </u>	 	+		
3.6%.		Medium 6-cy Crumbly SHALT SILTSTO		1==]	
0		- very little sample		\ <u>-</u>			-	-	
00,			900	, -{:	<u> </u>	- 	 	1	
75/22	3			1					
3	A	t]===				_	
WATER FLO	017	Darle Gray Graphitic Country		<u> </u>	4				
		SHALT SILTSTONE + minor pyrite	1000	n-	<u>:</u>	 		_	
	Took	/5		1				_	
	MT	+ MUSCOUTTE MINOR YOU	<u></u>		=			-	
	12	fine grained fring west	feed	+===	-				
			1100	n –					
			. .	1				_	
		<u> </u>					To a book of	1	
					Di	NILL TYPE:.	$s_{\mathcal{L}}$ $r_{\mathcal{L}}$ $r_{\mathcal{L}}$ $r_{\mathcal{L}}$	DATE DRILLED: 16th MAY 19	

	ECT : MURLODGOPPIE COAL			ON ORIL		INCLINA	LAR:
25	0.5000/07/04/	оергн	100		GEOCHEM	y	REMARKS
리.	DESCRIPTION	METRES	200	(ppm)	Cu (ppm)	Zn (ppm)	
	Buff Dust + Gypsom		ŀ				
1	Buff + Tellow Medium Grained Weathered Clayey SANDSTONE						
	Statuted Stay 3, 11 55 TOLE	1	::::::		ļ	<u> </u>	-
			1::::				
	becoming loss weathered + loss changy As Above + minor gives SHALE + pink fire granted SANDSTONIE	10 m -				 	•
777	and Time and A Modium						
	Grained Yellow QUARTE SAND +]::.::				
2/2/2							
7	As Above + Light Grey SANDY SILTSTONS	20m-	12.00			 	
j	Medium + Coares Grained Transparent QUAR SAND + most FELDSPATHIC SAND - very blee Fine + Medium Grained Transpatient	-	1		 		
	QUARTZ + mimor white FELDSPATHIE				 	 	
NO	SAND very clean						j
4710	<u>, , , , , , , , , , , , , , , , , , , </u>	30m -];;;;				
FORMA	+ v Goy minor frable black coul					<u> </u>	-
FOR	As Above +20% Medium Gran SANOY SILTSTO	~E	13.3.3		L.	-	-
	As Above +209 Medium Gray SANOY SILTSTO + minor black frields coul Fine-Madium Gramed +29 black coal	1	1	 	 	-	1
216	White FGLOSPATHIC SAND + Ucyminor black		1:33]
Ó	+minor very fried	40 m			·		
) 	Fine Grammed Transparent Quitetz +minor white Ferre Betwee Silver & Various black con	<i>x</i> .	13.5.5	<u> </u>			
5 7	Fine - Medium Grand Transparent QUAR + minor white FELDS PATHIC SAND					- -	
914	Fine Grain and Transparat QUARTES.	4.0	1.33.5	<u> </u>	 		-
0 0	+minor muscosite +minor blacke frable coal	50m	1	:	 		
10.4	Fine - Medium Grained tyning black		1::::				
N.W.	Transparent QJARTZ SAND						
32			1	1	_		5% intenstitual pyr
1166	Fine-Medium-Coars a Grained Transparent QUARTZ SAND+Majium-Tank Gray Graphitic SHA Fine-Medium Grained Transported QUARTZ	60 m	1:7:	<u> </u>	 		
PROT	Fine - Medium Grain ed Transportut QUARTZ SAND+Medium - Ante Grey Gradicitic SHALL GRANITE - grey. C.G. 2001 o quartz 30 95 Fe Rent biotite. (clays due to weathering	Ads	++	<u> </u>			- Lunconformity
1 8	Bottom of Hove 65m		1+				
1] .		<u> </u>		
	The state of the s	70 m	4		<u> </u>		-
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				DR 	THE TYPE:		DATE DRILLED: 17HL MAY 1971 LOGGED: BJ.U.

	TIC	ON:CO-ORD.	S:3	₹ ₹4	SHEET 1:250,000 4:252		DIRECTION:	
100		DESCRIPTION	DEPTH METRES	LOG	(ppm)	GEOCHEM Cu (ppm)	Zn (ppm)	REMARK.
	1	Dark Grey - Black Fissile SHALE						CONTRACTOR
, June 1	.	J + Gypsum'	-					
7	f	Mid-Grey SANDY-SILTSTONE With		::::				
	.	Carbonacions Matrix	10 m -	:::.		ļ	-	
102								
2		Medium-Coarse Crained + very mmor pyrite Clean Transparent + coarse	 					
9	8 -	QUARTZ SAND Medium - Fine Grained Vean -	-20m-					
- 1'	,	Transparent QUARTE + Buff Clay	1					
	٤.	Medium Grained Clean Transparent QUARTZ + White FELDSPATHIC SAND						•
- 1	9				ļ,			·
	5,00	Coarse + Medium Grained Very	-30m -					
	4	Clean Transporant QUARTZ+ White FELDSPATHIC SAND				 		
1								
1	.		40 m -					
	}	Medium - Fine Very Wear Transportent QUARTZ + White FELDS PATHIK	 					
	+	5400	50m -			<u> </u>		
		Coarse + Medium Grained Transparent QUARTZ + White FELDSPATHIC SAN - Very clean						
			60 m -		ļ	-		• 1
\dashv		As Above + Darle Gray - Black Shale	 					
		Egnal anantities of medium - Courses reines SANDA school + And Brow County Shall + Clay Dark Grey - Black SHALE + Clay with Sand Contamination of from 1602						
	1	Medium Grey Weathered SHALE+CLAT	70 m -	 ==		<u> </u>		
				1-				
٠		bacoming medium-light ge As Above + Medium Grain and Fransparent Clean BURGET STORY Contamination	Mean insparent					
	.	Medium Grey SHALE + minor Clean transparen			ļ	-		
		Mcdown - Darke Gray SHALE + Clay + Minor Medium Gramed Transparent Clean Sand - (gontammation?)		=	-			- 1
1	90	of Fine - Medium Gramed QUARTZ SAND						•
	ő	Medium-Light Every SHALE + CLAY + Equal quantities of Fine-Medium Grained Transparent QUARTZ SAND	90 m	J				
	7	Grand Transparati Control of	30111					
	ph.	Medium Every Fissile Schale + Medium	4					
	6000	Grained Transparent QUARTE SAND (contamination)						
	1/0	Medium Grey Fixile SHALE	100 m				<u> </u>	
	((-			
			-	<u></u> -				
			110 m	+				
•		Dark Gray - Black Carbonaceous		 ==	-			
	<u> </u>	Fissile SHALY SILTSTONE BOTTOM OF HOLE 117m]-:-		ILL TYPE:.		TE DRILLED

LOCA	ATIO	i:co-oru			1:250, 4141.					:90°.
CUT		DESCRIPTION	DEPTH METRE				EOCHEM	70/0001	-	REMARK.
1 3 c		Buff Weathered Fissile SHALE	PIEIRE	==	(ррп	7/	Cu (ppm)	Zn (ppm)	_	
	E	Day of the track		1						
	7 7									
	N		1	+-						
	900		10 m	Ţ <u> </u>					_	
	2 1	Dark Grey-Black SILTSTONE	-	 -						· .
	Ø)			1:					7	* *
	20%	Fine Grained Transparent QUARTZ SAND + MINOR ABOUT MEDIUM GOWING TRANSPARTAUARTZ+ MINOR FELDSPATHIC SAND	20 m	12 (%) 12 (%)	-	-				
	74.47	As Above but coarse grained								• • •
	75	Medium Grained Transparant QUARE + mmor white FELDSPATHIC SAND	12		75		35	55	$-$ $_{Pb}$	65
486	ئار 14	+ Buff Cla					<u> </u>		ゴ゙	
120	0-40	Medium - Coarse Gramed Transpara QUARTZ+MILLON FELDSPATHIC SAND + High	٠, ١		ļ				\dashv	
	40VA		-		ļ					
]"	U I	Fine - Medium Grain ad toufflay Transparent QUARTZ+ primer white FELOSFATHIC 5AND rhydlite ty							\exists	
	. 3X	Medium - Corince Comined 114 Grandet	1							· · · ·
	510	Medium - Fine Crimes Alove	-						\exists	
	4 5 9	Coorse Grangel Transparent QUARTZ					· · · · · · · · · · · · · · · · · · ·			
	ν̈́	Medium - Fine Erined Above Fine Erined Above	50m	133.5						
	2	Fine-Median Grand Transparent BUFFTZ - when FELDERTHIC SAND		18.50 18.50 18.50						
	3		<u> </u>						コ	
	居 3	transparent QUARTZ+ mica. mica. Mica. SAND			!		•	 		
1 1	AL 6	Fine Grainad Above	60 m						コ	
1		As Above + Dark Grey SHALE + minor pyrite D. 1. Grey Westbared Greasy			-			<u> </u>		,
		Dark Grey Weathered Greasy SHALE		1						الأراضية من المعادات
7			70 m	·				-	\dashv	٠
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2				-				-		•
à.		Light Grey Green, Fissile, Fred J SMALE	80 m							
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The state of the s				DESCRIPTIO	Ŋ	OEPTH METRES	LOG	(tiom	GEOCHEM)		o (n)	REMAR	9 <i>K</i> \$
Deade Gray Black Trade 59/6 20m - 10m - 10	-	 	Brown	Soil + Rubble									
Description of Stands of S			j		HALE + Gypsom+	+							
The desired of Stands 1987/16 20m - 30m -			1.										٠
The Comment of Tourspared Owners of Tourspared Owne			Sha	le bollay	+ Sypsum							4	
Debte Every Black Fresh 1981/E 20m	1.					10 m -							
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White Feese serve Shop Som Fine Seawed Transford Transford Transford Development Feese Seawed Transford Feese Seawed Transford Feese Seawed Transford Feese Seawed Transford Transford Feese Seawed Transford Transfor	1 2	•		<i></i>									·;
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As Move Fine - Mahum Gained Transluciat aught; minor shirte FROMATTIC SAND + minor shirte Transluciat aught; minor shirte FROMATTIC SAND + minor shirte Transluciat aught; minor aught; Transluciat aught; minor aught; Transluciat au		1.	Fine	· Grained Transp	arent + Translesses	+				-			
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As Above Fine - Malum Gained 80 m Medium - Course Grained Transported 1 Transported Quarty - minor Feldspublic SAND + White Claby + minor Fine Grained Transported QUART 2 SAND + White Claby + minor Fromboldal Pyinte Recoming very fine grained Recoming very fine grained Transport QUART 2 SAND Madium - Course Grained Very Clean Transport Quart Gray Fissile SHALT - SILTSTONE Dark Grey Fissile SHALT - SILTSTONE The Standard Grained Transported 110 m The Standard Gray Fissile SHALT - SILTSTONE	.		Tran	SPATHIC SAND +	minor white minor muscovite								
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As More Fine - Malum Gained 80 m Machine - Course Grained Transported 1 Translated Quarty - minor Feldsyndlic SAND. Fine Grained Transported QUART 2 SAND + White Aldy + minor Fromboldal Ryinte Recoming very fine grained Recoming very fine grained Recoming very fine grained Transport QUART 2 SAND Transport QUART 2 SAND Dark Grey Fissile SHALT - SILTSTONE AS Above + Fine Grained Prival Quart The Grained Transported Transported 110 m The Grained Transported Transported Transported 100 m The As Above + Fine Grained Transported 110 m The Grained Transported Transported Transported 110 m The Grained Transported Transported 110 m The Grained Transported Transported Transported 110 m The Grained Transported Transported Transported 110 m The Grained Transported Transp	800	A				20 m							
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Medium - Course Grained Transparent! Transparent Quartz - minor Feldspattle SAND Fine Grained Transparent QUARTZ SAND + White Chily + minor Frombotdal Pejite Peroning very fine grained Misdium - Course Grained Very Clean Transparent QUARTZ SAND Lowidentherontaminuta To Hove + Dark Gray Fissile Shalt TITONE Dark G-ey Fissile SHALT - SILTSTONE AS Above + Fine Grained SAND COURTS SAND QUARTZ SAND					A STATE OF THE STA								
Medium - Coarse Grained Transparent! Transburger Awartz + minor Feldspathie SAND Fine Grained Transparent QUARTZ SAND + White Chily + minor Frombotdal Papite Peroming very fine grained Medium - Coarse Grained Very Clean Transparent QUARTZ SAND Ato Allove + Dark Gray Fissile Shalt 7512750NE Dark G-ey Fissile SHALT - SILTSTONE Ato Above + Fine Grained Minor Quarts The Sand Above + Fine Grained Sand Of Medium - Coarse Grained Minor Quarts Ato Alove + Fine Grained Minor Quarts The Grained Sand Of Medium - Coarse Grained Minor Quarts The Grained Sand Of Medium - Coarse Grained Minor Quarts	'	1 2					1						
Fine Grained Transparent QUART 2 SAND + White Clody + minor Frombould Pyrite 20 Becoming very fine grained Wedium-Course Grained Very Clean Transparent QUART 2 Sino Wedium-Course Grained Very Clean Transparent QUART 2 Sino Dank Grey Fissile SHALT-SILTSTONE To so of the Above + Fine Grained Minor Quart The Above + Fine Grained Minor Quart The Quart SAND		EL.	H s	Above Fine - Ma	dium Gamed	80 m	-	<u> </u>	-	-			
Fine Grained Transparent QUARTZ SAND + White Clidy + minor Frombodal Pyrite Recoming very fine grained Recoming very fine grained Response toward Very Clean Transparent CUARTZ SAND Heavidenthecontaminata 100m As Above + Dark Gray Fissile SHALT-SILTSTONE Dark Grey Fissile SHALT-SILTSTONE To a fine Grained Prinor Quarty The Grained Pr	8	10	Mea	livm - Course Grain	ed Transparent ,								
Frombordal Pyrite Prombordal Py	3	· ·	Trun	succest wasts + m	SAND.					· .		•	
Frombordal Pyrite Prombordal Py		-	Fine	Grained Transp	went QUARTZ	+	1000					•	
Becoming very fine grained Madrim-Course Grained Vary Clean Transparent CUARTZ SAMO Howsparent CUARTZ SAMO As Above + Dark Gray Fissile SHALT-SILTSTONE Dark Grey Fissile SHALT-SILTSTONE To Above + Fine Grained Minor Quant As Above + Fine Grained Minor Quant Quartz SAMO Quartz SAMO Quartz SAMO Quartz SAMO Quart		1 × 1	5A1	NO + White Close	tuinov	90 m	1				• •		
# House + Dark Gray Fissile SHALT-SILTSTONE Dark Grey Fissile SHALT-SILTSTONE To the first Grained minor Quant As Above + Fine Grained minor Quant Of the Company Show agreed		Š	Pere	coming very fine a	ained	-		ļ					
# House + Dark Gray Fissile SHALT-SILTSTONE Dark Grey Fissile SHALT-SILTSTONE To the first Grained minor Quant As Above + Fine Grained minor Quant Of the Company Show agreed	.	30.0	Tran	sparent BUARTZ -	Ed Vany Clan Signa			1					
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E" E SAND+SHALE	3	2/6	8	QUARTE SAND	equal	7		:					
	75'	" E	<u>} </u>	· · · · · · · · · · · · · · · · · · ·	62 SAND+SHAC	ε		-				المتعددة والمتعددة والمتعددة المتعددة المتعددة المتعددة المتعددة المتعددة المتعددة المتعددة المتعددة المتعددة	
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CUL		DESCRIPTION	METRES	100	(ppm)	Cu (ppm)	Zn (ppm)	REMARKS
==		Buff Soil+ Gypsom						
		Light Brown-Buff Blocky SHALE						-
		Davie Grey Blocky SHALE			· ·			
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			10 m -	- <u>-</u> -			-	
	ALE			┤ <u>_</u>		 	 	
	H	Becoming Fresher+ More Fissile]				
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7717	900	Thin Batof white Aphanitic amangite	20m-	ļ::-::				
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	-	Medium - Course Grained Transparent	+	1333]
		towar shale contamination from above	- 30m ·				 	
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		As Above + Light Guey SANDY SILISTONE.		M. Ci	 	<u> </u>	 	1
	-	As Above + Mid - Daile Grey She Gray SHALL	=	<u> </u>	<u> </u>			1
		Medium - Cornia Transparent QUARTE	i				:]
		+ White FOLDS PATHIC TIVEN MINOS ON THE	40m]
	ξ.	T+minor]			1	ļ	
	04	Muscovite			<u> </u>		-	-
	84				 	 		-
	à	<u> </u>	- 50m	1				
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	g.	U-2m 3/act. Complete	_	75 to 12		<u> </u>		pastoral bere.
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	_	Internation - Course Transport Quarte - Lite	70 m	-	4		+	-
Ę		Medium-Coarse Transfort Quarts, white FECRIPATINE SAMP it Bufflag Coarse same of Transforment QUARTZ+ White FELDSMATHE SAMP	\dashv		1	 	- 	-
1000		AS Above - medium grained						·
		Medium - Coarse Gruined Transparent QUARTZ & MIMOR FELDSPATHIC SAND						
10,	Ų	I	80 m					.
ر	100	Coarse Grained Transparent BUTKIZ						-
700	7		- -					┥.
000		As Above -, med - fine - Coarse Graned						
9		Medium - Coarse Granical Transparant BUARTZ + FEZDSPATHK SAND+ Pullinghe Wedy	(a) 40 m	(A)			,	
የን	997	Medium-Course Grained Transparent V QUARTZ + FRIDSPATTHIC STAD,	30					
3	7	•		3:333		_		-
-160c	1 2	Light Every Fisile SHALT SILTS TONE + Medium - Course Grand Transport Quarty + Feldspothic SAND.		 				-
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	, W	Boundary Weathered SHALE, Callaretts Fossil Fragmans Steel-Grey-Brown Weathered SHALE	<u> </u>		<u> </u>					- .
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AUSTRALIAN SELECTION (PTY) LIMITED

MURLOOCOPPIE COAL PROSPECT

Exploration Licence 184 South Australia

Final Report, August 1975.



MURLOOCOPPIE COAL PROSPECT

Exploration Licence 184 South Australia

Final Report, August 1975.

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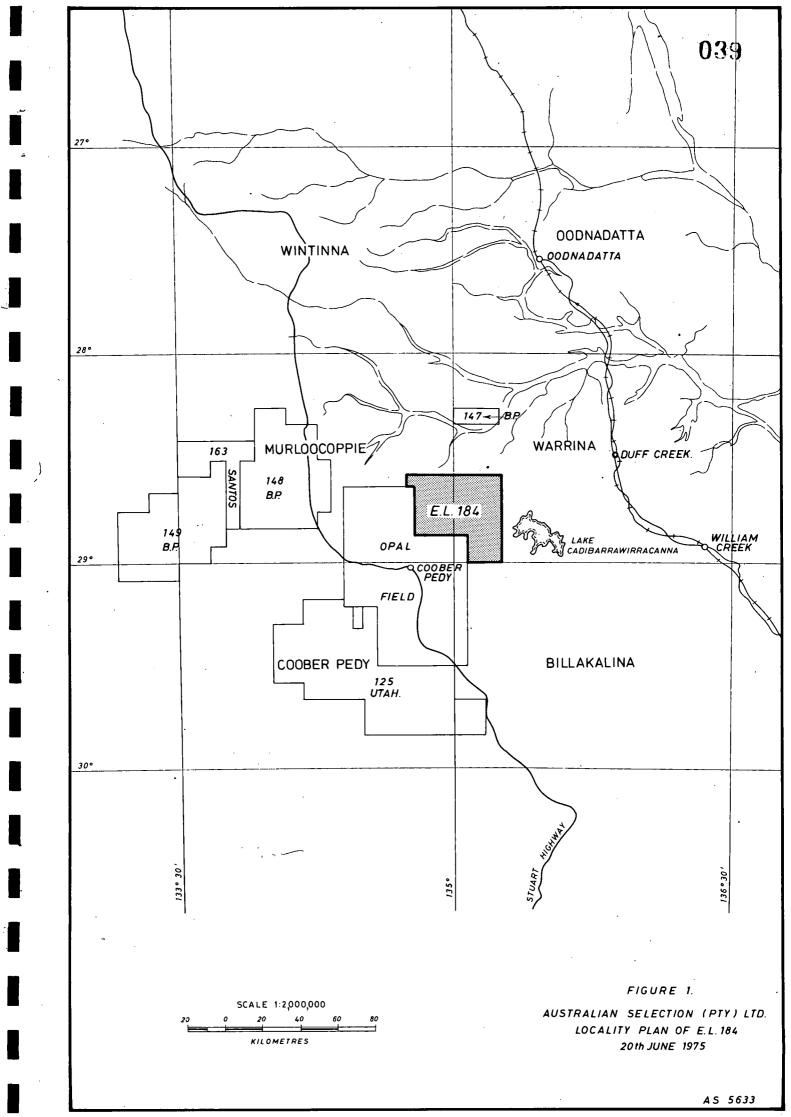
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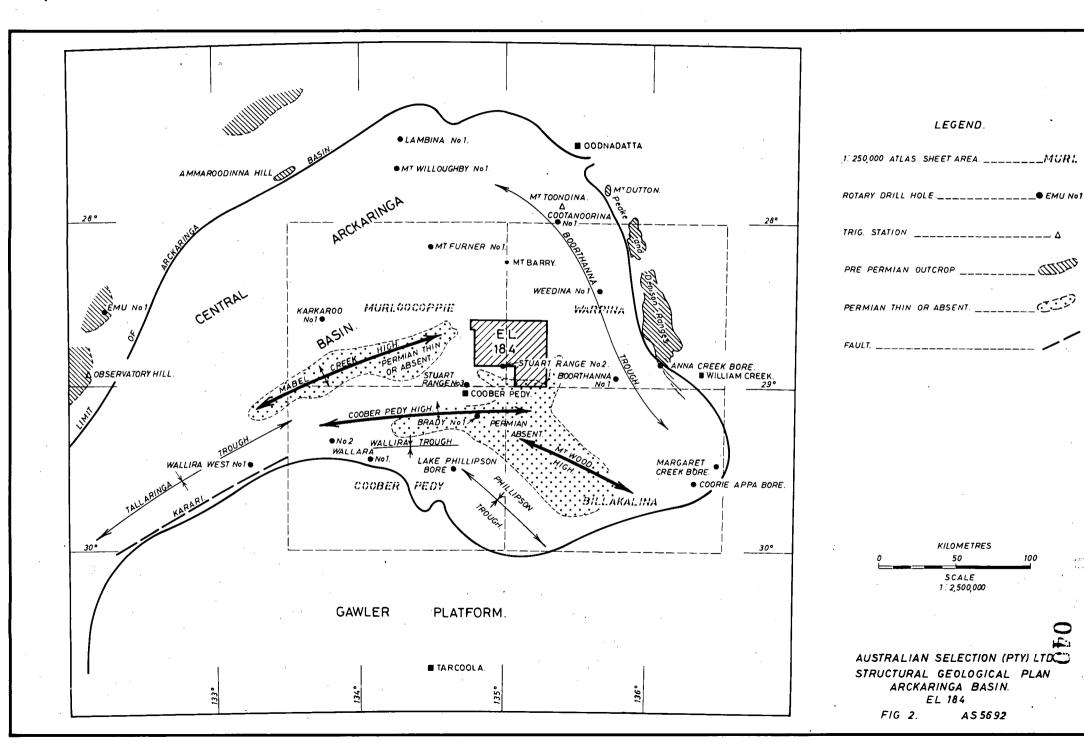
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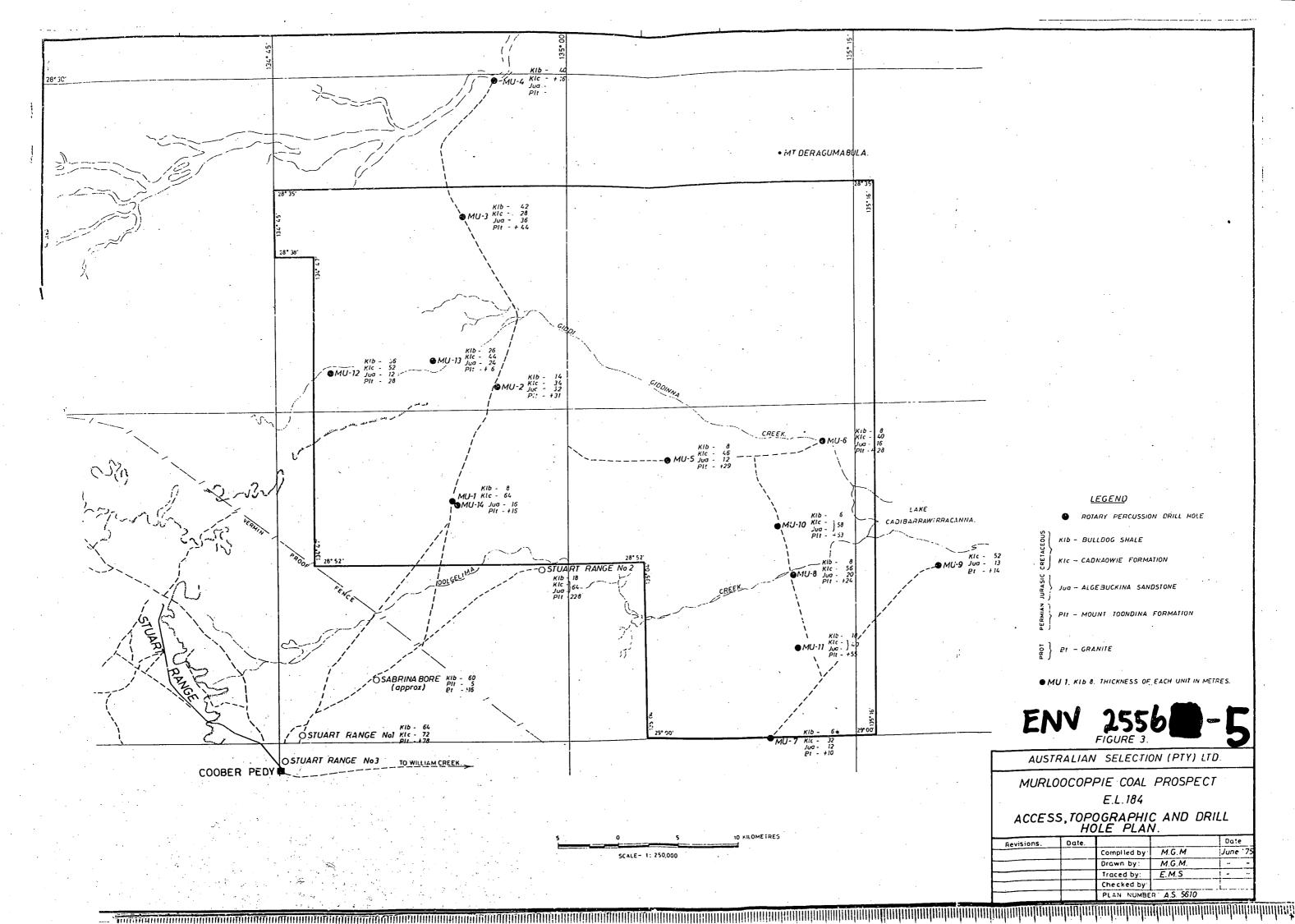
Appendix II Petrographic Analysis of Coal Samples from MU-2 and MU-13.

Appendix III Expenditure Report.

Fig. No.	<u>Title</u>	Plan No
1	Locality Plan E.L. 184 Scale 1:2,000,000	les alī
2	Structural Plan Arckaringa Basin Scale 1:2,500,000	
3	Access, Topographic and Drill Hole Plan Murloocoppie Coal Prospect Scale 1:250,000	
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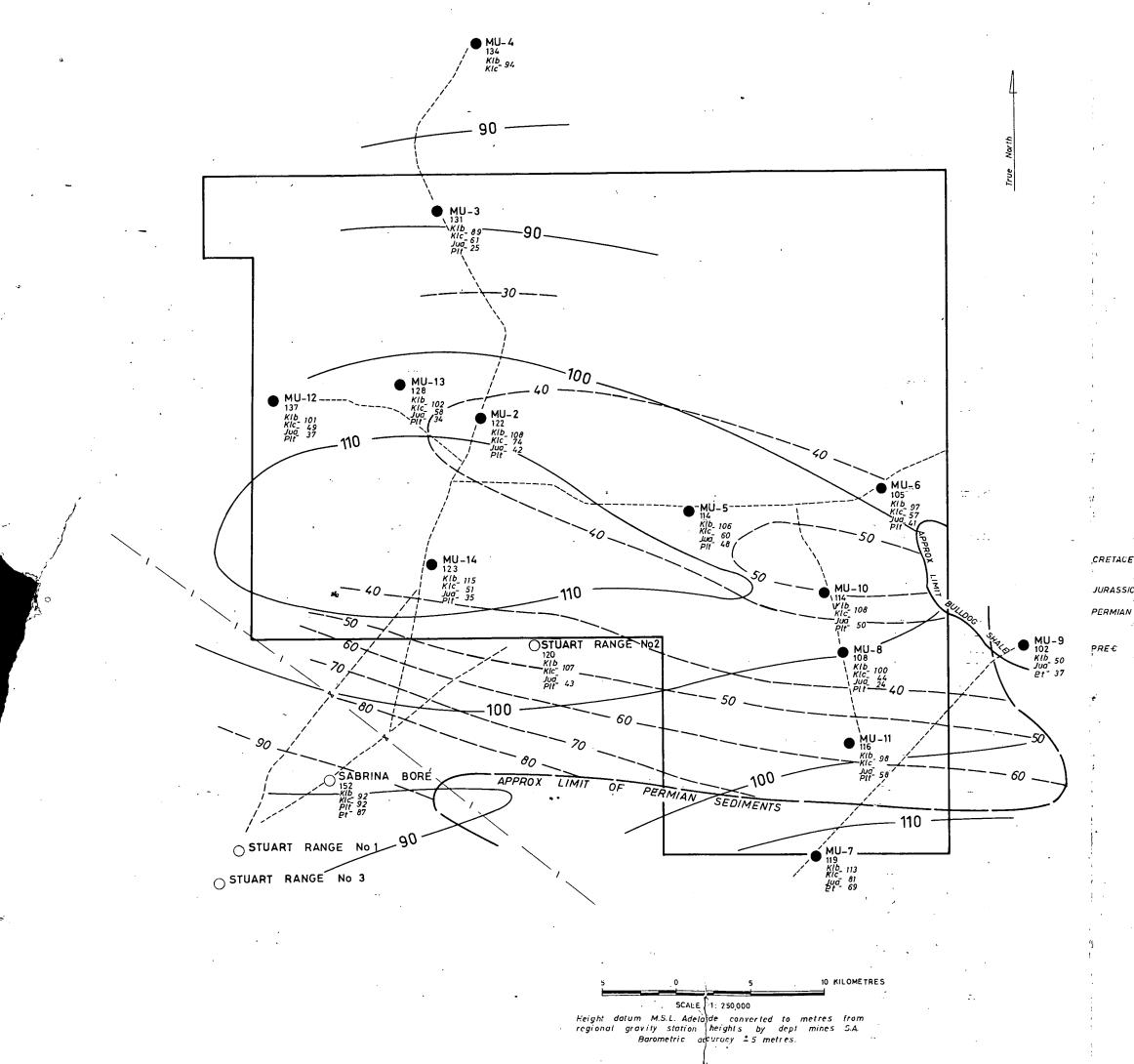




LITHOLOGY	FORMATION	AGE
	BULLDOG SHALE	Lower Cretaceous
	CADNA - OWIE (Mt. Anna Sandstone)	Lower Cretaceous.
	ALGEBUCKINA S.S.	Upper Jurassic
	(Upper) — MT. TOONDINA ————————————————————————————————————	Lower Permian.
	STUART RANGE	Lower Permian
	BOORTHANNA (Upper) (Lower)	Lower Permian.
+ \(\frac{A}{A} \) \(A	COOTANOORINA	? Devonian.
+ ?	OBSERVATORY HILL BEDS	? Cambrian.
Shale. Sandstone. Coal. Siltstone, Silty Shale. Dolomite.	Limestone. Diamictite. Granite. Anhydrite. Boulders & pebbles (granitic).	

COMPOSITE IDEALISED SECTION OF ARCKARINGA BASIN.

AFTER I.J.TOWNSEND 24 JAN. 73.



LEGEND

MU-6
105
Approx height hole collair (metres) above M.S.L.
Approx height (metres) above M.S.L. of contact between units.

KID Bulldog Shale

CRETACEOUS
KIC Cadnaowie Formation

JURASSIC Jua Algebuckina Sandstone

PERMIAN Plt Mount Toondina Formation

PRE€ Pt Granite

Contours of base bulldog shale top of cadnaowie formation

Contours of top of permian in metres

ENV 2556 -6

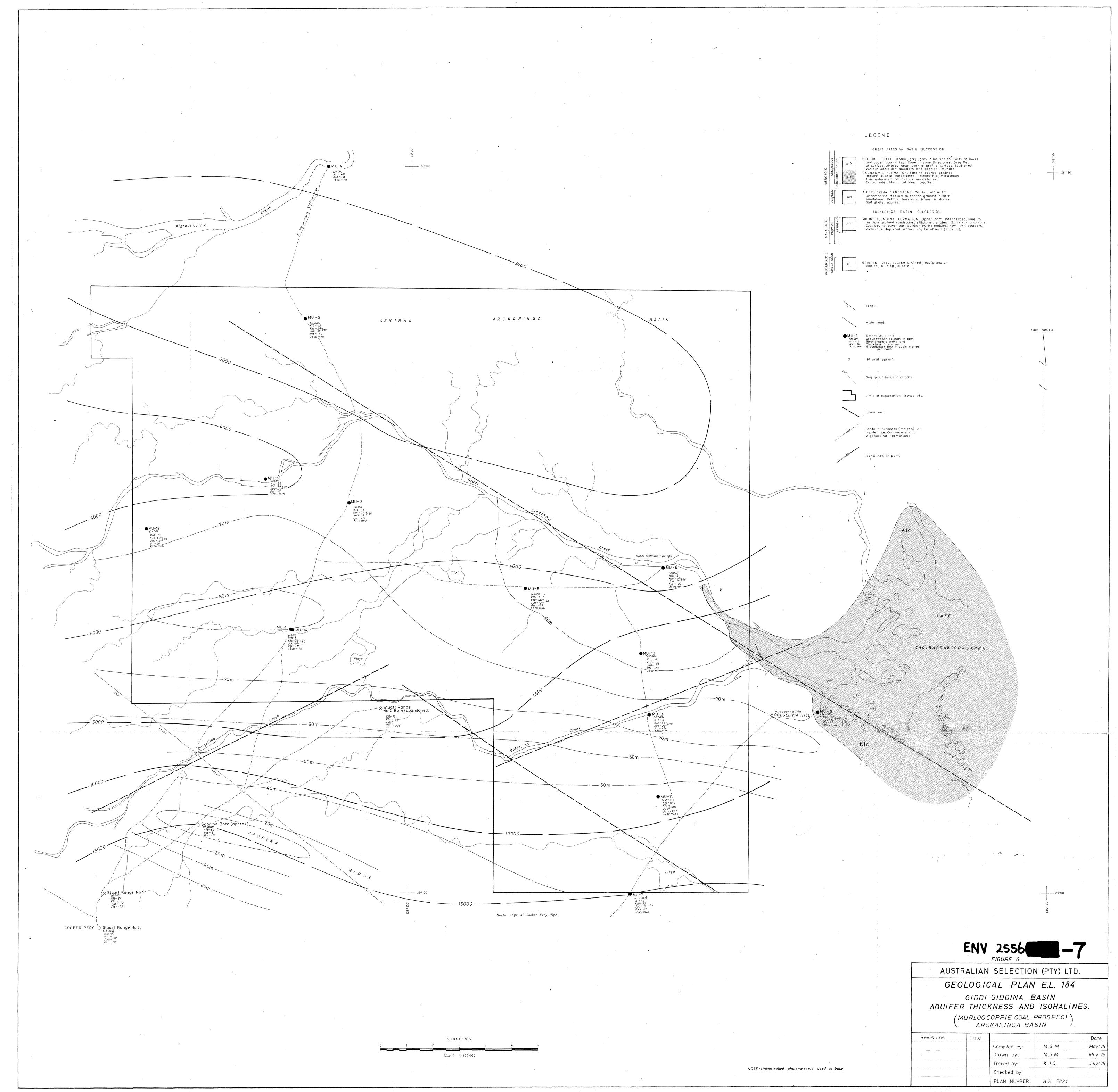
FIGURE 5.

AUSTRALIAN SELECTION (PTY) LTD.

E.L. 184

DRILL LEVELS AND CONTOURS ON TOP OF PERMIAN AND BASE BULLDOG SHALE

Revisions	Date.			Date.
	Ī	Compiled by:	M.G.M.	June '75
	1	Drawn by:	M.G.M.	71
	1	Traced by:	S.J.S.	
		Checked by:		
		PLAN NUMBE	R:A.S. 5632.	



1. INTRODUCTION

Exploration Licence 184 was applied for by Australian Selection (Pty) Limited as part of a programme to locate coal deposits amenable to open pit operation in the Arckaringa Basin South Australia. (Figure 1). Since early times coal has been known to exist in the Arckaringa Basin. In 1905 at Lake Phillipson (Fig. 2) a water bore to 988 metres intersected, between 50 and 143 metres in depth, a number of black bituminous coals ranging in thickness from 0.3 metres to 8.7 metres.

At Mt. Toondina (Figure 2) five coal seams are exposed in a circular piercement structure and total 11 metres thick over a stratigraphic interval of about 80 metres.

Following announcement of a proposal to re-route the Pt. Augusta-Alice Springs railway through Tarcoola, Utah Development Company took up exploration areas centred over the known shallow Lake Phillipson coal occurrence. Utah have located ten seams in an area of over 200 square kilometres at less than 200 metres below surface. To date over 2,000 million tons of steaming coal, amenable to open pitting, have been proved. (E.N. Milligan).

Mapping by the S.A. Geological Survey, on the Murlo-ocoppie 1:250,000 sheet area, during 1974, indicated the presence of an anticlinal structure in Mezosoic

rocks on the eastern boundary of the sheet. An E.L. to cover most of this structure, was applied for by Australian Selection (Pty) Limited on 4th December, 1974, on the premise that possible coal bearing rocks may be at shallow depth, centrally within the structure.

E.L. 184 was granted on 2nd March, 1975, current for 1 year.

1.1 Location and Access

Exploration Licence 184, the Murloocoppie Coal Prospect, covers an area of 1789km² centred about 40 kilometers north-east of Coober Pedy and 750 km N.N.W. from Adelaide. The exact position is shown on Fig. 1. The area is mainly within the pastoral block of Mt. Barry station with a small portion of the east side being within Anna Creek Station. This latter portion is also within the Woomera Prohibited area.

The land carries very little vegetation (no trees at all) and no sheep are run on this area.

Negotiations were successfully concluded with Weapons
Research Establishment to allow access onto the
Prohibited area during the period of exploration.

Existing roads in the area were confined to:-

- (i) the Coober Pedy-William Creek road,
- (ii) the Coober Pedy-Mt. Barry track,
- (iii) the dog proof fence which cuts the bottom portion of the block (see Figure 3); a rough track

is located next to it.

- (iv) a track that had apparently been recently graded from Duff Creek Railway Station to Weedina Waterhole and thence to Giddi Giddinna Springs.
- (v) an old disused track which passes from Coober Pedy to the abandoned Stuart Range No. 2 bore on Oolgelima Creek.

Indications were that existing tracks would be difficult to negotiate with heavy vehicles. However, this was not the case and even 25 tonne vehicles could negotiate these tracks with ease. The crust or virgin ground was soft and friable, making the first pass difficult. However, once the ground was flattened, access was relatively easy.

1.2 Physiography and Climate

The licence area is located to the east of the Stuart Ranges, which is the divide between drainage toward Lake Phillipson to the south-west and Lake Cadibarra-wirracanna to the east. The eastern side of the range is a line of breakaway country where the laterite profile developed during the Tertiary on Cretaceous units, has been stripped away. In fact, the area of the exploration licence has been stripped completely of its laterite profile and Bulldog Shale outcrops directly with no soil at all present. The surface is literally bare of vegetation and flat, rounded boulders

are randomly scattered over the khaki, dark grey clayshale surface. These boulders consist of silcrete
pebbles left from deflation of the top of the laterite
profile and well rounded reworked Permian glacial
erratics. The erratics are composed of rocks of
Proterozoic age. In places the silcrete boulders
form extensive sinuous areas which may indicate the
position of ancient drainage channels; e.g. an eastwest area through Mt. Derangumabula.

Rainfall is irregular and low (120mm/annum) and either seeps quickly into the deeply cracked clay surface, moves into near circular salinas to percolate downwards (or evaporate) or flows along shallow sinuous clay filled drainage channels to Lake Cadibarrawirracanna.

Two main drainages, "Giddi Giddinna Creek" and "Oolgelima Creek", are present. Surface waters are confined to a few mud pools in drainage channels after heavy rains and several natural springs on the edge of Lake Cadibarrawirracanna. Examples being Giddi Giddina springs and Oolgelima springs.

Although gypsum veins are common throughout the top ten metres of the Cretaceous Shales and widely scattered over the land surface, no salt crusts have developed in any of the salinas. This being apparently related to the quick ingress of surface water to subsurface.

2. REGIONAL GEOLOGICAL SETTING

Government drilling, in conjunction with private oil exploration wells, has defined reasonably accurately the Arckaringa Basin.

This is an intracratonic Permian sedimentary basin of about 80,000 square kilometres, located west of the Peake and Denison Ranges and centred at about 134°30' longitude and 28°30' latitude. See Fig. 2.

The basin is composed of a number of marginal troughs (grabens or half grabens) surrounding a central area of shallow basement. The troughs are:— the Boorthana Trough in the east, the Tallaringa Trough in the south-west, the Wallira and Phillipson Troughs in the south and the Wintinna Trough to the north-west. See Figure 2.

The northwest portions of the basin are overlain by Mesozoic sediments of the Great Artesian Basin and the whole by a thin veneer of Cainozoic alluvium and soils.

The basin sequence of Early Permian rocks is relatively well known from deep drill hole information (see Figure 4). The oldest and basal unit is the Boorthana Formation which consists essentially of conglomerates and sandstones. Overlying this is the Stuart Range Formation of marine shale, while the uppermost unit is the Mt. Toondina Formation (Townsend and Ludbrook, 1975).

The Mt. Toondina Formation (Fretag, 1965) is the unit throughout the Arckaringa Basin within which the coal seams are found (see Figure 4). The unit is 330 metres thick in the type section and consists of an upper section (170 metres) of grey carbonaceous shales, coals and interbedded grey sandstones, siltstones and sandy shales. The lower section is sandier and less carbonaceous. In places the coal bearing section has been eroded away.

The Mt. Toondina Formation was deposited in non-marine lagoons and swamps with intermittent deposition of fluvial sands.

Unconformably overlying the Permian in the north-west of the Arckaringa basin is a series of Jurassic-Cretaceous units which are of particular interest since they cover the Mt. Toondina Beds in the Murloo-coppie Anticline (Exploration Licence area).

The basal unit is the Upper Jurassic Algebuckina Sandstone. Overlying is the Lower Cretaceous Cadnaowie Formation which is generally represented by its uppermost member, the Mount Anna Sandstones Member. This is then overlain by the Lower Cretaceous Bulldog Shale (marine).

3. EXPLORATION

3.1 Company & Government Exploration

Exploration in the Arckaringa Basin had been mainly for oil up until several years ago. As the potentially oil bearing zones are close to the coal bearing sections (i.e. the upper Mt. Toondina Formation) oil exploration results are extremely useful in the search for coal.

Between 1969 and 1971 the South Australian Department of Mines completed seven stratigraphic wells (see Figure 2) most of which intersected coal seams. Cootanoonina No. 1 intersected 14 seams of coal from 10 centimetres to 2 metres thick between 190 metres and 350 metres depth. In Karkaro No. 1 a 1 metre and a 2 metre coal seam were penetrated between 70 and 74 metres while Mt. Furner No. 1 intersected 5 seams, 1 metre to 3 metres thick between 130 and 170 metres vertical depth. Oxymin Boorthana No. 1 also intersected coal seams but thinner than those in Cootanoonina No. 1 (Holmes, 1970).

Reports of exploration on formerly held Exploration

Licences listed as follows, provided helpful background
data:-

- E.L. 148 & 149 BP (current) and W of E.L. 184,
- E.L. 163 Santos (current) and W of E.L. 184.
- E.L. 147 BP to the north of E.L. 184 (current).
- E.L. 104 Shell (relinquished) S.E. of E.L. 184.
- E.L. 108 Shell (relinquished) N.E. of E.L. 184.

E.L. 15 & 39 - Oilmin - (relinquished) N and N.W. E.L. 184

No significant shallow coal intersections were made in the relinquished areas. In Oilmin's areas to the north-west of E.L. 184 coal of low rank was intersected in Cretaceous sediments. The coal is not of economic significance.

3.2 Drilling

A truck-mounted Schramm rotary-percussion rig with its own compressor was used. This rig has a hydraulic pull-down with a rotary top drive enabling the amount of bit pressure to be varied from 0-14 tonnes. The rig was equipped for rotary air drilling and a water pump and tanker supplied for rotary water circulation drilling.

The rig was also supplied with a PW conventional core barrel equipped with either a diamond bit or a bit with "tungsten" inserts.

A total of fourteen holes was drilled for a total length of 1,362 metres. Several cores were attempted in holes MU-2 and MU-4 of which two were successful after a minor problem with the core lifter was elimated.

No water circulation drilling was attempted since an adequate sample return was gained in most holes. High water flows were intersected in almost all holes. This created some problems with fine clays often being washed

away. However, a careful scrutiny of operations at all times indicated an accurate assessment of rock type. Coal was intersected in a number of holes; generally in the Cretaceous Cadnaowie Formation. The only method of coal collection was to run the water through a sieve. Retention of finer coal particles occurred in the sample buckets around the hole collar, while coarser lumps floated out and onto the sieves.

Samples were collected in buckets at the drill collar over two metre intervals. These samples were placed in rows on the ground near to the drill site. The samples were then logged individually under a binocular microscope, then sampled using Kraft envelopes for storage.

When coal was intersected the exact depth was noted and both bucket and sieve samples taken over a two metre interval. Only a rough estimate of coal seam thickness and quality was possible. However, even 0.05 metre seams of coal could be recognised and seams of better than 1 metre thickness gave good samples at surface. Only where seams were thicker than 0.5 metres did the water return become brown or discoloured; e.g. MU-2, MU-3 and MU-13.

Proterozoic granite was intersected in holes MU-7 and MU-9. In hole MU-7 blades were exchanged for a hammer drill and rotary percussion continued from 53 metres to 60 metres. In MU-9 the hole was carried to the limit of penetration by rotary blades.

]	Hole No. (MU)		ap rds	Total Depth	Date Drilling Commenced	Comments
	1	2827	4277+	59	29.4.75	Abandoned-high water flows
	2	2868	4382+	111	30.4.75	1m coal in Mt. Toondina
				•		at 84 metres
	3	2838	4534 ^T	1 50	2.5.75	1m coal in Cadnaowie
1	4 .	2860	4534 ⁺ 4660 ⁺	56	4.5.75	Didn't reach Mt. Toondina
	4 5	3024	4315	95	5.5.75	No Coal
	6	3164	4329	82	6.5.75	No Coal
	7	3115	4060	60	15.5.75	Granite
	8 9	3136	4207	108	16.5.75	No Coal
	9	3257	4210	65	17.5.75	Granite
}	10	3124	4252	117	18.5.75	No Coal
	11	3141	4141	117	19.5.75	No Coal
1	12	2715	4394	128	20.5.75	No Coal
	13	2809	4402+	100	21.5.75	1-3m coal Cadnaowie
	14	2827	4277+	114	23.5.75	No Coal

Total Advance 1,362 metres

+ Murloocoppie 1:250,000 Atlas Sheet - remainder Warrinna 1:250,000 Atlas Sheet

High water flows often washed outside the collar casing and created large holes around the collar. Disposal of water was also a problem. Often sites were chosen on stream banks and water flowed for several hundred metres along the permeable deeply cracked stream beds. Volumes of greater than 500 cubic metres were generally pumped from the hole during drilling operations.

4. GEOLOGY OF E.L. 184

4.1 Stratigraphy

The stratigraphy encountered during drilling of E.L. 184 was similar to that elsewhere in the Arckaringa Basin with only minor differences.

Mt. Toondina Formation was intersected in ten holes; the depth below surface varied from 62 to 106 metres averaging 81 metres. The deepest penetration into Mt. Toondina Formation was 66 metres in MU-11 and averaged 30 metres. The sediments of this unit varied little throughout the licence area and also varied little with depth. It appears that in most cases the top coal bearing section of the Mt. Toondina Formation has been eroded away. This indicates Post Permian uplift centred around basement highs. general the sediments were grey silty shales carrying up to 10% fine carbonaceous fragments. Thin siltstones and sands were present often associated with thin coal fragments. A few thin pyrite noduler zones were intersected; e.g. MU-5. The shales were well bedded and relatively fissile. Garnet tended to be a prominent accessory in holes MU-2, MU-3 and MU-14.

Mesozoic sediments were encountered in all drill holes from surface to the Mt. Toondina Formation. In general Bulldog Shale occurred on Cadnaowie Formation with Algebuckina sandstone beneath. In some areas Bulldog Shale was absent and Cadnaowie Formation outcropped.

The Aegebuckina Sandstone is the basal unit on the Permian and is of Upper Jurassic Age. This unit is the main aquifer for the Great Artesian Basin, and, similarly, is the main aquifer in this area.

The Aegebuckina Sandstone has been recognised in most drill holes and can be equated to the Mt. Furner No. 1 section (105-132.5m - Townsend, 1973).

The unit is generally coarse to medium grained quartz sands with some coarser pebble bands. A core taken from MU-2, at 60 metres depth, showed coarse cross bedded, well graded, unconsolidated kaolinitic sands. The core could not be preserved.

The Cadnaowie Formation is often difficult to diffentiate from the Algebuckina Sandstone in rotary chips. Both are coarse to medium grained, relatively unconsolidated sands with minor fine sand, silts and silty shale layers. The Cadnaowie Formation has thin undurated calcarenite bands near the top in the northern part of the lease (MU-4), similar to those intersected in Mt. Furner No. 1. Coarse grits, with round pebbles of pitted porphyritic rhyolite are common at the top of the unit and may equate to the Mt. Anna Sandstone unit.

Together these units are about 60 metres thick.

Bulldog Shale overlies the Cadnaowie Formation and is again of Cretaceous Age. At the base of the Bulldog Shale is a more silty member which, though only a few metres thick, can be recognised over most of the area. This equates to the un-named Transition Member of Ludbrook in the Stuart Range No. 3 Bore. Thin calcarenties with cone-in-cone structure are common to this interval, but do occur elsewhere in the overlying section. This unit consists generally of khaki, black to grey carbonaceous shales.

The Bulldog Shale outcrops over wide areas. Where the Tertiary laterite profile is present (e.g. the opal workings at Coober Pedy) it is a pale brown to off white silty claystone. However, where the laterite has been stripped, which is the case over most of the Exploration Licence, the shales are khaki, dark grey, soft and contain abundant gypsum veins. Cadnaowie Formation outcrops around Lake Cadibarrawirracanna, and to the east as a strip parallel to the Peake and Denison Ranges. This area is typified by sand dunes and salinas; with springs near the outcrop edge of the Cadnaowie with the Bulldog Shale.

4.2 Structure

Drilling has shown two basement highs: one under Sabrina
Bore extending southeast, the other under Lake Cadibarrawirracanna and extending south; both joining
the Mt. Woods high. The high passing under Sabrina

Bore has been termed the "Sabrina Ridge". In all cases the highs consist of granite, or granite gneiss, showing weathered surfaces which rapidly become solid rock and fresh in depth.

Preliminary work indicates the Permian unconformable surface and later units dip towards the north from the "high" at the south edge of the Exploration Licence. However, interpretation is hampered by lack of accurate levelling. A weak, broad anticline may be present as shown by the base of the Bulldog Shale (see Figure 6). However, the top of the Permian is much more complex. A low is present almost directly beneath the Cretaceous anticlinal structure and this is both the thickest and the deepest part of the Cretaceous sediments. That is, the deepest part of the basin has suffered some uplift. Figure 6 shows the thickness of the Algebuckina and Cadnaowie units together.

Several lineaments have been noted. One passes along a W.S.W. branch of Oolgelima Creek to the N.W. of Sabrina Bore. The Sabrina Ridge appears to be affected by this feature and becomes less pronounced on the northern side. The lineament lines up with the Karari Fault mapped to the S.W. A similar lineament parallels Giddi Giddinna Creek and the southern edge of Lake Cadibarrawirracanna.

4.3 Hydrogeology

Large volumes of brackish water have been located in the Algebuckina and Cadnaowie coarse sand units. This groundwater sub-basin of the Great Artesian Basin has been described in detail in report by Mason (1975) and will not be further discussed here.

4.4 Coal

Carbonaceous fragments were intersected in almost all holes from the Cretaceous Cadnaowie to the Permian Mt. Toondina Formation. However, coal seam intersections were confined to MU-1, MU-2, MU-3, MU-8, MU-9 and MU-13.

Coal in the Mt. Toondina Formation was confined to MU-3 (less than 50mm seams below 125 metres) and MU-2, where a metre seam was intersected from 81.5 to 82.5 metres; a 0.2m seam at 86.5 metres, and seven 50mm seams were intersected down to 101 metres. Below this the sediments were not carbonaceous. Petrographic analysis of coal from the interval 84-86 metres indicated the coal was principally vitrinite with sub-ordinate amounts of granite and inertinite. The coal was low rank with an estimated violarite matter of 55%, calorific value of 12,500 (Btu/lb) and low ash content. Details appear in Appendix 2.

The metre intersection in MU-2 was the only Permian intersection of note. This intersection is

surrounded by barren holes MU-13, MU-14, MU-3, MU-4, MU-5 and Stuart Range No. 2. Therefore, the possibility of an economic development of coal is confined to the northeast, where drilling indicates the Permian is greater than 100 metres below surface.

Coal in the <u>Cadnaowie Formation</u> was much more common and widespread. Intersections included:

- MU- 1 minor seam at 41 metres
- MU- 3 1 metre seam 42-43 metres 4 0.05 to 0.2 metre seams 43-47 metres few minor seams down to 66 metres
- MU-8 minor seams 66 to 80 metres; possibly in the Jurassic Algebuckina Sandstone
- MU- 9 minor seam 30-52 metres
- MU-13

 0.5 metre seam 28-29 metres
 1 to 2 metre seam 56-58 metres
 1 metre seam 59-60 metres
 0.5 metre seam 66-67 metres
 minor seam 88-89 metres, probably in the
 Jurassic Algebuckina Sandstone

Of these, the intersections in MU-3 and MU-13 were significant. These may in fact be the same horizon and continuous. However, the minor intersections in MU-1 was not repeated in MU-14 and indicates a lack of continuity of coal seams in the Cadnaowie unit.

Coal has previously been intersected in the Cadnaowie by Oilmin further to the north. The quality was poor, as is the case in this area.

Three samples from MU-13 were submitted to Robertson Research for analysis. See Appendix II. Intervals

tested were from 32-34 metres, 56-58 metres and 59-60 metres. All samples were similar being almost entirely composed of vitrinite, low rank, an estimated 55% volatile matter, caloritic value of 12,400 Btu/lb and of low ash content.

5. CONCLUSIONS

The top of the Mt. Toondina Formation varies from 62 to 106 metres below surface generally becoming deeper to the north.

Coal was intersected in the Mt. Toondina Formation only as a 1 metre seam in MU-2. Surrounding holes indicate that the intersection is of no economic significance.

Coal was intersected in MU-3 and MU-13 in the Cretaceous Cadnaowie unit. This suggests a significant area underlain by coal greater than 1 metre thick. However, the quality is poor and no economic deposit is considered present.

There is little chance of significant coal deposits near the perimeter of E.L. 184.

6. RECOMMENDATION

No further work is warranted.

M. G. MASON SENIOR GEOLOGIST

REFERENCES

- ALLCHURCH, P. D. and WOPFNER, H. (1967)
 Cootanoorina No. 1 Well Completion Report Report of Inves. 43 Geological Survey S.A.
- FREYTAG, I. B. (1965) Mt. Toondina Beds Permian Sediments in a Probable Piercement Structure. Trans. Roy. Soc. South Australia. 89:61-75.
- JOHNS, R. K. (1973) Report on Coal Occurrences in South Australia. Unpub. Dept. of Mines South Australia Report Book No. 73'249 pp35-42.
- LUDBROOK, N. H. (1967) Stuart Range No. 3 Bore Coober Pedy: Stratigraphy and Micro palaentology. Min. Rev. Adelaide, 122:28-32.
- MASON, M. G. (1975) Groundwater Occurrence North Coober Pedy. (Unpub. Report held by South Australian Dept. of Mines. E.L. 184).
- TOWNSEND, I. J. (1973) A Synthesis of Stratigraphic Drilling in the Arckaringa Basin 1969-1971.
 Unpub. Dept. Mines South Australia Report Book No. 73'98.
- TOWNSEND, I. J. and LUDBROOK, N. H. (1975)
 Revision of Permian and Devonian Nomenclature
 in Below the Arckaringa Basin. Quart. Geol.
 Notes No. 54, January 1975. Geological Survey,
 South Australia.

APPENDIX I

ROTARY DRILL LOGS MU-1 to MU-14

LOC	ATION: 26km NNE Coober Pedy CO-ORD	5: <i>2827</i>	4.2	2.77		DIRECT	TION: - 90
KATER CUT	DESCRIPTION	OEPTH METRES	LOG	. (ppm)	GEOCHEM Cu (ppm)	Zn (ppm)	REMAR
	CADNAOWIE FORMATION - Core in core interestone - some Ferraginous 3 ones		光三				20% 8 ypsum
	ME OVERDUE IN CEMIN SORO 15 /OMICA	1					4
S	of Toro clay gray minor brown . HW-CN toron thate. Some sand clay becoming thate. Some sand clay bands, clay silestone . 2570 siledath about	1	苣			-	1
1	(の) たっとんじょくこしのべ さいてきてきいち ノラフタ さいとく かっぱんしんばん	10 m -					5% porite.
10107	CLAY SAND - Grey 45% m.g rounded quant 15% miles. Rest clay 1570 miles. 65% m.g., quanta, 2% green mineral? - Groy.						2% pyrite 5%
1	SAND v. pale groy 90% F-c.g. quants c.g. subrounded F.m. grounded - Water Cut, 2-5% mica minor clay	,					2% pyrile 1%
2000	- Water Cut, 2-570mica minor day						2% carbonaceon
50mp6 5660p		20m-		<u> </u>		 	_
Θ-	COPREC SAND - V. pale grey miner mice & clay. 1590 m.g. sand Rext c.g. subgrigular quarty OSAND- light grey . 60% m.g. reunded frame; 5% parity miser term alone, 10% etay bands. Syd mice Rast clay. Thin soal scam.						
@ -	Rest cig. Inbaviguian quartz				ļ	ļ	5% F.g. Fragna
	5% parite miles tournaline 10% stay bands.			, , , , , , , , , , , , , , , , , , , ,			matriv to sand
300094 490094	Subangular quants. Minor clay & silt. Rese P-m.g. subrounded quants.	30m -	معربية 				
8 T	Rest P-mig. subrounded quanty		:: . :			ļ	3% Fig. coal F
_		1	-				5% Kadin m. 9
ooogsh.	minon tourmaine, part c, Feldspar	40 m -	7				10% Kaolin
7000	10% coal lumps -woody . (Seam) 30% Fine sandstone with 20% tageout frequents - detarted 2% pyrite.			·		· ·	10 /9 1/40115
	Fine Sandstone - 30% Feldspar minor clay 10% mid Rege quarts. Subangular]					30% m.g. coal Fro
,ab	5% Fig. detrital coal: 20% Fig. 3 detrital coal:	ā					coal bei
ö.	COMBEE SAND - white . Bos c.g. subangale	50m -				1	Goodson Sana
6/6/90	10% and fine sandstone a 10%.				· ·		due to high !
8		1			 	 	-
<u> </u>	V. minor coal a pyrite.	60 m	<u> : : :</u>				
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- 	LOC	ATION 37km.	MNE Coober Ped		2868	4.38	<u> </u>			DIRECT		
	WATER CUT		DESCRIPTION	0 N	OEPTH METRES	LOG	(ppr		Cu (ppm)	Zn (ppm)	REMARK	'5
	175	CLAY KH	naki high pla It quartz 15			7.7. 1.1.					10% 94/PSUM YE	h3 ,
_	132K	15.60	15% city s	- andstone							45% cone in cons	
	Water	dans dans	150% mica. 3	ynite 20% F.g	10 m -	- i					2% F.g. destrita	ر
	7.00 m	O COARSE	SPHOSTONE Subangular Pebbles miner Rest Fim.	quants . minority . grants . 200 parity . Subrounded quarts							commented in node	
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			minor Sa	indy siltatione							-	10 t
	u d d	•	15% c.a	. Subangulan quanty	30m -							نعالم.
	00g.E (Q)	0										containi
.		Ston			40 m -							* + of
	496000	Sano	5% sha	le a silt bands	50m -		<u> </u>				<u> </u>	20 T A
	1400	0	shale - grean- grey. 3:	canbonaceous grey to dark 5% quants 51 lt.	30111							
		ON ONE	camented. v.	vague bedding	60 m -							
		900	carbon accous	vague bedding k. minor Fragmends 50%	·		,				<u> </u>	
		4			70 m							٠,
			5% yellow bur sand stone	or F.g. cemented] .	
• •		MEDIUM	GRAINED S	ide a malatage	80 m				•		a 70 cool det	ntal
•		Dur COAL SE	% including	gannet - distinction	١ ،							
		Z mid	to solt angular	thick in 1+2 and and a hour mest be thought in 1+2 and a hour minor magnety in 2% garner minor in 1, 2% garner minor in 1, 5% minor	90 m	***			1 Fragments		0.05m.	S.
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	1	CALE	1.500]				••••		· · · · · · · · · · · · · · · · · · ·	Nº 4556/6	

	į		RCU	SSI	ON DE	? <i>IL</i> .L	HOLE	HOLE	OLLAR:
	1	PECT MURLOOCOPPIE COFIL MAP TION: 48 km NNE Coober Pedy CO-ORDS			453		06	3 INCLI	NATION: - 90°
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		vague layering. 2% canbon Fragments.							
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,	7 00	comes & Khaki - 40 % vague layering grey clay. 10% silt quanty. 30% mice Rett clay.		<u>:-:</u>					
	1973 ALE	quantos. 35% inica Rest clay.							
	3 1	BLACK CLAY F.g. 30% mica	20m-						
	XXX	5% carbon Fragments Rest clay 5% quantz silt 2% u.F.g. pyrite.							
	יוויוו	vague Foliation							<u> </u>
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		() CADREE SAND-DOLD DAM 5074 F-9 : MINOP	D.						5966 massive 8
	Scoop Scoop	conese sand-pale any soler, minor silt clay, mice, pyrite -thin coal sear som.			-				shale.
	m 0	5% sand silt with	60 m -	• •					<u> </u>
•		sand becoming carbe Fragments.	60 m		 				thin town coa
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		FINE SAND V. pale gray well sarted]:::					
	-	minor silt traction. 5% greenshap.	70 m	<u> </u>		-			Somm coal so
	ad	medium sand pale gray 15% cg. minor silt kaoli- (cog-?) 5% mg. musicovite 5% carbonaceous shake layers.	·						miner coal
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		shale.			<u> </u>			 	
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	1 1	COARSE SAND 1% garnet . 30% c.g. Rent	1						
	dao	SILTY SAND - gran - 40% Fig. Subremated quarta - 2% grant 1% Fig. Subremated	110 m]:::				1	miner carbona
	290	E WILLOW DITUTE Descrit 2 section" was he seed	.1	├ :-	·		 	 	
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	ATION: A8th NNE Coober Pedy CO-ORDS			4534	GEDCHEM	DIRECT	T
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	SANDY SILTSTONE - gray 25% Frag. angular quant3. 20% carbon accous. shale Fragments. 2-5% mg. grains bright coal. 40% silt.5% mica C Rest day. miner pynt Fewgernet.	120m-	-: -				10% coal his little canb. sh 20% F. g. Sands thin lamellas coal
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<u></u>	c	LINESTONE Dale Drow massive indunated	in ele	-]
\cup_{i}		SILTICLAY - 25-30% silt -10-2 5% pyrule, minor graphite &	0% mica			 	 	4
· · · · · · · · · · · · · · · · · · ·	P &	5% pyrite, muon graphite	1			 		-
	38 12	coanse sano - opposite gogo co quanto 15 b Eg. musconte Rest minor posite, tournaline, graphic	g rounded 40 m	15.5				30% sitty clay
	2000 2000 1000 1000	minor pyrite, tournaline, graphito	Prags		ļ	· ·		4
	∯ Ø -	A mica , coal grains . Pert clay .	siltetone			 		┥
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	4 860 J	gr 3070 silt 1-3m. 2% mica, 3% coal fragments. 15-30% day 10% c.g. Roxt.	~~		1		<u> </u>	calcanenti
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	7 May 7	quanty when mice silt new day follow	<u>.</u>					some cambo
· •	~~ ~	SAND - light gray Some coal sea Boloma ac. a sub tounded bright quanty niver mice silt rette chay from 10% col SAND-gray Tolong send miner prints a some c.g. lagers also silt layers.	*				 	Tayers .
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	7		70 m]-:-:				-
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			110 m	1				7
• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •				1	· · ·	<u> </u>		-
	 			 .	DI	RILL TYPE:.	Schramm . E	ATE DAILLE
. •					· · · · · · · · · · · · · · · · · · ·	RILLER: P. B		S-6 MO

LOC	AT	10N15tm NN Oolgelina Hill CO-ORDS	5: 3!6A	· · · · ·	4329		DIRECT	TION: - 90'
CUT		DESCRIPTION	OEPTH METRES	LOG	(ppm)	GEOCHEM Cu (ppm)	Zn (ppm)	REMARI
1240)		CLAY-Khaki - Bui 20% silt. 20% mica . high plasticity . Reve clay						
£ 3	1496	and the second						20% c.g. sana
4 5	10°	COARSE SAND - pale gray. Minon						—
ტ 3 √	MAT ANN	coarse sand - pale gray. Minon mich silt, clay . 20% fg. 20% m.g. 25% c.g. quarty. Also Few ponphyny pebbles.	10 m -	100				- sum coal sea
yd booos	Ĭ,	FAND - pale gray . Minor silt, clay pyrite . mica . 10% c.g . 20% mg.	•					1
6	701	50% F.g. quartz. Feldspar common subrounded.	20m-					1
	FORMATION			∤ ∷∙				
②	1 1] :::				· ·
4000 pm	AONIE	COARSE SAND - Dale area . minim Durke	30m -	• • •				-
400	CADNA	coanse sand - pale gray. minor pyrie, sitt day. mis. 30% c.g. 30% m.g.		.:				
								_
		Somm coal Seas	40 m -					+
]
	*	coance cours pole only mynes brank		1				
	Spectorion	cit. 10% kaolin. 40% c.q. 20 % org. 10% F.g. quarty. Some spaline.	50m	: :		·		
				<u>}</u>			·	
	BUCKINA						<u> </u>	-
gph.	ALCE		60 m]
460008	No	SILTSTONE - gray . 15% F-ma . Endangular quantz 55% sit 10% mica mino-pyrite . 5%		- T				
<u> </u>	FORMATI	CAMburnasous Fg. pieces . Rost clay .	70 m	<u> </u>				
	1 .			-				
3900pm	TOONDINNA			 				
			80 m					1
	E	END OF HOLE Baneties.	 					
				}				
			90 m]				
				1]
				1				
			100m	닉				_
					-	 		1
				1				
			110 m	· -		1		
				1				

	PR	OJĽ	CT ARCKARINGA E	17,377			rion (et		HOLE	Nº MU-7
	PR	೧೯೯	PECT : MURL OO (OPP)	LOG OF P E COAL	ERCU	55/	ON URI			.LAR:
			•		. .		•	06	8 INCLINA	ATION: -90°
_ •.	1200	CAT	/ON:	CO-ORD	5:		· · · · · · · · ·	0.000	DIRECT	10N:
	CUT		DESCRIP	TION	OEPTH METRES	LOG	(ppm	GEOCHEM) Cu (ppm)	Zn (ppm)	REMARKS
	F	91,	CLAY - Khaki, a	e5% silt minor	1.	<u></u>				50% gypsun
		HALL	n.g. sand, 15% m	ia, Rest clay.						2070 94P14~
		0.5	SAND - pale yellow m.g. Rent F.g.	. 20% c.q. 45%		• •				
•			5% Feldspan	angular quien 3	10 m -	•				-
J			minor slag. 20% feldspan 10% a. sub augular quar	STIP. Some	† .					-
			Feldspan, 1090 es sub angular quar	ts .						1
		20	COPRISE SAND. yel 30% q. minon Pere F.g. sand. S Iron oxide coated si	low , 95% c.g.	20m-			_		Ì
•	£3	ORMEN	Iron oxide coasted st	infaces.						
	3-	F00	Limet of	oxidation?		:::				1
-		N .	MEDIUM SAND . Whit	a. 5% mica.	30m -					_
	0	ONVO	Rout F.g. quart	3 10% whole]				
$\mathcal{O}_{\mathcal{Y}}$	4	CR]: ··.				
	960	一	MEDIUM SAND - Whi	te mmo-mica.	40 m -	· ·				1
	8	CIND	10-20% Kaolin , 6 mg subangular o opaline quants	wartz Miron				_		
		BUCK								-
		ALGE			- 50m -	<u> </u>				
		٦	GRANITE gray m. 30% quants (greg-blue) & 30%0	30	+++	30	45	230	75% sand as about 16 40
		A020	feldspan. eq	ngranular		1++			1 30	
		Rote			Ġo	++	 		-	
		-	END OF HOLE	60-			<u> </u>			
	1]				
					20-	-	ļ			1
					70 m]]
Ç,										
· · ·						-				
					80 m	'			<u> </u>	1
					1	} .				∃.
						}				-
					90 m	1]
	4					1				-
						1		1 1000		
					. 100m	1				
<u> </u>		-				.				1
•						1			1.	
	1.				110 m	1 :::	ļ		 	-
						1	·			
	-	1				1		RILL TYPE:.	Schramm 1	DATE DRILLED
i					•		 . ,			NATE DRILLED:
1				-		•	ם	RILLER: P. B		OGGED: M. Mason
•	S	CA	LE 1:500					••••	···· DRG	Nº AS 5618

	,	ON:	co	-ORDS:	ېې. 	? ?	~ Y. /		DIRECTI	TION:
CUT		DESC	CRIPTION	i	DEPTH 1ETRES	10G	(ppm)	GEOCHEM Cu (ppm)	Zn (ppm)	REMARI
777		Medium Grey Fis	sile Fresh ALE CLAYSTONE			<u></u>				
	10.4	•	-		-					
7.5	160	Medium Grey		· +						
17/5/		QUARTZ + MINOr V	Site FROSPATHE rained Transpar Lite FELDSPATH	SAND	10 m -	:	·			
	1	QUARTZ+ MINON	- white FELDSPATI Si	AND						
		Madure - Con -	Grained Transpare	et					 	
		QUARTZ + MINON	hite + medium seem	Poorly	- - کومس					
									-	·
			+ minor/tsto	one				-		
		As Above + Bla Minor Muse	che Contonaceons.	Shale+		::::				
		Medium + Fine QUARTZ + mine	Grained Transpare or FELDS PATHE SA	~T	30 m -					<u> </u>
			•				·			.
	2	Fine Grained Ti	ransparant QUAR THIC SAND + whi	e7z+					 	
١.	4110	MINON FELDS RA SANDY SILTS		te	40 m -].
	KMATI	Medium Grainea	(Very Clean Trans			17.11		-		1
	14.	QUARTE SAND	+minor sphe	rulitic	*		•			1
	9.3	Medium + Coan QUARTZ + min	se Gramed Trans	SAND				<u> </u>	 	1
	Ĭġ.			•	50m -					1
	Α×		+ minor sphe	enlitic		:::				4.
	AD				•		· · · · · · · · · · · · · · · · · · ·]
	١.				60 m -					4
			+ m/n 0.	fite	•				<u> </u>	†
iwij.		Fine Gamed L SAND		'Z]
mdilgoo	١		gramed coal fraction	ments hed				 		<u> </u>
5,0	1 4		+5% medium - coarsa	grained of cont	70 m]
ļλ	CINA DS TO	1	+ min or muscou	ite					<u> </u>	╡ 、
Į,	2 4				٠.					1
SALIN	56.0		t miner soft brown crumbly coal + 5-10% pyrite	- one u	80 m			 		-
١.	ALCS		+ medium &	Grey Estone	·.					1
4960	\prod	Medium Grey C	-very little san	TSTONE				-	<u> </u>	4
000				<i>I</i>	90 m	<u> </u>				_
15,0	;			•	30111]			1	_
4	1			•.						
FLOWE	٨ ٢		aplitic Country]
l _v	0 10	SHALT SILTS	+ minor pyrite		100m	 	 	· · · · · · · · · · · · · · · · · · ·		<u></u>
WATE	700		. //	· .		1			·]
3	MT.		+ muscovite	יייייייייייייייייייייייייייייייייייייי	-		•			-
-	十		Fine grained frag	ment of tool	110 m					
						-				- '
						+		-		-

LOCAT	10N: CO-OR	OS:3	RINA 2.5.7.	1:250,000 4210	U	70 INCLINA	10N:
WATER CUT	DESCRIPTION	ОЕРГН	106		GEOCHEM	·	RE
30		METRES		(ppm)	Cu (ppm)	Zn (ppm)	
	Buff Dust + Gypsom	<u> </u>	ļ .		 	ļ	1
. -	Buff + Yellow Medium Grained Weatherd Clayer SANDSTONE		 			ļ	-
			1:::			-	1
	becoming loss weathered + loss changes					 	1
	Secoming loss weathered to loss changy As Above + pring grey SHALE + pink fine grained SANDSTONE	10 m -	-]
ונניק	Come Grained Transport Medium						
8	Grained Yellow QUARTE SAND+ minor white FELDSPATHIC SAND	· [1
/5/8/	AS Above + Light Gray JANDY SILTSTONE					+	1 .
*	Medium + Coarse Grained Transparent QUAN SAND + miner FE-DSPATHIC SAND - very cle Fine + Medium Grained Transparent	erz 20m-]
	Fine + Medium Grained Transportent]
	QUARTZ+ minor white FELDSPATHIE SAND - very clean		:::		ļ		4
110			{:::}			 	1
474	+very minor frable black coul	30m -	::::			 	1
ORMA	+5-79 Friable	1]::::				1.
l li	As Above +20% Medium Grey SANOY SILTSTO	N/E]
ŝ	Fine-Madium Gramed +29 black coal Transpare + QUARTZ + minor White FGLOSPATHIC SAND + veryminor blace	2				ļ	4
4 3	+minor very fraisblack cool					 	
15	Fine Grained Transparent QUARTZ + minor	.					1
Bpoo PPM ADNA	Fine Grained Transparent QUARTZ + minor white FELDS ATTHIC SAND + VENT MINOR DICK COM Fine - Medium Grain ed Transparent QUAR + Minor white FELDS PATHIC SAND	TZ		·		 	1
0 2 0	As Above + 15% Black Graphitic Shale	2] . `
300	Ac Above + 15% Black Completic Shale Fine Gamed Transparent QUARTZS. + minor muscovite + minor black	50m] .
IS'S	triable coul				ļ		-
A V KA	Fine - Medium Gramed frable coal Transparent QUARTZ SAND		-			<u> </u>	-
3 25							1
SEC S	Fine-Medium-Coars a Grained Transparent QUARTZ SAND+Madium David Gray Graylitic SHAFFINE-Medium Grained Transparted Dumerz SAND+Medium-David Gray Graphitic SHAEL GRANITE-grey. C.G. 20% quanty 30% FRANCE But biotite. (clays due to weathering	E 60 m					590 inte
£ 200	SAND+Medium-Dark Grey Graphitic SHALL	E					LunconF
E.S.T.W.	Rest biotife. (clays due to weathering	Mas.	++		<u> </u>		-
	BOTTOM OF HOLE 65m		4				1
		20 -	1]
		70 m					
			-		ļ	·	4
			1	·			4
			1		-		1 - 3
		80 m]]
] .				1
	[18] 1. 图图图 [18] A. A. A.	·. /	1.00	<u></u>		· ·	4:00
			4	<u> </u>			1 33
		90 m	-		1		1-25
.			1		·		1 5
11.]]
					<u> </u>		4 350
		100m	┥⋰′		 	+	1 1 1
			1.		-	 	1
		•	1.		<u> </u>	1	1
.] .]
		. 110 m	1				- .
			. 4 : . : .		ļ ·		-
			1.		 	 	-
					LL TYPE:		ATE DR

	PR	OJE	CT. AKKARINGA YASA			TION (PTY		HOLE NS	MU-10
	1		LOG OF F ECT : MURLOO = O.PPIE COM ON: CO-ORD		•	SMEET 4352	,		ON: 90°
•	WATER		DESCRIPTION	DEPTH METRES	LOG		GEOCHEM		REMARKS
	120	<u> </u>		METRES		(pprn)	Cu (ppm)	Zn (ppm)	
	8 4		Dark Grey - Black Fissile SHALE + Gypsum				-		•
	BUCK		J	.		·	- 		
	1	1	Mid- Grey SANDY-SILTSTONE with		· · · ·				•
. :			Carbonaccous Matrix	10 m -					
	>				:		- 		
	100								
•	\$	b	Medium-Coanse Grained + very mmor pyrite]				•
	FORMA	8	QUARTZ SAND	20m-					. '
	lo"	7 55	Medium - Fine Grained lean - Transparent QUARTZ (+ Q. 1/1/2)	1				 	
	7		Making Grand (dear Transment		3				
•	ADNA	3.64	Medium Gramed Clean Transparent QUARTZ + white FELDSPATIFIC SAND	1					
•	V	0	·	20-					
		8	Coarse + Medium Grained Very	 3 0m -					
<u></u>	1	15,	Clean Transporant QUARTE + White FELDERATHIC SAND]::::.				
() ()		R							
• '.				,				- .	
•			,	40 m -				 	•
			Medium - Fine Very Clean Transporent		1				
			Medium - Fine Very Clean Transportent QUARTZ + White FELDS MATHIK SAND			•			
	1 .		Coarse + Medium Grained Transported QUARTZ + White FELDERATHIK SAN	1 ·	188		· · ·		,
			- very clean	50m -	1:3				•
• 1	ł			ŀ	- ::::::	 	_		
	ł								
•				ŀ]:::::				
•	l			60 m -					
	į			•					-
	-	┨.	As Above + Darle Gray - Black Shale Fragments	-	1				
			For a Para stier of modium - con- er maine	4					
•			SANDA Sabore + Sale Gay (number Shale + Clay Dark Grey - Black SHALE + Clay with Sanda Contamination? from above	70 -					
			Medium Grey Weathered SHALE+CLA	/- 70 m ·	[·			
\bigcirc	1						<u> </u>		•
()			becoming medium light gre	1	1.7	ļ			
			As Above + Madyon Grained Fransparent Clean GUARTE SAND - contomination Medium Gray SHALE + more Clean transparen QUARTE SAND	<i>+</i>	1==		 		
	1		Medium - Dark Grey SHALE + Clay +	+80 m	1==				. •
	1	ξ.	Medium - Darke Grey SHALE + Clay + Minor Medium Grained Transparent Clean Sgund - (gontamination?)	`					•
:	1	100	Shall + Clay is above + equal quarties	,	1:-:	<u> </u>			•
•	Ì≳	0	Medium - Light Grey SHALE + CLAY + Equal quartities of Fine - Medium		1:-:	·			
	Ĭ	50,	Grained Transparant QUARTE SAND	90 m	-	ļ			
	Ž.	1			==	-	_	 	•
	ű	14	Medium Gray Fissile SualE + Medium	1	1				•
	4	00	Grained Transparent QUARTE SAND (contamination)]	-			
•	Ž	18		100m	1	-			
	Z	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Medium Grey Fissile SHALE						
	8	1 "	•		1	<u> </u>			
	1.			-	1	-	- 	<u> </u>	
	ξ			110-	1				
		. .		110 m]_				
	1		Dark Grey-Black Carbonacions Fiscle SHALT SILTSTONE		-				
•	-	1_	<u>'</u>			1			
			BOTTOM OF HOLE 117m			DF	RILL TYPE:.	Schramm DA	TE DRILLED:. 18KM4-1 19
•						•	• • • • • • • • • • • • • • • • • • • •		
					• •	DF	RILLER : .B/4	3.70.N. LOC	3GED:
	6	. ~ .	1.500					DDG	NO 115 56

RO	SPEC	CT : MURLOOCOPPIE COAL	WAR	RINA	1:250,00	072) INCLINA	TION:90°
oc.	AT10!	N:	RDS:3	14/	.4!41		.	10N:
-		0.5500,0770,0	OEPTH	100		GEOCHEM		REMARK:
5		DESCRIPTION	METRE.	S	(ppin)	Cu (ppm)	Zn (ppm)	
	,	Buff Weathered Fissile SHALE		√			-	4
	HALE						 	1
	Ň]
	ان		10 m			<u> </u>	 	4
	ŏ			+		 		4
	710	Dark Grey - Black SILTSTONE		 				1
	80		ŀ]				4
	30:	Fine Grand Transparent QUARTZ SAND + mmor above Medium Grand TransparentaUARTZ. MINOR FELDSPATHIC SAND	20m	12:00			 	
	777	As Above but coarse graned		13.5		 		
	Š	Medium Grained Transparent QUA + mmor white FELDSPATHIC SAND	RTZ					1 54 75
ا رزز) /E	+Buff C		188	< 5	35	5.5	Pb 65
200	3	Medium - Coarse Grained Transpar						1
Self	40 WA	QUARTZ+MINON FELDSPATHIC SAND +minon flint	Clark] .
λ.	040		·			<u> </u>	<u> </u>	4 :
٠	١	wind white FELOSPATHIC + Scoriace	2/2		:	·	 	1
	SNO	Medium - Coarse Grained Transparen	<i>H</i> 1	200				
	DSTE	Fine Granged Transparant QUAR- trainer shall contamination SAND	72	1550	-			
	400	Fine Erained Transparat QUARET HIMMORTH SAND MEDIUM Erained Transparent QUART SAND Coarse Grained Transparant QUART HIMMORTH FELDRATHIC SAND MEDIUM FILE Grained Above	72		-	 		4
	ν̈́	Medium - Fine Gaines Above	50m	153.5				1
	4	Fine Grained Above	1				 	4
	7/30	Fine-Me dim Grained Transparent RUTATI + moor FELOSPATHIC SAND Medium - Coarse Grained + minor		1000				
	80 .	transparent QUARTZ+ mica.	<u>·</u>] :
	8	SAND Fire Grained Above		4::::	<u> </u>	_		-
	AL	As Above + Dark Grey SHALE + mine	r_	• : '. : ;				-
	:	Dark Grey Weathered Greasy]==]
		SHALE		J	·			+
			70 m	4-		-		┥,
	· .			1-]
1			· .	-	Ţ <u> </u>			-
à.		Light Grey- Green, Fissile, Fr	eoh	+=	-	-	:	-
9000	1	J SMILE)	80 m	1-	-] - :
5,00				<u> </u>	-	-		-1.
٨			•		-	_		-
			9011	.]	-]
Y'	3		30	'	· · · · · · · · · · · · · · · · · · ·			_
49.000	ATION			1-	<u> </u>			→
3,00	3			j	-]
4	10		1001	n- -	<u>-</u>	· · ·		-
3	1			1 -			· · · · · · · · · · · · · · · · · · ·	7
1,40	DINA		•	1-	-			
٦	00 E			ļ	-			┥.
	16		110 6	n- -	_	-		-
	M.			1-				\exists
	٤.							
		BOTTOM OF HOLE 117M.			DA	HLL TYPE:.		DATE DRILLED:.
								.19 1h. May 19

		PRO	OJEC	T. ARKAKINGA DASIN			TION (PTY) LTD	HOLE	V. MU-12
				LOG OF P.	ERCU	S5/(ON DRILL HOLE		LAR:
		•		•	MURLO S 271	0000 5 4	opie 1:250,000 () 7. 3NCLINA	TION: 90°
_	•	-	A110	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0.50511		GEOCHEM	- Direction	<u> </u>
		XATE		DESCRIPTION	DEPTH METRES	LOG	(ppm) Cu (ppm)	Zn (ppm)	REMARKS
. —.				Brown Soil + Rubble					
				Medium Grey weathered SHALE + Gypsum + white Aphanific anatzite	-	 		<u> </u>	
, =				Dark Grey Blockey + Gypsum .					
: 📕	•				10 m -				
, =		HOE	-						
		2							
		77.7		Dade Gray - Black Fresh Fissile SHALE	20m-				
_		000	ALE						1
		2 50	S						
		3 2 2	900		30m -				
	`	1 8 0 0 A 0	777	· Becoming SILTY SHALE		_	:		
		X 4 6	80		l				
	•	OF 14		Fine-Medium Grained Transparent QUARTZ SAND + Gray Shall Containington? from above)	40 m -				1.
		100		Medium + Coarse Grained Transparents Translicent Quartz SANO	T 40 ///			· · · · ·	+ Very minor black coal.
		`					· .		1
				Medium Grained Transparent QUARTZ+ White FELDSPATHIC SAND				 	+state (contamination
					50m -				
	•	ŀ		QUARTZ + MINOR White + Translaces	(<u>}</u>
				FELOSPATHIC SAND]] .
	•			Medium - Coarse Grained Transparent+	60 m -				<u> </u>
: -	.:			Translucent Quarts + minor white FELDSPATHIC SAND + minor Musicovite					
· ·	. ,	3,800 ppr	4710].
.		3,80	A A		70 m			1	
)		60] :
	\bigcirc	**	510						· ·
•	•	Ę	0	As Above Fine - Masium Gained	80 m				
	•	dos	AONA	Medium - Coarse Grained Transparent 1	1	†			
-	2	1 4	U	Transhuent Quartz + minor Feldspattic					1
	• • •			Fine Grained Transportent QUARTZ SAND + White Chay + minor	90 m				1
			AND	Framboldal Pyrite		-		·	1
· F			DST.	Bleoning very fine gramed Medium-Course Gramed Very Clean Transparant DUARTZ SARD					1
		£	S.A.		·				1
		3800pp	<u> </u>	+considerable contaminat As Above + Dark Gray Fissile SHALT SILTSTONE	10011]
		Ĭ		Dark Grey Fissile SHALT-SILTSTONE		-		· · · · · · · · · · · · · · · · · · ·	_
		4000	7 3						-
		1	100ND	As Above + Fine Grained Minor Quarts					1
:		3.4	1 1 8	QUARTE SAND equal guantifies of SAND+SHALE			l '		-
1		Ì	1 - /	JG SAND+SHALL	·	4	DRILL TYPE:.	Schramm. D	ATE DRILLED:
	•								20HMAT.1973
					:	•	ORILLER:		0GGED: 8.3.U.
		IC	CA	15 1.500			1	\cdots \cap \cap \cap \cap \cap	NO DX 5/22

PROJECT: ARKARINGA BASIN	OF P	ERCU	SSI	ON DRIL	L HOLE		" MU
PROSPECT MURLOD COPPLE COAL		URLOG	COPF	DIE 1:25	0 m	4 INCLINAT	AR
DESCRIPTION		DEPTH	100		GEOCHEM		REM
-X		METRES		(ppm)	Cu (ppm)	Zn(ppm)	
Dark Gray Fissile SHALT-SI + minar Fine Grained QUARTZ (contamination)	L SAND				<u> </u>		
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APPENDIX II

PETROGRAPHIC ANALYSIS OF COAL SAMPLES FROM MU-2 AND MU-13

ROBERTSON RESEARCH (AUSTRALIA) PTY. LIMITED

MEMORANDUM NO. 793

PROJECT NO. 756/9714/6A/6C

RESULTS OF PETROGRAPHIC ANALYSIS AND PHYSICAL AND CHEMICAL ANALYSIS OF FOUR PERCUSSION DRILL HOLE SAMPLES SUBMITTED BY AUSTRALIAN SELECTION (PTY.)

INTRODUCTION:

Four percussion drill hole samples were submitted to Robertson Research (Australia) Pty. Limited by Australian Selection (Pty.) Limited for coal petrographic analysis. The four percussion drill hole samples are from the Murloocoppie area; they are as follows:-

- Sample A462811; borehole MU-2 (84-86 metres)
- (2) Sample A636341; borehole MU-13 (32-34 metres) (3) Sample A636342; borehole MU-13 (56-58 metres)
- Sample A636343; borehole MU-13 (59-60 metres)

As a result of discussions between the client and Mr. R.C. Driver (Senior Coal Geologist, Robertson Research (Australia) Pty. Limited), the following work was carried out on the four samples.

- Petrographic analysis, involving the determination of meán maximum reflectance in oil (R_0) max. %) of vitrinite and maceral analysis.
- (2) Preparation of a 1.50 S.G. float fraction for each sample.
- Proximate analysis and determination of total sulphur content and calorific value for the 1.50 S.G. float fraction of sample A636343.

RESULTS OF THE PETROGRAPHIC ANALYSIS OF THE COAL SAMPLES:

A polished particulate coal mount was prepared from a representative portion of each of the coal samples.

MACERAL	A462811	A636341	A636342	<u>A636343</u>				
Vitrinite Resinous Vitrinite Total Vitrinite	64.2% 10.5% 74.7%	The coal con principally humotelinite	irely of vitrinite, he huminite macerals te.					
TO DOT ATOTITIES	. 4 /	Tunio octini oct						
Sporinite Resinite Cutinite		Trace to very minor amounts						
Total Exinite		Very minor	Trace to very minor amounts					
Fusinite Semifusinite High-Reflectance	0.2% 5.2%							
Macrinite High-Reflectance Inertodetrinite	0.8%		Inertinite macerals were not observed in coal samples A636341, A636342 and A636343.					
Low-Reflectance Macrinite Low-Reflectance	1.0%	coal samples A030341, A030342 and A030343.						
Inertodetrinite Fine (Granular)	2.0%							
Micrinite	0.7%							
Total Inertinite	10.9%							
Quartz Carbonate Clay Minerals Sulphide	0.2% - 2.5% 0.2%	Minor amounts, Trace to very minor amounts	Trace to very minor amounts of limonite after iron oxide.	Very minor amounts.				
Total Mineral Matter	2.9%	Minor amounts	Trace to very minor amounts	Very minor amounts				
farge Inertinite Macerals Small Inertinite Macerals	5.4% 5.5%							
High-Reflectance Inertinite Low-Reflectance	2.0%							
Inertinite	8.9%							
(Vitrinite + Exinite)% (m.m.f.)	88.8%	1.00%	100%	100%				
		LECTANCE		D. Mars of a Constitution of				
Ro Max.% Vitrinite Range of Ro Max% values	0.39%	0.35%	0.32%	in A636343 very s 0.35% ilar to that of v				
3 0				rinite in A636342				

A few oval, cellular, inertinite bodies, resembling sclerotia (fungal resting spores), are present in the coal. The absence of well-defined polygonal cell structure, combined with the distinctly vesicular nature of these bodies, and the presence of thick massive margins with cracks ("kerfs") suggest that these bodies are fusinized resin bodies and, therefore, not of fungal origin.

The principal mineral matter component is a very fine-grained brownish clay mineral which occurs as fine lenses and partings in the sporinite-rich microlithotypes, i.e. clarite (E), clarite (V) and sporinite-rich duroclarite. Traces of quartz and pyrite are also present in the coal.

In terms of microlithotypes (maceral associations) the coal appears to consist primarily of vitrite, clarite (V), clarite (E) and duroclarite. Semifusite, clarodurite and vitrinertite (V) constitute subordinate microlithotypes in the coal. Traces of liptite, in the form of sporite and resinite, and durite (E) are observed in the coal.

B. <u>SAMPLE A636341</u>:

In polished particulate coal mount the sample is observed to consist almost entirely of vitrinite. The vitrinite is present as the huminite macerals humotelinite (texto-ulminite and eu-ulminite) and humocollinite (bank gelinite and gelinite cell-infilling material). The partially-gelified, texto-ulminite exhibits clear botanical structures, including delicate structures on the cell walls.

Some of the vitrinite cell lumens are infilled with yellowishorange to reddish-brown resin which typically contains occlusions of bright yellow, gas bubbles. There is some evidence of suberinization (resin impregnation) of the vitrinite. Traces of sporinite are present.

The mineral matter component consists essentially of finegrained, brownish clay mineral. Disseminated, fine-grained, framboidal pyrite and limonite after sulphide are present in trace to very minor amounts.

SAMPLE A636342:

In polished particulate coal mount the sample is observed to consist almost entirely of vitrinite similar to that observed in sample A636341. Some of the vitrinite cell lumens are infilled with resin.

Trace to very minor amounts of limonite are present in the coal as a replacement of iron oxide.

• <u>SAMPLE A636343</u>:

In polished particulate coal mount the sample is observed to consist almost entirely of vitrinite similar to that observed in samples A636341 and A636343.

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Some of the vitrinite cell lumens are infilled with gelinite (pseudo-phlobaphenite) or porous, in part suberinized, gelinite. Some of the gelinitic infilling material has a higher reflectance than the surrounding humotelinite. It is possible that this gelinitic material is derived from tanin-like substances (phlobaphenite?)

Very minor amounts of disseminated, fine-grained, framboidal pyrite are present in the coal; a few euhedral/subhedral cubic pyrite grains are also observed to be present in the coal.

In all four coal samples the huminite macerals exhibits shrinkage cracks ("gel" fissures) which are characteristic of vitrinite in low rank coals.

The petrographic composition of the four coal samples, as represented by the polished particulate coal mounts, indicates that they are probably not of Permian age.

The high content of reactive macerals, (vitrinite + exinite)% (m.m.f. in sample A462811, in particular the high content of exinite, suggests a Mesozoic or Tertiary age. The high content of sporinite and absence of characteristic forms of sclerotinite (fungal remains), i.e. sclerotia (fungal resting spores) and teleutospores (fungal propagation spores), is, perhaps, indicative of a Mesozoic rather than a Tertiary coal. The latter typically contain characteristic forms of sclerotinite and resinite and suberinite usually constitute the principal exinite maceral components.

Reference to *Cook (1975), indicates that Cretaceous coals from Queensland and West Australian sedimentary basins tend to be rich in inertinite and tend to contain a low proportion of exinite. Judging from the summary of petrographic features of Mesozoic coals presented by Cook (ibid); sample A462811 resembles the vitrinite-rich Triassic coals of the Ipswish District or the Jurassic Walloon coals.

Samples A636341, A636342 and A636343 could be Mesozoic or Tertiary in age since there are no diagnostic features present in these coals to assist in assessing their age.

Extrapolation of data presented by **Bennett and Taylor (1970) permit the prediction of the following tentative values for physical and chemical properties of the four coal samples, based on the petrographic parameters, vitrinite reflectance (R_0 Max. %) and reactive maceral content (vitrinite + exinite % on a mineral matter free basis).

**A.J.R. Bennett and "Apetrographic basis for classifying Australian G.H. Taylor (1970) coals".

Proc. Aust. I.M.M. 233, 1 - 5.

^{*}A.C. Cook (1975) "The spatial and temporal variation of the type and rank of Australian coals", Paper IV, Australian Black Coal Symposium, A.I.M.M. Wollongong, 1975.

	Values Predicted on the basis of petrographic parameters						
Sample Number	Volatile Matter % (d.m.m.f.)	Calorific Value (Btu/lb) (d.m.m.f.)	Crucible Swelling Index				
A462811	55%	12,500 -12,600	0 - ½				
A636341 A636342 A636343	55 – 56%	12,400	1/2 - 1 (?)				

The predictions refer to normal coals. For perhydrous coals, i.e. coals rich in eximite macerals and/or resinous vitrinite, the predicted values are likely to be somewhat lower than the measured values.

3. PHYSICAL AND CHEMICAL ANALYSIS OF THE COAL SAMPLES:

A representative portion of each of the coal samples was split out and crushed to $-1"/+\frac{1}{2}"$. The crushed coal was placed in a perchloroethylene/white spirit mixture of 1.50 specific gravity and a 1.50 S.G. float fraction and a 1.50 S.G. sink fraction obtained. The proportions of "floats" and "sinks" at 1.50 specific gravity for each of the coal samples are presented in table II.

TABLE II: PROPORTION OF "FLOATS" AND "SINKS" AT 1.50 SPECIFIC GRAVITY:

Sample Number	Borehole	Depth	1.50 S.G. Float Fraction	1.50 S.G. Sink Fraction
A462811	MU - 2	84-86m	96.1%	3.9%
A636341	MU -13	32-34m	90.1%	9.9%
A636342	MU -13	56-58m	96.0%	4.0%
A636343	MU -13	59-60m	98.0%	2.0%

The results presented in table II indicate that the coal samples possess a relatively low ash content.

The results of the proximate analysis and determination of total sulphur content and calorific value for sample A636343 are presented in table III.

Table IV summarizes the classification of the coal according to various systems of classification; Mott's classification yields the most useful form of classification for this rank of coal.

4. GENERAL COMMENTS:

On the basis of their low-rank, none of the four coal samples appear to represent coal that would be of any application in the direct manufacture of coke. However, it is possible that the coal samples could represent coal which may find application as a thermal coal (steam-raising coal) or as a raw material for conversion to liquid or gaseous hydrocarbon products.

Further testwork will be necessary in order to ascertain whether the coal in the Murloocoppie area is likely to be suitable for either of the abovementioned applications. It should be noted that this testwork will need to be carried out on fresh borehole samples, as solid core material, and will involve some sophisticated and, hence, relatively expensive forms of analysis.

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TABLE III: RESULTS OF PHYSICAL AND CHEMICAL ANALYSIS OF SAMPLE A636343

<u>ANALYSIS</u>	RESULTS OF ANALYSIS EXPRESSED IN TERMS OF VARIOUS BASES:								
(1) PROXIMATE ANALYSIS Moisture Ash Volatile Matter Fixed Carbon	AIR DRIED BASIS: 45.1% 5.9% 26.8% 22.2%			DRY BAS - 10.8% 48.8% 40.4%		DRY ASH-FRE - 54.7% 45.3%		MATTER I	MINERAL FREE BASIS: - - 54.6%
(2) TOTAL SULPHUR CONTENT:	0.79%			1.44	1.44% -			-	
Fuel Ratio	Fixed Carbon % Volatile Matter % = 0.83								
(3) CALORIFIC VALUE:	AIR DRIED BASIS	DRY BASIS	MOIST, ASH FREE BASIS			IST MINERAL ITER FREE BASIS		ASH- EE BASIS	DRY, MINERAL MATTER FREE BASIS
Btu/lb K.Cal. MJ/Kgm	6,170 3,428 14.4	11,239 6,244 26.2				6,629 3,683 15.5		12,592 6,996 29.4	12,862 7,146 30.0

SYSTEM	PARAMETERS	<u>CLASSIFICATION</u>
International Classification of Hard Coals by type.	CV (m.a.f.) 6,557 Btu/lb. VM (d.a.f.) 54.7%	CV (m.a.f.) is less than 10,260 Btu/lb; therefore, coal is classified as a Soft Coal.
International Classification of Soft Coals	Total Moisture (a.f.) *47.9% Tar Yield (d.a.f.) n.d.	Class 13 - 14 Group -
N.C.B. Classification	VM (d.m.m.f.) 54.6% Gray-King #A Coke Type	Non-coking, High-volatile Coal. Class 902.
A.S.T.M. Classification	Fixed Carbon (d.m.m.f.) 45.4% VM (d.m.m.f.) 54.6% CV (m.m.m.f.) 6,629 Btu/lb.	Lignite IV. 1
Mott's Classification	CV (d.m.m.f.) 12,862 Btil/lb. VM (d.m.m.f.) 54.6%	Perhydrous Lignite B.1
Fuel Ratio Classification (A.S. No. P.S. 3 - 1929)	Fuel Ratio 0.83 Moisture (a.d.) 45.1% Ash Content (d.b.) 10.8%	Lignite/Brown Coal E.13 (c)
Classification for Australian Hard Coal (A.S. K184 - 1969)	CV (m.a.f.) 6,557 Btu/lb. CV (d.a.f.) 11,239 Btu/lb.	CV (m.a.f.) less than 10,260 Btu/lb., i.e. CV (d.a.f.) less than 11,650 Btu/lb.; therefore, coal is classified as a Soft Coal.

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CV = Calorific Value
VM = Volatile Matter
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a.d. = air dried basis; d.b. = dry basis; a.f. = ash-free basis;

m.a.f. = moist, ash-free basis, d.a.f. = dry ash-free basis;

m.m.f. = moist, mineral-matter-free basis;

d.m.m.f. = dry, mineral-matter-free basis

n.d. = no data available

*This values is the air dried moisture figure on an ash-free basis; the as-mined moisture value (ash-free) is probably in excess of this figure.

#The coal is assumed to be non-caking.

APPENDIX III

EXPENDITURE REPORT

FINANCIAL REPORT

Total Expenditure is as follows

Geological Survey	Salaries - Field Salaries - Drafting Maps & Aerial Photos	5,688 540 102	· .
	Sample Bags Plan Reproduction External Consulting External Assaying	220 118 606 683	7,957.00
Logistics	Field Support Transport Equipment Repairs	3,703 2,101 54	
	Mines Dept. Rental	895	6,753.00
Drilling	Percussion Drilling	9,206	9,206.00
Depreciation	Drill Equipment Exploration Equipment	776	
	Including Vehicles and Office	358	1,134.00
Administration Costs - F	ort Augusta		
	Salaries Office Maintenance	670	
	(Includes power, phone etc.)	304	974.00
Other Costs	We maintain an Office at 32 Main Street, Port Augusta as a base for operations within South Australia. Most of our administration costs are		
	generated in Kalgoorlie and Perth. We therefore make application to have		
	these costs included and deemed applicable.	đ	2,387.00
	Total Expenditure	:	\$28,411.00

P. R. GRAHAM OFFICE MANAGER