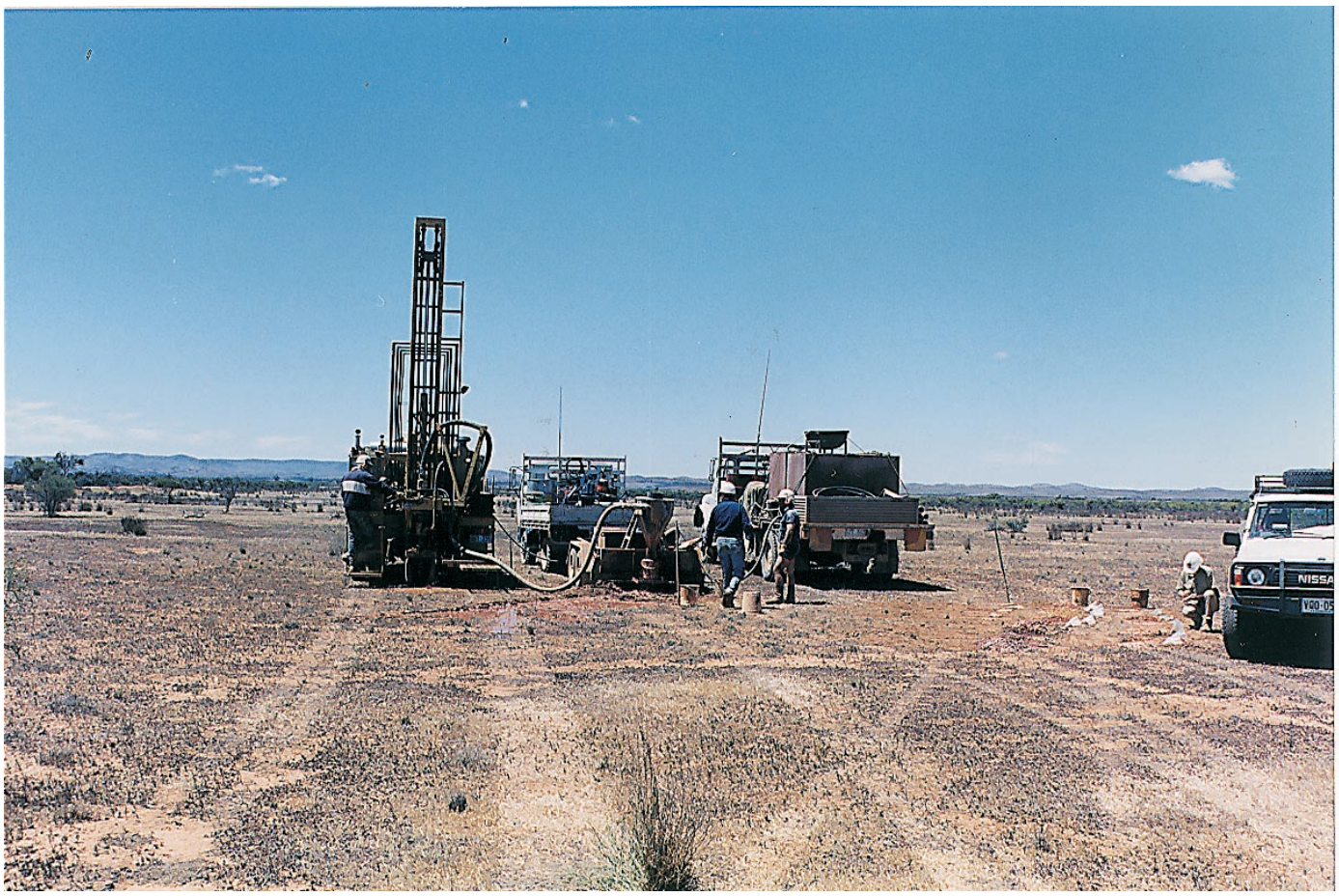
SOUTH AUSTRALIAN EXPLORATION INITIATIVE

TRIASSIC COAL EXPLORATION PROGRAM



HAWKER - QUORN AREA

RB 95/30

R A Shaw
Geologist

MINES and ENERGY
SOUTH AUSTRALIA

June 1996

DEPARTMENT OF MINES AND ENERGY

GEOLOGICAL SURVEY

SOUTH AUSTRALIA

REPORT BOOK 95/30

SAEI TRIASSIC COAL EXPLORATION PROGRAM. HAWKER-QUORN AREA, SOUTH AUSTRALIA ELA 228/93

by

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Contract Geologist

JUNE 1996 DME 208/92

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DEPARTMENT OF MINES AND ENERGY
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SAEI Triassic Coal Exploration Program Hawker-Quorn Area, South Australia ELA 228/93

R A SHAW

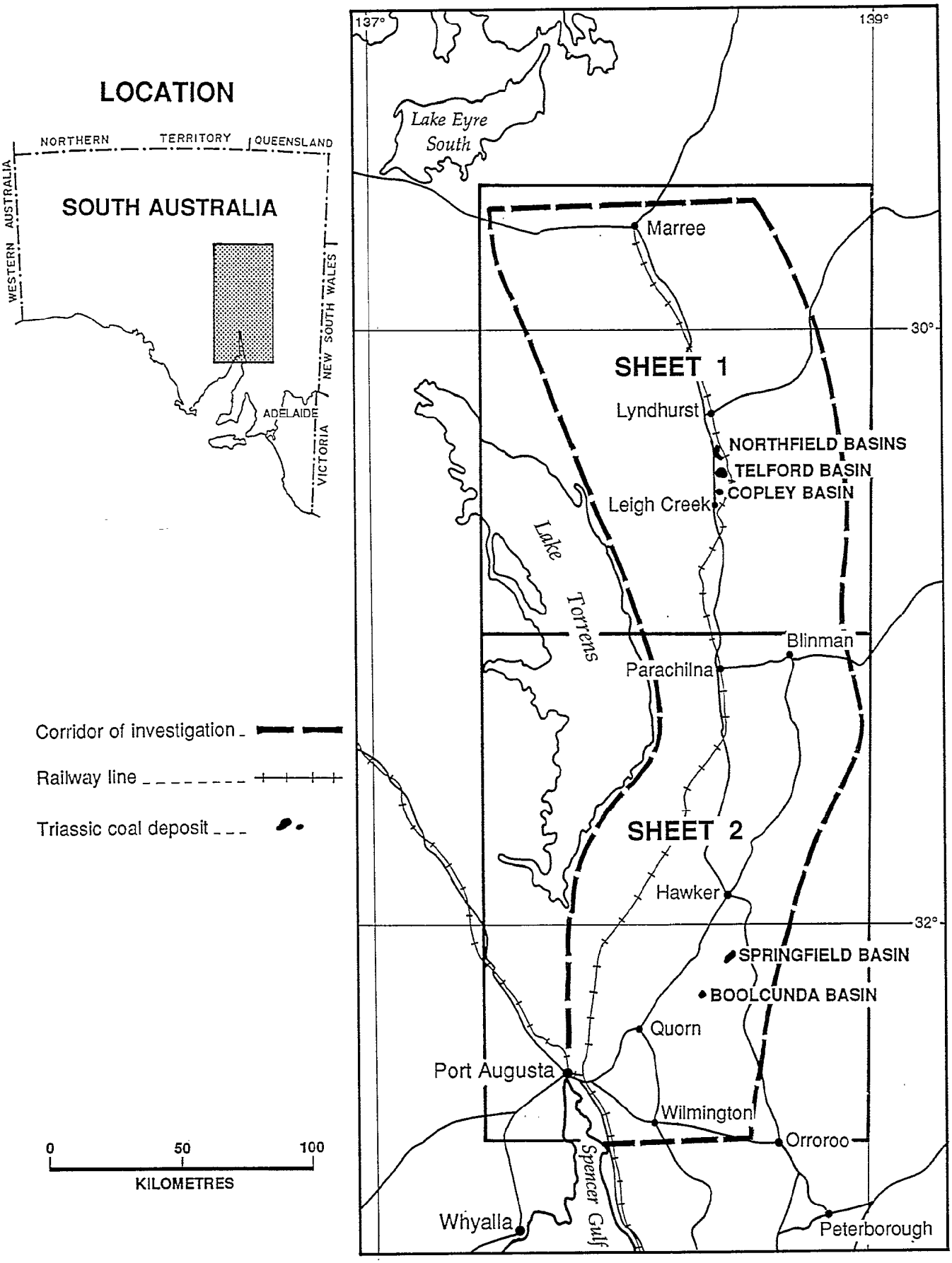
The results of a data review by MESA in 1992 to assess the prospectivity of the northern Flinders Ranges for concealed Triassic coal highlighted four main areas as having the best potential for a discovery. Following exploration for coal by MESA/ETSA in the Leigh Creek-Lyndhurst area (RB 95/28) attention was focussed on the alluvium covered areas within the vicinity of the Springfield and Boolcunda Triassic coal basins near Hawker and Quorn. Gravity surveys totalling 697 stations over an area of approximately 420km² were undertaken and used in combination with existing gravity information to define coal targets and a base/precious metal target in an area near Round Hill.

A program of 23 reverse circulation exploratory holes totalling 1506 metres of drilling was completed to test these targets. No coal or carbonaceous sediments were intersected. The gravity lows drilled were interpreted as being due to Quaternary-Tertiary sediments within bedrock depressions, deeply weathered bedrock or variations in bedrock lithology. The Round Hill gravity/magnetic high was tested by two holes which both intersected weathered Adelaidean rocks at shallow depth.

A total of 21 bedrock assay samples were submitted from 17 holes and apart from one gold value which was above background levels (0.039ppm from 42-44m in hole RH2) no significantly anomalous results were detected. A total of 9 water samples were collected from mainly Tertiary sands, with salinities ranging from 1962 mg/l to 10490 mg/l and flow rates from 0.2 to 1.4 l/s. A total of 38 sand-gravel bulk samples were collected from drillholes, with sample splits of these submitted for geochemical testing for diamond indicator elements. Of these, 4 intervals showed anomalous results. Bulks of these samples were submitted for indicator mineral identification with 3 possibly kimberlitic grains being identified in one sample (RB 95/31).

INTRODUCTION

In June 1992 the Premier of South Australia announced a government initiative (the South Australian Exploration Initiative (SAEI)) to boost petroleum and mineral exploration within the to facilitate the discovery of new resources thus benefiting the State in terms of new wealth and jobs. The Triassic Coal Exploration Program was consistent with this initiative as it would encourage the search for new Triassic coal deposits within a corridor from Marree, just north of the existing infrastructure of the coal mine at Leigh Creek, along the railway line, to the power stations at Pt. Augusta (Fig. 1) which are designed to burn Leigh Creek coal or similar Triassic coal.



SAEI TRIASSIC COAL EXPLORATION PROGRAM

AREA OF INVESTIGATION AND LOCATION OF TRIASSIC COAL DEPOSITS

Figure 1
96-0130 MESA

MINES AND ENERGY
SOUTH AUSTRALIA

NORTH FIELD BASINS

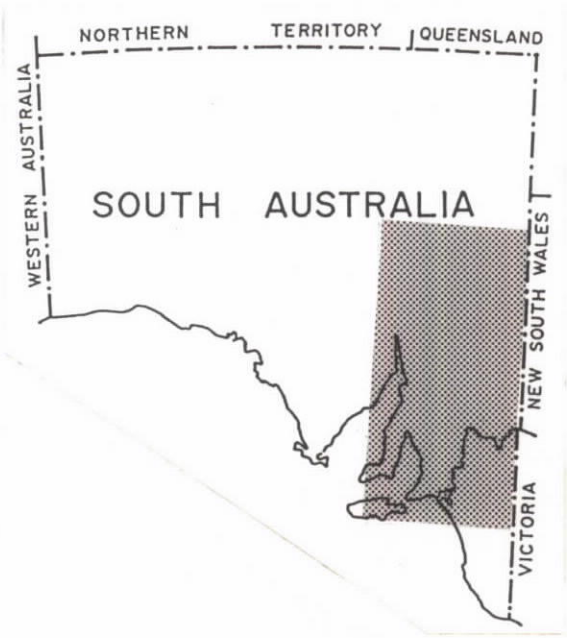
TELFORD BASIN

COPLEY BASIN

SPRINGFIELD BASIN

BOOLCUNDA BASIN

LOCALITY MAP



Corridor of investigation . . . .

Triassic coal basin . . . . . .

0 50 100

KILOMETRES

SOURCE: MESA Regional Geology Section (Compiler), 1993. Geological map, South Australia.
South Australia. Geological Survey. Maps of South Australia Series, 1: 2 000 000

SOUTH AUSTRALIAN EXPLORATION INITIATIVE

TRIASSIC COAL EXPLORATION PROGRAM

LOCATION OF TRIASSIC BASINS WITHIN THE ADELAIDE GEOSYNCLINE

Figure 2
96–0131 MESA

With this major infrastructure already in place a new discovery could be developed and put into production in a relatively short period which in turn could benefit South Australia by:

1. Supplementing coal supplies to Northern Power Station (NPS) units 1 and 2 (at Port Augusta) with cheaper fuel thereby reducing the overall cost of electricity to the State.

2. Providing enough additional coal at competitive rates to enable NPS3 (250 MW) to be built thus providing jobs and low cost electricity for the State.

3. Providing enough coal to build a new stand alone 500 MW coal fired power station.

EXPLORATION RATIONALE

Coal of Triassic age was chosen as the exploration target because the coal fired power stations in operation at Pt. Augusta are specifically designed to burn Leigh Creek coal, also of this age.

The area of investigation was defined as all alluvium covered areas within a corridor extending 50 km either side of the railway line from Pt Augusta to Marree (see Fig. 2). In defining this area the following economic constraints and assumptions were used;

- any Triassic basin within exposed Precambrian/Palaeozoic bedrock would have been discovered through regional mapping work, therefore Triassic basins concealed beneath alluvium cover were targeted.

- to be viable any coal discovery needed to be in close proximity to existing infrastructure such as the Port Augusta to Marree railway line, the Port Augusta to Leigh Creek power line, the Leigh Creek mine and township, or the Port Augusta power stations

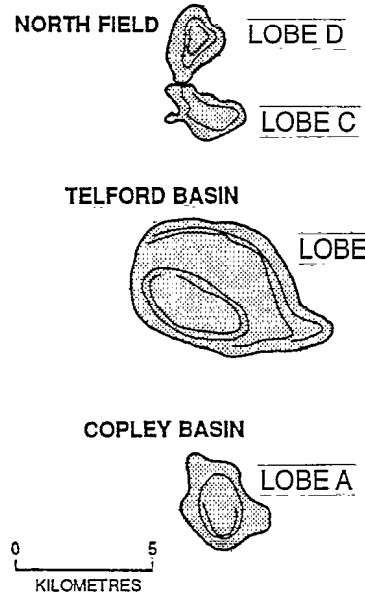
- the minimum economic size of a deposit would be that of the Lobe D Triassic coal deposit for areas close to Leigh Creek and a Springfield/Copley basin size deposit for areas away from Leigh Creek (see Fig. 3).

- Knowing the nature and configuration of the coal within the existing Triassic basins and the methods available for mining these deposits a post-Triassic surficial cover of less than 50 metres would be desirable.

To date in SA coal bearing sediments of Triassic age are known to exist within the Simpson Desert Basin and Cooper Basin sequences in the north, and as discrete sedimentary basins within the Adelaide Geosyncline near Leigh Creek (Lobes A,B,C,D) and Hawker (Springfield and Boolcunda Basins). For the purposes of this report attention will focus on the discrete basin-type deposits found within the Adelaide Geosyncline (Fig. 2). A comparison of size and various statistics for these basins is given in Figure 3.

A number of geological models have been postulated for the accumulation and preservation of these Triassic basins. In addressing this issue Springbett et. al. (1995) reviewed a number of references and concluded that it is generally considered that these basins represent erosional remnants of localised intramontane sedimentation and subsidence. The movement of diapirs and/or the reactivation of basement faults is thought to provide the mechanism for the localised structural movements which have given rise to the syndepositional subsidence. These ideas remain speculative and are too generalised to be used as a basis for eliminating any areas from detailed assessment. For this reason, a review of all waterbore and exploration data in the alluvium covered regions within the area of investigation was considered the best method for defining areas most prospective for Triassic coal.

	APPROXIMATE DIMENSIONS (km x km)	MAXIMUM SURFACE AREA (km^2)	MAXIMUM THICKNESS OF SEDIMENT (m)	COAL RESOURCE (tonnes)
LEIGH CREEK COALFIELD	2·5 x 1·5	3	130	22×10^6 (All mined)
NORTH FIELD LOBE D	2·5 x 1·5	3	240	20×10^6 (8×10^6 mined)
LOBE C				
TELFORD BASIN LOBE B	7×4·5	25	1200	500×10^6 (100×10^6 economic)
COPLEY BASIN LOBE A	3×2	6	250	11×10^6
SPRINGFIELD BASIN	4×2	7	500 (Includes 150m of Permian(?))	N/A
BOOLCUNDA BASIN	2×1·5	3	250	N/A

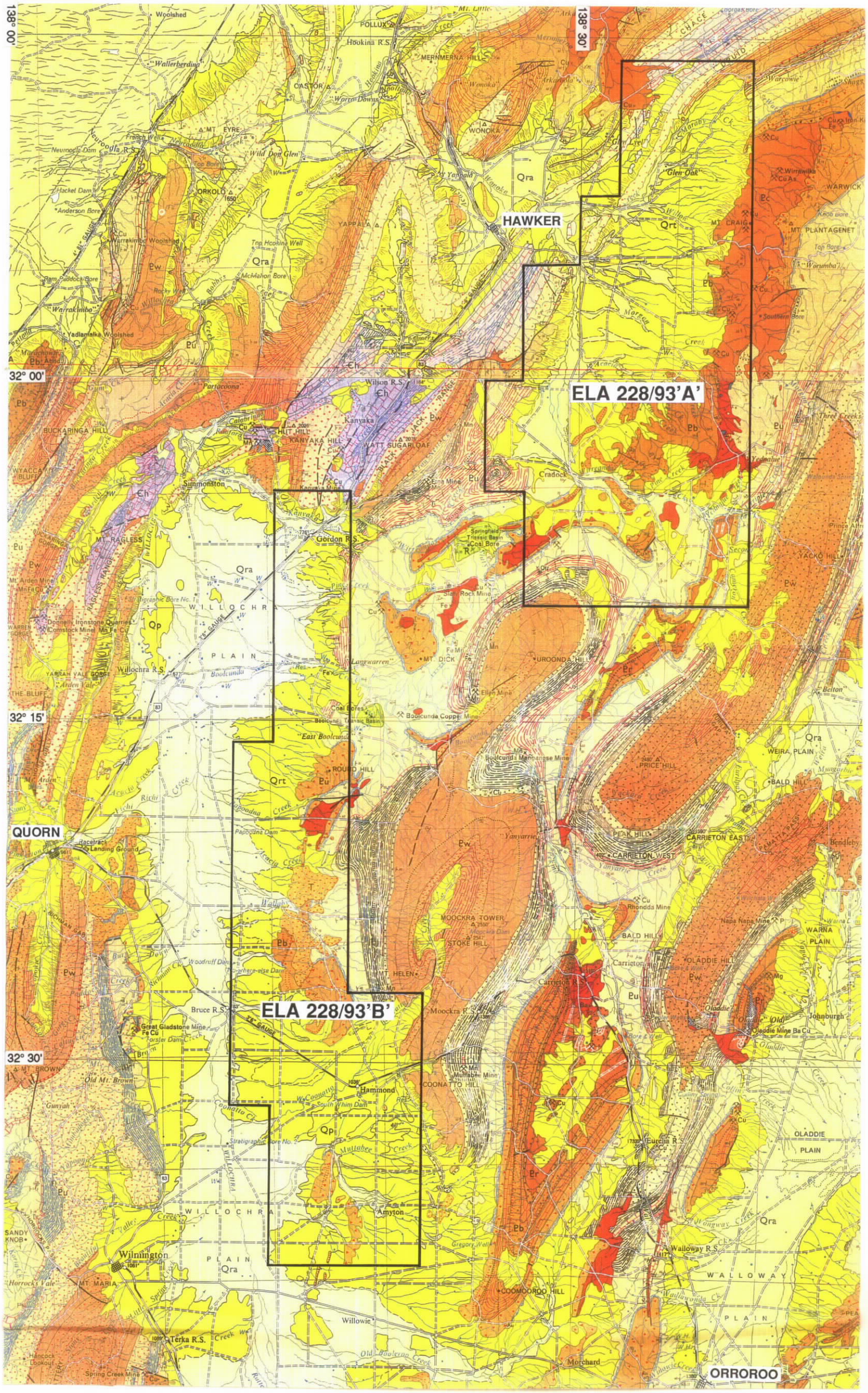


SAEI TRIASSIC COAL EXPLORATION PROGRAM

INTRAMONTANE TRIASSIC COAL BASINS IN SOUTH AUSTRALIA

MINES AND ENERGY SOUTH AUSTRALIA

Figure 3
96-0132 MESA



SOURCE: Dalgarno,C.R. and Johnson, J.E., 1966. PARACHILNA Map Sheet. *South Australia. Geological Survey. Geological Atlas 1: 250 000 Series, sheet S H 54-13*
Binks, P.B., 1968. ORROROO Map Sheet. *South Australia. Geological Survey. Geological Atlas 1: 250 000 Series, sheet SI 54-1*

SOUTH AUSTRALIAN EXPLORATION INITIATIVE

TRIASSIC COAL EXPLORATION PROGRAM

GEOLOGICAL SETTING OF ELA 228/93

Figure 4 96–0139 MESA

REGIONAL DATA REVIEW

Over a three month period in late 1992 a review of all relevant data was carried out to assess and prioritise the prospectivity of all alluvium covered areas within a corridor 50 km either side of the Pt Augusta to Marree railway line for concealed Triassic coal. The data included geological/geophysical information obtained through company exploration activity, MESA investigations, and waterbore drilling. When compiling the data the stratigraphy of all drillhole logs was assessed in order to identify any possible Mesozoic intersections and to define a depth to Palaeozoic/Precambrian bedrock isopach for all alluvium covered areas. A summary of all previous Triassic coal exploration within the corridor of investigation was produced (see Fig. 5 for previous exploration in the vicinity of ELA 228/93), with a first pass interpretation of all gravity data over the areas of interest also undertaken (Refer to MESA Envelope No. 9051)

The results of this data review showed that the density of geological and geophysical information within the alluvium covered areas of investigation was insufficient to eliminate the possibility of additional concealed Triassic coal basins of economic size.

The depth to bedrock isopachs and the proximity to known occurrences of Triassic sedimentation were then used as the basis for defining four main areas which appear most prospective for economic Triassic coal beneath shallow alluvium cover (Fig. 6 shows the two areas considered most prospective in the vicinity of the Springfield and Boolcunda Triassic Basins). Other areas with a low density of data and shallow alluvium cover were also considered as having potential but were given a lower priority.

In December 1992 a meeting between ETSA and MESA representatives to discuss the outcomes of this review resulted in an agreement between ETSA and MESA to jointly explore the priority areas with the understanding that ETSA would have rights to any coal discovery. It was decided to begin exploration within the Leigh Creek-Lyndhurst area which was given the highest priority because of its proximity to the existing infrastructure of the Leigh Creek Coalfield. This would then be followed by a program to investigate the shallow alluvium covered areas in the vicinity of the Springfield and Boolcunda Triassic basins (near Hawker and Quorn). The results of this second exploration phase are detailed below.

HAWKER-QUORN EXPLORATION PROGRAM

Following the completion of a program of exploration over the alluvium covered areas in the vicinity of the Leigh Creek Coalfield (Shaw, 1996a) which resulted in the discovery of a new coal bearing basin near Copley (Shaw, 1996b), attention was focussed on the areas highlighted as being most prospective in the vicinity of the currently uneconomic Springfield and Boolcunda Triassic basins located approximately 30 kilometres south of Hawker (Fig. 6). Exploration was carried out under Exploration Licence Application 228/93, and as for the northern program concentrated on the shallow alluvium covered areas.

Geological Setting

ELA 228/93 covers two separate but extensive flat alluvium covered areas (Fig. 4). The area to the northeast, labelled 228/93 "A" encompasses a flat alluvium covered region known as the Willow Plain. This plain is flanked by low to moderate hills of outcropping Adelaidean rock which, to the southwest encompass a small Permo-Triassic basin known as the Springfield Basin. The basin is approximately 7 km² in area and contains a sequence of at least 132 metres of Permian sediments overlain by up to ~600m of Triassic sediment (Johnson, 1960; Alley, 1995; Kwitko, 1995). The Permian sediments consist of conglomerates, claystones, carbonaceous siltstones and coal seams (up to 7m thick) which rest unconformably on a combination of diapiric breccia and rocks of Adelaidean age. The steep dip of the coal seams, depth of burial, high ash content and limited tonnage suggests that the coal is of little economic interest (Alley, 1995). The Permian sequence is unconformably overlain by sandstones, grey carbonaceous mudstone, and thin discontinuous coal seams of Triassic age, which are similar in appearance and configuration to those seen within the Leigh Creek Triassic coal deposits (Binks, 1971). It is believed that both the Springfield and Boolcunda deposits have been preserved as a result of post-Triassic folding and faulting (Johnson, 1960).

Area ELA 228/93 "B" (Fig. 6) is located on the eastern flank of the Willochra Plain beneath which lie the Quaternary-Tertiary sediments of the Willochra Groundwater Basin. The eastern margin of this alluvial plain is bound by low hills of Adelaidean outcrop which contain the Boolcunda Triassic Basin. This basin is approximately 3km² in surface area and contains up to ~300 metres of grey carbonaceous mudstone, sandstone and thin discontinuous coal seams of Triassic age (Kwitko, 1995).

Both the Springfield and Boolcunda Basins are predominantly overlain by a thin veneer of Quaternary/Recent alluvium.

Previous Coal Exploration

The Springfield and Boolcunda Triassic basins were discovered in 1957 and 1956 respectively with subsequent drilling by the Department of Mines proving the coal in both basins to be uneconomic with no further work being warranted (Binks, 1971). The existence of these deposits proved that Triassic sedimentation had taken place in the area, and highlighted the potential for finding other Triassic basins which might contain economic coal.

Since the discovery of these deposits, 3 phases of exploration have taken place for Triassic coal within the area (Table 1 and Fig. 5). The first of these programs was carried out in 1958-59 by the Department of Mines (SADME) following ground reconnaissance of areas within the vicinity of the Springfield and Boolcunda basins. The program consisted of 3 holes drilled to the northwest of the Springfield Basin with no coal being intersected (Johnson, 1959). The second phase was undertaken in 1979-80 by Dampier Mining/BHP as part of a larger program to search for base metals, diamonds and coal. Two holes were drilled for coal to the southwest of the Boolcunda Basin following a review of SADME gravity data, with no coal being intersected (Dampier Mining, 1979). The last program was undertaken by the Electricity Trust of South Australia and was aimed at identifying any large (Lobe B type) deposits which may have been present beneath the alluvium covered areas around Hawker. The program consisted of 12 holes with the discovery of a thin horizon of Tertiary lignitic clay in one hole, to the northwest of Hawker, being the only intersection of carbonaceous material (ETSA, 1989).

In all, 17 holes totalling 1500m of drilling has been undertaken to-date to search for Triassic coal in areas around the Springfield and Boolcunda Deposits. The sparseness of this drilling together with the limited number of mineral and waterbore drillholes (Fig. 6), and the lack of gravity survey data in the area suggests that there is still significant potential for finding an economic sized deposit beneath the alluvium covered areas in the vicinity of the Springfield and Boolcunda basins should such a deposit exist.

TABLE 1 : Previous Triassic Coal Exploration (Sheet 2)

Date	Company	Tenement	Exploration Summary	References
1958-59	SADME	Nil	Ground Reconnaissance - investigation of areas within the vicinity of the Springfield and Boolcunda Basins for other outcropping Triassic sediments. Drilling -3 holes northeast of the Springfield Basin - total metreage = 291m	SADME Docket Reference 997/56
1979-80	Dampier Mining Company Pty Ltd	EL 496	Gravity -SADME surveys (broad traverses) over the Willochra Basin were reviewed Drilling -2 holes east of Quorn - total metreage = 221m	SADME Env 3540
1989	ETSA	EL 1576	Gravity - Nil Drilling -12 holes around Hawker - total metreage = 988m	SADME Env 8157

Exploration Program

As previously discussed selection of the exploration area (ELA 228/93) was based upon the results of an earlier data review which highlighted extensive alluvium covered areas within the vicinity of the Springfield and Boolcunda basins with drillhole and geophysical information sparse enough to have missed a concealed Triassic coal deposit of economic size.

Because of the lack of infrastructure and the potential cost of starting up a new mine in the area the minimum economic target was considered to be a deposit of similar size to the Springfield or Copley Triassic basins (Fig. 3) with less than 50 metres of overburden. The use of gravity surveys to identify drilling targets was considered the best method for exploring the large extent of prospective alluvium covered areas for Triassic coal deposits of this size. Gravity stations at 1000x1000m and 1000x500m (closest to the known deposits) were considered appropriate for identifying the presence of a concealed Triassic coal deposit, within the depth and size limits chosen.

Based on the interpretation of the gravity surveys conducted and previous survey data a number of gravity lows were identified as being prospective for coal. A gravity high identified in the Round Hill area was further investigated by detailed gravity and ground magnetics as a base and precious metal target (Appendix C). Geological reconnaissance was undertaken to check the ground locations of the anomalies with some coal targets being eliminated due to the presence of outcropping Adelaidean rocks. The coal and mineral targets were subsequently tested by drilling.

Representatives of the Flinders Ranges Aboriginal Heritage Consultative Committee as the traditional owners of the area, inspected the drillsites prior to drilling.

1. Gravity Surveys

The exploration area had previously been covered by a regional gravity grid at approximately 7 km spacings, and more detailed traverses along tracks in some areas. The extent and limited station density of these surveys together with the generally sparse nature of drilling to bedrock left large unexplored areas which could contain a Triassic coal deposit of potentially economic size. For this reason it was decided to infill the

existing gravity over these areas with surveys of a suitable station density to identify possible coal basins of the targeted size, with the areas closest to the known coal basins given highest priority.

In all, four gravity surveys were completed by MESA in the exploration area (Fig. 7) with gravity readings being taken at 697 stations over a total area of approximately 420 km². Equipment used in these surveys consisted of Scintrex Autograv and La Coste and Romberg gravity meters, 3 base-station and 2 roving Digibar 2000 digital barometers (which were used to calculate elevations and store gravity readings and station co-ordinates in digital form), and 2 GPS units (roving) to provide easting and northing co-ordinates for each gravity station. The following are details for each of the surveys completed.

1. Willow Plain Gravity Survey (MESA, 1993)
   - 280 stations as a 1000x500m and 1000x1000m grid over approximately 120 km² in an area to the northeast of the Springfield Triassic Basin.

2. Quorn East Gravity Survey (MESA, 1993)
   - 280 stations as a 1000x5000m and 1000x1000m grid over approximately 150 km² over the northeastern margin of the Willochra Basins, directly west and northwest of the Boolcunda Triassic Basin.

3. Hammond Gravity Survey (MESA, 1994)
   - 75 stations as 10 traverses (along tracks) over approximately 150 km² in an area to the south of Hammond.

4. Round Hill Gravity/Ground Magnetics Survey (MESA, 1994)
   - Gravity - 62 stations at 100m spacing as two 3 km traverses.
   - Magnetics - approximately 300 stations at 25 m spacings along the two gravity traverses and as a 1.5 km additional traverse.

All survey information has been added to the MESA State gravity and magnetics databases with results of each of the above surveys presented in Appendices C and D.

2. Drilling

Following the interpretation of gravity survey data, a review of all drillhole/waterbore information in the area, and geological field reconnaissance a number of prospective gravity lows (for coal) and a gravity high (for base/precious metals) were selected as drilling targets.

A program of 23 holes (including 2 for base/precious metals) totalling 1506m of reverse circulation drilling was completed over the period from 19/10/94 to 29/10/94 within ELA 228/93 to test these targets (see Table 2 and Fig. 7). Drilling was carried out by the MESA Drilling Branch using an Almet Masters Explorer 200 reverse circulation drilling rig. The reverse circulation drilling method was used in all cases with the exception of 40m of drilling where a roller bit (RAB drilling) was used to penetrate very hard surface conglomerates in 2 holes.

TABLE 2 : Hawker-Quorn Coal Exploration - Drilling Summary

Drill hole Number	Completion Date	Total Depth (m)	GPS Co-ordinate (AMG Zone 54)		MESA Unit Number
			Easting	Northing	
W1	19/10/94	54	273750	6474880	6634-257
W2	20/10/94	113	274315	6470690	6634-258
W3	20/10/94	80	272776	6464620	6634-259
W4	21/10/94	44	269850	6459000	6634-260
W5	21/10/94	74	266130	6458550	6634-261
W6	21/10/94	36	262000	6460000	6534-277
W7	21/10/94	54	261510	6452960	6533-729
W8	22/10/94	83	240900	6443720	6533-730
W9	22/10/94	26	244050	6440980	6533-731
W10	23/10/94	105	242470	6437720	6533-732
W11	23/10/94	110	242004	6434200	6533-733
W12	25/10/94	108	241600	6431750	6533-734
W13	26/10/94	100	242007	6429134	6533-735
W14	26/10/94	27	241944	6426610	6533-736
W15	26/10/94	75	239500	6419600	6533-737
W16	28/10/94	62	246470	6398790	6532-1399
W17	28/10/94	101	240620	6402690	6533-740
W18	28/10/94	44	238820	6406350	6533-741
W19	29/10/94	68	244820	6400126	6532-1400
W20	29/10/94	60	248960	6394000	6532-1401
W21	29/10/94	10	251000	6386240	6532-1402
RH1	27/10/94	28	242506	6424493	6533-738
RH2	27/10/94	44	241880	6423520	6533-739

Drillhole lithological descriptions (Appendix A) have been based on cuttings samples collected at 2m intervals. These samples have been submitted to the MESA Core Library for permanent storage.

Samples were also collected from bedrock lithologies to test for base and precious metal potential, and from sand-gravel intervals for diamond indicator element geochemistry (Tables 3 and 4). Where significant groundwater flows were encountered, water samples were airlifted by the rig to obtain a flow rate estimate, with a sample of the water collected for salinity testing (Table 5).

All drillholes were completed by inserting an octaplug and flattening out any mounds or depressions created, with all sites being left as close as possible to their original state (refer to MESA Drillsite Inspection Report, given as Appendix F). In drillholes where separate groundwater aquifers were encountered these were cemented back to prevent any exchange of waters between these zones.

TABLE 3 : Bedrock Samples (cuttings) Submitted for Analysis

Hole No.	MESA Rock Sample No.	Depth Interval (m)	Lithology		Degree of Weathering
			Rock Type	Colour	
W3 "	R112254 R112255	78-80 80-80.5	Siltstone Siltstone	lgy-yl gy-or	M-SW SW
W5	R112259	73-74	Siltstone/shale	gn-br	M-SW
W6	R112260	34-36	Sandstone/siltstone	yl-wh	MW
W7	R112261	52-54	Siltstone/shale	br-gn/gy	M-SW
W9	R112266	22-24	Sandstone/siltstone	rd-yl	MW
W13	R112278	98-100	Sandstone/siltstone	gy-gn	M-SW
W14	R112283	26-27	Siltstone	rd-br & gy	M-SW
W15 "	R112284	64-68 74-75	Siltstone Siltstone/shale	yl-gy kk-br	M-SW SW
RH1 " "	R112295* R112296* R112297*	12-16 22-26 27-28	Siltstone Siltstone Shale (RC cores)	yl-br-mr mr-br & gy gy	SW SW-F F
RH2 "	R112298* R112299*	34-38 42-44	Siltstone Shale (RC cores)	br-yl gy	M-SW SW-F
W16	R112287	60-62	Siltstone/shale	mr-br & gy	SW
W17 " "	R112289* R112290* R112291*	86-88 94-96 98-101	Siltstone/ Fe grit Ferrug. Siltstone Talcose Siltstone	lgy-gn/rd-br lgy-gn/rd-br lgy-gn	MW MW SW
W19	R112292	66-68	Siltstone	yl-br	MW
W21	R112294	8-10	Siltstone	br-yl	M-SW

* Samples submitted for extended analysis

TABLE 4 : Samples Submitted for Geochemical Analysis (for Diamond Indicators)

Hole No.	MESA rock Sample No.	Depth Interval (m)	Sample Weight (Kg)	Lithology	Age
W2	R112245	74-76	10	Gravel/sand/clay(30:60:10)	Tertiary
	R112246	76-78	13	Gravel/sand/clay(30:60:10)	Tertiary
	R112247	78-80	6.5	Gravel/sand/clay(30:60:10)	Tertiary
	R112248	80-82	20	Gravel/sand/clay(20:50:30)	Tertiary
	R112249	82-84	18	Gravel/sand/clay(30:60:10)	Tertiary
	R112250	84-86	12	Gravel/sand/clay(30:60:10)	Tertiary
	R112251	100-102	4	Gravel/sand/clay(20:50:30)	Tertiary?
W3	R112252	64-66	9	mg Sand	Tertiary
	R112253	68-70	12	mg Sand (minor eg)	Tertiary
W5	R112256	66-68	12	Sand/gravel/clay (85:10:5)	Tertiary
	R112257	68-70	20	Sand/gravel/clay (85:10:5)	Tertiary
	R112258	70-72	19	Sand/gravel/clay (85:10:5)	Tertiary
W8	R112262	46-48	9.5	f-mg sand (20:80)	Quaternary
	R112263	62-64	13	f-mg sand (80:20)	Tertiary
	R112264	64-66	20	f-mg sand (20:80)	Tertiary
	R112265	66-68	19	f-mg sand (80:20)	Tertiary
W11	R112267	24-26	8	Gravel/pebbles	Quaternary
	R112268	30-32	14	Gravel/pebbles	Quaternary
	R112269	40-42	23	Gravel/pebbles	Quaternary
	R112270	42-44	15	Gravel/pebbles	Quaternary
	R112271	86-88	22	Gravel/sand (80:20)	Tertiary
	R112272	88-90	24	Gravel/sand (80:20)	Tertiary
	R112273	90-92	15	Gravel/sand/clay (70:20:10)	Tertiary
W12	R112274	6-36	80	Gravel/pebbles (minor clay)	Quaternary
	R112275	92-94	45	Sand/gravel (90:10)	Tertiary
	R112276	94-96	23	Sand/gravel (90:10)	Tertiary
	R112277	96-98	19	Sand/gravel (90:10)	Tertiary
W13	R112279	12-14	6	Gravel/pebbles	Quaternary
	R112280	60-62	6	f-mg Sand (80:20)	Tertiary
	R112281	62-64	9	f-mg Sand (80:20)	Tertiary
	R112282	64-66	14	f-mg Sand (80:20)	Tertiary
W16	R112286	22-26	22	Gravel/pebbles	Quaternary
W17	R112288	64-66	12	f-cg sand	Tertiary
	R112289	86-88	<1	Siltstone/Ferrug. grit	Adelaidean
	R112290	94-96	<1	Ferruginous Siltstone	Adelaidean
	R112291	98-101	<1	Talcose Siltstone	Adelaidean
W20	R112293	8-10	13	Gravel/pebbles	Quaternary

TABLE 5 : Water Samples

Hole No.	MESA Water Sample No.	Sampled Depth (m)	Lithology	Aquifer Interval (m)	Flow Estimate		Salinity (mg/L)
					Gall/hr	L/sec	
W2	W4220/94	80	Sand/gravel	74-85	340	0.4	2,137
W5	W4215/94	69	Sand/gravel	66-72	1050	1.3	3,395
W8	W4218/94	47	f-mg sand	46-48	160	0.2	1,962
W8	W4221/94	68	f-cg sand	62-68	930	1.2	2,658
W10	W4219/94	103	fg sand/silt	100-104	260	0.3	4,927
W11	W4222/94	110	Gravel (fg sand/silt)	86-92 (96-100)	930	1.2	3,810
W12	W4217/94	94	Sand/gravel	92-99	1120	1.4	5,728
W17	W4214/94	60	f-mg Sand	52-60	270	0.3	3,464
W20	W4216/94	44	Weathered Sandstone/ siltstone	30-44	340	0.4	10,490

Notes: 1. Flow estimates were measured by using the drilling rig to airlift water from the 'sampled depth' given above.

'Aquifer Interval' indicates the depth at which the water bearing zone occurs (Lithology is the rock type within this zone).

Results

All of the 21 holes drilled to test gravity lows for coal were terminated in variably weathered Adelaidean bedrock at depths ranging from 1m to 104m without encountering coal or carbonaceous sediments. The gravity lows tested have been interpreted as being due to the presence of poorly consolidated Quaternary and/or Tertiary sediments infilling bedrock depressions, deeply weathered bedrock, or contrasts in sub-surface bedrock lithology.

Geology encountered in exploration drillholes included Adelaidean lithologies which varied from siltstones, shales and sandstones to an unusual talcose siltstone in hole W17. These lithologies were often characterised by deep weathering with fresh bedrock reached in only 2 drillholes. In places the bedrock was overlain by fine to medium grained sands and silts of Tertiary age which were more commonly intersected as the main aquifer zone within the Willochra Groundwater Basin. In both of the areas drilled (i.e. Willow Plain and Willochra Plain) these sediments were overlain by significant thicknesses (up to 93m in hole W10) of off-white, puggy clay with common limonitic mottling, and brown, gypseous clay interbedded with lithic gravel and pebbles which occasionally occur as conglomerate with calcareous cement. It is thought that these units are equivalent to the Avondale Clay and Telford Gravel as seen in the northern Flinders Ranges (Binks, 1971), which are given ages of Late Tertiary (pers com G. Krieg 1994), and Quaternary (Coats, 1973). These sediments are blanketed by a thin layer of Recent alluvial silty clay.

The 2 holes drilled on magnetic and gravity highs near Round Hill intersected Adelaidean bedrock (Tapley Hill Formation; Tindelpina Shale Member?) at shallow depth. Apart from one gold value that was above background levels (ie. 0.039ppm from 42-44m in hole RH2) assay results showed no significantly anomalous values. The geophysical anomalies tested by these holes may have been due to deeper features which were not reached by drilling, or localised variations in the structure of sub-surface geological units. Assays of the remaining 16 bedrock samples submitted to AMDEL to test for base and precious metal potential did not show any significantly anomalous results. (Appendix B).

A total of 38 sand-gravel bulk samples were collected from drillholes (Table 4) with a 300g representative split submitted for geochemical analysis to test for diamond indicator elements. Four lithological intervals returned results considered to be anomalous in kimberlitic indicator elements and these were submitted for diamond indicator mineral identification with a chromite and 2 pyrope garnets of "possible kimberlitic" origin being found in one of the samples. This work showed that geochemical methods may be useful in diamond exploration as first pass alternative to the more expensive method of heavy media separation and diamond indicator mineral identification. The results of this work have been compiled as MESA Report Book 95/31 (Shaw, 1995).

Water was generally intersected within Tertiary sands with samples collected from 8 holes (Table 5). Salinities ranged from 1962 mg/l to 10490 mg/l and flow rates from 0.2 to 1.4 l/sec (Appendix E).

Conclusions

Gravity surveys and exploratory drilling for coal over shallow alluvium covered areas in the vicinity of the Springfield and Boolcunda Triassic basins failed to identify any coal or carbonaceous sediments.

The gravity targets that were interpreted as possible Triassic basins were found to be due to either the presence of poorly consolidated Quaternary and/or Tertiary sediments infilling bedrock depressions, deeply weathered bedrock, or contrasts in sub-surface bedrock lithology.

Geology encountered in exploration drillholes included variably weathered Adelaidean bedrock lithologies, Tertiary sands and silts, and Quaternary clays, gravel and conglomerate which was generally overlain by a thin cover of Recent soil

Two holes drilled to test the mineral potential of a magnetic/gravity high near Round Hill intersected Adelaidean bedrock (Tapley Hill Formation) at shallow depth with one assay result of 0.039ppm Au (42-44m) in hole RH2 which was above backgroung levels. Assay results from these holes and the coal exploration drillholes did not warrant any follow-up at this time.

A total of 38 sand-gravel drillhole samples were submitted for geochemical analysis with 4 returning results considered to be anomalous in kimberlitic indicator elements. The bulks of these were submitted for diamond indicator mineral identification with 3 minerals of "possible kimberlitic" origin being found in one of the samples. This work showed that geochemical methods may be useful in diamond exploration as first pass alternative to the more expensive method of heavy media separation and diamond indicator mineral identification (RB 95/31; Shaw,1995).

Based on the current geological and geophysical information available the shallow alluvium covered areas in ELA 228/93 have been adequately explored for Triassic coal deposits of the targeted size and no further work is warranted.

ACKNOWLEDGMENT

The author wishes to acknowledge the contribution of ETSA Corporation who jointly funded the project, and ETSA personnel Sean Brennan, Edek Choros, and Jeff Brick (of the Leigh Creek Coalfield Planning Branch) for their co-operation and assistance throughout the project. Thanks should also go to Serge Caplygin (Chief Engineer,MESA) and George Kwitko (Senior Geologist, MESA) for their input, project management and technical advice.

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137°30' 138°00' 138°30' 139°00'

31°00' 31°30' 32°00' 32°30' 32°40'

LAKE TORRENS

Parachilna

EL 1576

H12

H11 H10 H9 H8 H7 H6 H5 SC3 H2 SC2 H3 H4 H1 SC1

Hawker

SPRINGFIELD BASIN

BOOLCUNDA BASIN

EL 496

Quorn

Qn2 Qn1

Port Augusta – Leigh Creek powerline

PORT AUGUSTA

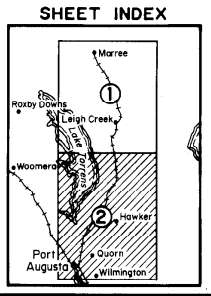
Northern Power Stations

Wilmington

0 5 10 15 20 25

KILOMETRES

SHEET INDEX



Alluvium cover

Triassic coal basin

Precambrian / Palaeozoic bedrock

Corridor of investigation

DRILLING

DATE	COMPANY	TENEMENT	DRILLHOLE NUMBERS
1958-59	MESA	–	SC1 – SC3
1979-80	Dampier Mng	EL 496	Qn1, Qn2
1989	ETSA	EL 1576	H1 – H12

GRAVITY

Although regional BMR and MESA surveys and traverses were probably used there were no surveys undertaken to specifically search for Triassic coal basins.

SOUTH AUSTRALIAN EXPLORATION INITIATIVE

TRIASSIC COAL EXPLORATION

PREVIOUS COAL EXPLORATION

SHEET 2

5674

137°30' 138°00' 138°30' 139°00'

31°00' 31°00'

31°30' 31°30'

32°00' 32°00'

32°30' 32°30'

32°40' 32°40'

137°30' 138°00' 138°30' 139°00'

LAKE TORRENS

Parachilna

Port Augusta – Leigh Creek powerline

Hawker

SPRINGFIELD BASIN

BOOLCUNDA BASIN

PORT AUGUSTA

Northern Power Stations

Wilmington

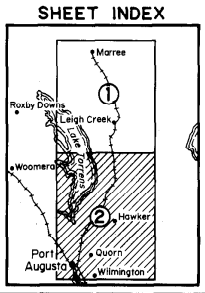
50 25

3 3 4 4

0 5 10 15 20 25

KILOMETRES

SHEET INDEX



Alluvium cover

Triassic coal basin

Precambrian / Palaeozoic bedrock

Corridor of investigation

Mineral bore to bedrock

Water bore to bedrock

Depth to bedrock contours, value in metres

Areas chosen as having the best potential for concealed, shallow Triassic coal

3 Priority 3

4 Priority 4

Although potential still exists in other areas they have been given a lower priority

SOUTH AUSTRALIAN EXPLORATION INITIATIVE

TRIASSIC COAL EXPLORATION

DRILLING TO BEDROCK AND PROSPECTIVE AREAS

SHEET 2

Figure 6
95-1304 MESA

5674

138° 00'
138° 15'
138° 30'
138°45'
31° 45'
32° 00'
32° 15'
32° 30'
32° 40'
138° 00'
138° 15'
138°30'

Neuroodla
Hawker
Quorn
Wilmington
Carrieton
Hammond

PORT AUGUSTA – LEIGH CREEK POWERLINE
PORT AUGUSTA – LEIGH CREEK RAILWAY

ELA 228/93'A'
ELA 228/93'B'

WILLOW PLAIN SURVEY
QUORN EAST SURVEY
ROUND HILL SURVEY TRAVERSES
HAMMOND SURVEY

SPRINGFIELD BASIN
BOOLCUNDA BASIN

SADME survey not in gravity database (Milton, 1977)

(Strat. Bore No.1)
(Strat. Bore No.2)

MINERAL DRILLHOLES

SAEI exploration

W1–W21 coal, RH1,RH2 minerals

Mineral: stratigraphic to basement

H1–H11, Q469–479, Q481–492, Qu1,2

WATER DRILLHOLES

Drilled to bedrock, prefixed by 1:100 000 map sheet number

Gravity survey station

Gravity contour (interval 1mgal)

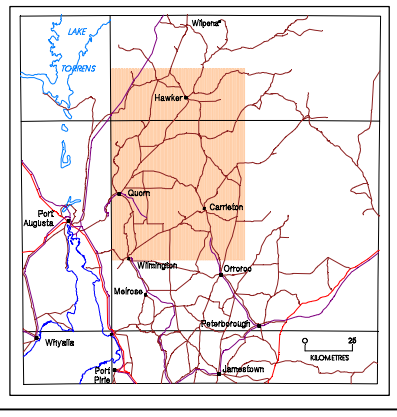
MESA gravity surveys (1993–94)

Quaternary and Tertiary cover

Triassic coal basin

Precambrian – Palaeozoic bedrock

0 5 10 15 20
KILOMETRES



LOCALITY

NEUROODLA 6534–III	HAWKER 6534–II	WARCOWIE 6634–III
WILLOCHRA 6633–IV	KANYAKA 6633–I	YEDNALUE 6633–IV
QUORN 6533–III	MOOCKRA 6533–II	CARRIETON 6633–III
WILMINGTON 6532–IV	WILLOWIE 6532–I	ORROROO 6632–IV

MINES and ENERGY RESOURCES SOUTH AUSTRALIA

Figure 7

SAEI Triassic Coal Exploration

DRILLHOLE LOCATION and GRAVITY CONTOUR PLAN

MESA 94–1868

567/48JDTA

APPENDIX A

DRILLHOLE GEOLOGICAL LOGS

DEPARTMENT OF MINES AND ENERGY

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W1

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 273750 Northing: 6474880 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 19/10/94 **Total Depth**: 54m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Brown, silty, clayey with minor dispersed gravel and pebbles. Unconsolidated.
2-14	GRAVEL - Various sub-angular to sub-rounded lithic gravel and pebbles ie. predominantly sandstone and quartzite with minor chert and occasional green-black dolerite? fragments from 6 to 8 metres. Unconsolidated with occasional brown silty clay matrix.
14-34	CLAY - Light brown to brown, puggy with occasional lithic gravel (as above) in places and minor gypsum.
34-38	CLAY - Off white with occasional light brown towards top, soft to moderately compact with occasional dispersed coarse to medium grained quartz grains.
38-54	CLAY/SILTSTONE (weathered bedrock) - Sticky and dry, soft clay with occasional soft to moderately firm off white and yellow siltstone. Siltstone is becoming ochreous red-brown-yellow in colour and more common with depth. Highly weathered.
	EOH = 54m

INTERPRETED STRATIGRAPHY: 0-2m - Recent
2-34m - Quaternary
34-38m - Quaternary-Tertiary
38-54m - Adelaidean, Tarcowie Siltstone ?

SAMPLING: Nil

F07951.RS

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W2

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 274315 Northing: 6470690 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 20/10/94 **Total Depth**: 113m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Brown, silty, clayey with occasional dispersed gravel and pebbles. Unconsolidated.
2-8	SILTY CLAY - Light brown, soft, with occasional dispersed lithic gravel and pebbles.
8-24	CLAY/GRAVEL (40:60) - Brown, soft to moderately compact clay with trace gypsum and common dispersed gravel. The gravel occurs as thick intervals with minor brown clay as matrix. Gravel is predominantly made up of yellow-brown and blue-green siltstone with minor quartz and quartzite fragments.
24-74	CLAY - Off white to light grey, soft to moderately compact with occasional red-yellow limonitic staining and grit. Occasional silty lenses with minor dispersed quartz sand. Silty clay from 72 to 74m.
74-85	SAND/GRAVEL/CLAY (60:30:10) - Poorly consolidated sub-angular to sub-rounded quartz sand and gravel with occasional off white soft silty clay lenses. Gravel contains minor agates. Water struck - sample airlifted from 80m, flow estimate = 340 Gallons/hr.
85-90	CLAY - Off white to brown with occasional ochreous yellow, mottled colouring, soft and silty.
90-113	CLAY (Highly weathered bedrock) - Off white to ochreous yellow, relatively homogeneous, predominantly soft but appears to be getting firmer with depth. Trace soft claystone/siltstone towards base of interval, with a band of bright yellow firm clay observed at approximately 90m (oxidation contact?). Trace mica. Common sand-gravel contamination from above. EOH = 113m

INTERPRETED STRATIGRAPHY:

0-2m	- Recent
8-24m	- Quaternary
24-74m	- Quaternary-Tertiary
74-90?m	- Tertiary
90?-113m	- Adelaidean

SAMPLING: **Sand-Gravel** (bulk samples) : 74-76m, 76-78m, 78-80m, 80-82m, 82-84m,84-86m, 100-102m (likely contamination from above)
Water : Sample airlifted from 80m

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W3

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 272776 Northing: 6464620 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 20/10/94 **Total Depth**: 80m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Light brown, silty, clayey with occasional dispersed gravel. Unconsolidated.
2-10	GRAVEL/CLAY (80:20) - Various lithic gravel and pebbles (ie. siltstone, dolerite , quartzite, chert) within a light brown silty clay matrix. Occasional firm brown gypseous clay lenses becoming more common towards base.
10-20	CLAY - Firm to soft, brown, gypseous as above but with rare gravel.
20-36	SILTY CLAY - Off white to light grey, soft to moderately compact, puggy with varying amounts of maroon and yellow limonitic mottling and occasional grit. Silty from 24m with common medium to coarse grained sand lenses (occasionally cemented) from 32 to 35m.
36-57	CLAY - Off white to light grey, soft to moderately compact, puggy with varying amounts of red-brown and yellow limonitic mottling and occasional grit.
57-64	SILCRETE/SILTY CLAY - Brightish white to off white soft silty clay with common hard to very hard silcreted sand bands and silcrete grit from 57 to 60m.
64-72	SAND - Predominantly fine to medium grained, poorly consolidated, clean quartz sand with minor silty clay lenses. Up to 5% coarse grained with minor yellow staining from 70 to 72m. No significant water struck.
72-76	CLAY/SILTSTONE (weathered bedrock) - Off white to ochreous yellow, clayey, soft siltstone.
76-80.5	SILTSTONE - Light green and yellow, soft to moderately indurated becoming light grey to grey-brown and platey towards base of interval. Moderately to slightly weathered.
	EOH = 80.5m

INTERPRETED STRATIGRAPHY:
0-2m - Recent
2-20m - Quaternary
20-57m - Quaternary-Tertiary
57-72m - Tertiary
72-80.5m - Adelaidean, Upper Burra Group ?

SAMPLING: **Bedrock assay** : 78-80m, 80-80.5m
Sand-Gravel (bulk samples) : 64-66m, 68-70m

DEPARTMENT OF MINES AND ENERGY

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W4

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 269850 Northing: 6459000 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 21/10/94 **Total Depth**: 44m

DEPTH (m)	CUTTINGS DESCRIPTION
0-1	SOIL - Light brown, silty, clayey with occasional dispersed gravel. Unconsolidated.
1-28	CLAY/GRAVEL (70:30) - Brown, soft to moderately compact clay with trace gypsum to 20m and occasional dispersed lithic gravel from 1 to 6m. Abundant gravel (90%) from 20 to 28m with brown clay matrix, trace calcareous cement from 26 to 28m.
28-30	CLAYEY SILTSTONE/SANDSTONE (60:40) (weathered bedrock) - Medium grained yellow stained sandstone interbedded with highly weathered red-orange and yellow siltstone.
30-44	CLAY/SILTSTONE - Highly weathered siltstone as above with occasional firm (moderately indurated) zones becoming more common towards base of interval.
	EOH = 44m

INTERPRETED STRATIGRAPHY: 0-1m - Recent
1-28m - Quaternary
28-44m - Adelaidean, Cradock Quartzite?/Tarcowie Siltstone?

SAMPLING: Nil

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DEPARTMENT OF MINES AND ENERGY

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W5

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 266130 Northing: 6458550 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 21/10/94 **Total Depth**: 74m

DEPTH (m)	CUTTINGS DESCRIPTION
0-4	SOIL - Light brown, silty, clayey with occasional dispersed gravel and pebbles. Unconsolidated.
4-18	CLAY - Brown, soft to moderately compact, gypseous. Occasional lenses of lithic gravel and pebbles. Trace black-grey manganese staining.
18-66	CLAY - Off white to light grey with varying amounts of maroon and yellow limonitic staining and mottling, puggy, moderately to very compact. Minor black manganese? staining from 56-60m. Trace rounded quartz granules (up to 3mm) within clay from 60-66m.
66-72	SAND/GRAVEL/CLAY (85:10:5) - Off white, relatively clean, fine to coarse grained (predominantly medium grained), poorly sorted, well to sub rounded quartz sand with occasional rounded and polished quartz gravel up to 10mm in size. Rare white silty clay lenses throughout interval. Water struck - sample airlifted from 69m, flow estimate = 1050 Gallons/hr.
72-74	SILTSTONE/SHALE - Off white and green-brown, laminated, clayey from approx. 72-72.5m but generally moderately to well indurated.
	EOH = 74m

INTERPRETED STRATIGRAPHY:
0-4m - Recent
4-18m - Quaternary
18-66m - Quaternary-Tertiary
66-72m - Tertiary
72-74m - Adelaidean, Saddleworth Formation Equivalent?

SAMPLING:
Bedrock assay : 73-74m
Sand-Gravel (bulk samples) : 66-68m, 68-70m, 70-72m
Water : Sample airlifted from 69m

F07951.RS

DEPARTMENT OF MINES AND ENERGY

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W6

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 262000 Northing: 6460000 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 21/10/94 **Total Depth**: 36m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Light brown, silty, clayey with occasional dispersed gravel and pebbles. Unconsolidated.
2-8	CLAY/GRAVEL (40:60) - Brown, soft to moderately compact, gypseous clay with common dispersed lithic gravel and pebbles of predominantly sandstone and quartzite.
8-20	CLAY - Off white to light grey, puggy with varying amounts of red-maroon and yellow limonitic mottling and grit. Slightly silty throughout.
20-30	SAND/CLAY (weathered bedrock) - Soft, off white and yellow clay with common fine to medium grained sand interbeds? occasionally occurring as well indurated sandstone bands.
30-36	SANDSTONE/CLAY - Off white, fine to medium grained, moderately to well indurated sandstone with common yellow-white weathered siltstone interbeds. Sandstone is becoming firmer and less weathered with depth.
	EOH = 36m

INTERPRETED STRATIGRAPHY: 0-2m - Recent
2-8m - Quaternary
8-20m - Quaternary-Tertiary
20-36m - Adelaidean, Uroonda Siltstone Member?

SAMPLING: **Bedrock assay** : 34-36m

F07951.RS

DEPARTMENT OF MINES AND ENERGY

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W7

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 261510 Northing: 6452960 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 21/10/94 **Total Depth**: 54m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Brown, silty, clayey. Unconsolidated.
2-8	CLAY - Brown to light brown, soft to moderately compact, gypseous. Occasional dispersed lithic gravel and pebbles.
8-46	CLAY - Off white to medium grey with varying amounts of red-maroon and yellow limonitic staining and mottling, puggy, moderately to very compact. Occasional bands of hard red-maroon limonitic concretions and grit. Minor lenses of lithic gravel (predominantly sandstone and coarse grained well to sub rounded quartz). Basal limonitic and quartz grit with trace gypsum? at 46m.
46-51	CLAY (weathered bedrock) - Soft, white, yellow and red multicoloured, sticky and dry texture.
51-54	SILTSTONE/SHALE - Brown-green with occasional light grey banding, moderately to well indurated, well bedded with common joints.
	EOH = 54m

INTERPRETED STRATIGRAPHY: 0-2m - Recent
2-8m - Quaternary
8-46m - Quaternary-Tertiary
46-54m - Adelaidean, Tarcowie Siltstone Member ?

SAMPLING: **Bedrock assay** : 52-54m

F07951.RS

DEPARTMENT OF MINES AND ENERGY

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W8

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 240900 Northing: 6443720 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 22/10/94 **Total Depth**: 83m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Brown, silty, clayey with occasional dispersed lithic gravel. Unconsolidated.
2-16	CONGLOMERATE/CLAYEY SAND - Lithic gravel in a variably cemented calcareous matrix of light brown clay and fine to medium grained quartz sand. Occasional poorly cemented lenses of clayey sand throughout. Interval from 7 to 16m is predominantly made up of very hard, calcareous cemented, fine to medium grained quartz sand with minor coarse lithic grains and trace light brown clay as matrix.
16-46	SILTY CLAY - Off white to light grey and light brown-yellow, soft to puggy with occasional dispersed lithic granules and grit. Varying amounts of maroon and yellow limonitic staining and mottling. Clay varies in silt content throughout. Approx. 30cm band of fine to medium grained sand in 36 to 38m interval.
46-48	SAND - Fine to medium grained (20:80), well to sub-rounded, poorly consolidated quartz sand with minor yellow silty clay as matrix. Water struck - sample airlifted from 47m, flow estimate = 160 Gallons/hr.
48-62	SILTY CLAY - as for 16 to 46m but with occasional bands of hard red-maroon limonitic nodular concretions and grit.
62-68	SAND - Fining upwards sequence of fine to coarse grained, sub-angular to sub-rounded, quartz sand with minor yellow clay matrix. Quartz grains are up to 5mm in size with minor grey-black grains. Water struck - sample airlifted from 68m, flow estimate = 930 Gallons/hr (may be some contamination from waters above)
68-83	CLAY (weathered bedrock) - Relatively homogeneous white clay with rare soft, highly weathered siltstone/claystone throughout. Some chips from 70 to 72m show minor pink dendritic features. Sand contamination from above is common from 68m to end of hole. EOH = 83m, Hole abandoned at 83m when the drillbit became blocked.

INTERPRETED STRATIGRAPHY:
0-2m - Recent
2-16m - Quaternary
16-62m - Quaternary-Tertiary
62-68m - Tertiary
68-83m - Adelaidean, weathered Wonoka Formation??

SAMPLING: **Sand-Gravel** (bulk samples) : 46-48m, 62-64m, 64-66m, 66-68m
Water : Samples airlifted from 47m and 68m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W9

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 244050 Northing: 6440980 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 22/10/94 **Total Depth**: 26m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Light brown, silty, clayey with minor dispersed gravel. Unconsolidated.
2-8	GRAVEL/CONGLOMERATE - Various lithic gravel and pebbles in a variably calcareous cemented matrix containing minor amounts of brown silt and clay. Gravel from 6 to 8m has common black-dark grey manganese? staining.
8-26	SANDSTONE/SILTSTONE (90:10) - Off white, yellow and pink, medium grained sandstone with occasional black-brown iron? or manganese? rich laminae, and minor pink, red and yellow highly weathered siltstone interbeds.
	EOH = 26m

INTERPRETED STRATIGRAPHY: 0-2m - Recent
2-8m - Quaternary
8-26m - Adelaidean, Uroonda Siltstone Member?

SAMPLING: **Bedrock assay** : 22-24m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W10

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 242470 Northing: 6437720 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 23/10/94 **Total Depth**: 105m

DEPTH (m)	CUTTINGS DESCRIPTION
0-1	SOIL - Light brown, silty, clayey with occasional dispersed gravel and pebbles. Unconsolidated.
1-6	GRAVEL - Unconsolidated lithic gravel and pebbles in a light brown silty clay matrix.
6-24	CLAY - Light brown with traces of black manganese streaking, soft to moderately compact, with occasional lenses of lithic gravel and pebbles and minor dispersed lithic granules. Trace gypseous texture in places.
24-94	CLAY - Off white to light grey, occasional red-brown with varying amounts of red-maroon and yellow limonitic staining, mottling and grit. The clay is moderately to very compact and contains occasional hard calcareous cemented bands/lenses between 32 and 38m, and is silty from 68 to 76m.
94-100	SILCRETE/SILTY CLAY/SAND (75:20:5) - Off white, variably cemented silcrete bands and grit with occasional white silty clay lenses and minor dispersed well to sub-rounded quartz sand and quartz granules up to 2mm.
100-104	SILT/SAND - Off white to buff silt/very fine sand, poorly consolidated with occasional cemented lenses. Trace buff coloured clay matrix. Water struck - sample airlifted from 103m, flow estimate = 260 Gallons/hr.
104-105	CLAY (weathered bedrock?) - Soft, sticky and dry texture, off white with red-brown and yellow colouring.
	EOH = 74m, Hole abandoned at 105m when drillbit became blocked.

INTERPRETED STRATIGRAPHY:
0-1m - Recent
1-24m - Quaternary
24-94m - Quaternary-Tertiary
94-104m - Tertiary
104-105m - Adelaidean?

SAMPLING: **Water** : Sample airlifted from 103m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W11

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 242004 Northing: 6434200 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: RC (incl. tricone, 32-36m) **Logged By**: R. Shaw
Completion Date: 23/10/94 **Total Depth**: 110m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Light brown, silty, clayey. Unconsolidated.
2-44	CLAY/GRAVEL - Alternating intervals of light brown, off white to yellow-brown, soft to moderately compact clay with occasional dispersed lithic gravel, and poorly consolidated lithic gravel and pebbles with minor amounts of light brown clay as matrix. Intervals containing predominantly gravel occur at 12-22m, 24-26m ,30-33m and 40-44m. Black manganese? staining on gravel and pebble surfaces from 24-25m.
44-76	CLAY - Off white to light grey with red-brown and yellow-brown, puggy.
76-80	SILTY CLAY / SAND (70:30) - Light grey and yellow-brown, moderately puggy silty clay with occasional silty very fine to fine grained poorly consolidated sand lenses.
80-86	CLAY - as for 44-76m interval.
86-92	GRAVEL - Well to sub-rounded quartzose and siltstone gravel and pebbles and abundant quartz grains, trace brown clay matrix. Poorly consolidated with a high proportion of gravel and pebble sized material. Lense of medium grey clay between 90 and 92m. Water struck - sample airlifted from 110m, flow estimate = 930 Gallons/hr.
92-100	SILTY CLAY - Soft off white to light grey with occasional hard red-yellow limonitic? fragments. Common fine to very fine loosely cemented sand/sandstone bands and lenses from 96 to 100m. A brightish yellow clay layer with occasional hard red-yellow limonitic chips was observed at approx. 92m (oxidation contact?).
100-110	CLAY/SILTSTONE (weathered bedrock) - Off white and light grey to pink, sticky, soft and dry clay with occasional moderately indurated massive light grey siltstone with occasional maroon-red and yellow dendritic features.

EOH = 110m

INTERPRETED STRATIGRAPHY:
0-2m - Recent
2-44m - Quaternary
44-86m? - Quaternary-Tertiary
86?-100m? - Tertiary?
100?-110m - Adelaidean, Uroonda or Tarcowie Siltstone?

SAMPLING: **Sand-Gravel** (bulk samples) : 24-26m, 30-32m, 40-42m, 42-44m, 86-88m, 88-90m, 90-92m
Water : Sample airlifted from 110m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W12

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 241600 Northing: 6431750 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: RC (incl. tricone, 0-36m) **Logged By**: R. Shaw
Completion Date: 25/10/94 **Total Depth**: 108m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Light brown, silty, clayey with occasional dispersed gravel. Unconsolidated.
2-6	CLAY - Light brown, soft with occasional dispersed lithic gravel.
6-38	GRAVEL/CLAY (95:5) - Various lithic gravel and pebbles (predominantly quartzite, siltstone/shale and quartz) with minor light brown silty clay as matrix and as occasional thin lenses throughout. Poorly consolidated. No significant water present after passing through this unit.
38-78	CLAY - Off white to light grey and light brown-yellow, puggy, moderately to very compact. Trace red-maroon limonitic grit from 74 to 78m.
78-92	CLAY - White to off white, soft and sticky with occasional red and yellow colouring. Appears to be becoming firmer with soft siltstone/claystone chips becoming more common with depth. Siltstone/claystone is becoming lilac to light grey with yellow mottling and ferruginous specks towards base of interval.
92-99	SAND/GRAVEL (90:10) - Predominantly well to sub-rounded, fine to medium grained, poorly consolidated quartz sand with occasional lenses/bands of polished well to sub-rounded quartz gravel and pebbles. Occasional hard red-yellow ferruginous sandstone?/silcreted sand? bands from 92-94m. Water struck - sample airlifted from 94m, flow estimate = 1120 Gallons/hr.
99-108	CLAY/SILTSTONE (weathered bedrock?) - Multicoloured light grey and lilac with occasional yellow, buff, and pink-brown, and minor grey manganese? streaks. Clay is soft and sticky with occasional soft siltstone/claystone fragments with small RC cores showing occasional banding at 60 degrees from the horizontal (bedding?).
	EOH = 108m

INTERPRETED STRATIGRAPHY:
0-2m - Recent
2-38m - Quaternary
38-78m? - Quaternary-Tertiary
78?-99m? - Tertiary?
99?-108m - Adelaidean

SAMPLING: **Sand-Gravel** (bulk samples) : 6-36m, 92-94m, 94-96m, 96-98m
Water : Sample airlifted from 94m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W13

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 242007 Northing: 6429134 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 26/10/94 **Total Depth**: 100m

DEPTH (m)	CUTTINGS DESCRIPTION
0-1	SOIL - Light brown, silty, clayey. Unconsolidated.
1-12	CLAY - Brown, moderately compact with occasional yellow mottling and trace lithic gravel.
12-22	CLAY/GRAVEL (75:25) - Soft to moderately compact light brown-yellow (occasionally light grey) clay with occasional black manganese streaking and common bands and lenses of lithic gravel and pebbles. Trace grey manganese? staining on gravel from 12 to 14m as seen in hole W9.
22-42	CLAY - Red-brown, moderately compact, puggy.
42-60	CLAY - Off white to light grey with common red-maroon and yellow limonitic mottling, puggy, moderately to very compact. Light brown and grey, and silty from 54m.
60-68	SAND - Fine to medium grained (80:20) well to sub-rounded quartz sand. Occasional hard silcrete bands and grit from 60 to 62m, with minor dispersed off white to buff silt becoming more common from 66 to 68m. Occasional sub-angular to sub-rounded quartz gravel up to 1cm in diameter. No significant water encountered.
68-80	SILTY CLAY (weathered bedrock?) - Multicoloured (off white, yellow, pink and light grey) with occasional soft claystone/siltstone? fragments.
80-98	SANDSTONE/SILTSTONE (95:5) - medium grey, fine to medium grained weathered quartz sandstone with minor silt (weathered siltstone?). Moderately to well indurated sandstone chips are becoming more common with depth. Minor white vein quartz from 92 to 94.
98 -100	SANDSTONE/SILTSTONE (90:10) - medium grey and grey-green, fine to medium grained well indurated sandstone with occasional interbeds of massive grey-green siltstone with minor dark green staining on joint and bedding surfaces. Moderately to slightly weathered bedrock.
	EOH = 100m

INTERPRETED STRATIGRAPHY:
0-1m - Recent
1-42m - Quaternary
42-60m - Quaternary-Tertiary
60-68m? - Tertiary
68?-100m - Adelaidean, Uroonda Siltstone Member

SAMPLING: **Bedrock assay** : 98-100m
Sand-Gravel (bulk samples) : 12-14m, 60-62m, 62-64m, 64-66m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W14

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 241944 Northing: 6426610 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 26/10/94 **Total Depth**: 27m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Brown, silty, clayey with occasional dispersed gravel. Unconsolidated.
2-22	CLAY/SILTSTONE (weathered bedrock) - Red-brown and brown-yellow, soft and sticky with occasional soft to moderately indurated siltstone becoming more common with depth.
22-27	SILTSTONE - Red-brown and brown-grey. Generally massive bedding with occasional fine laminations.
	EOH = 27m

INTERPRETED STRATIGRAPHY: 0-2m - Recent
2-27m - Adelaidean, weathered Tapley Hill Formation?

SAMPLING: **Bedrock assay** : 26-27m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W15

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 239500 Northing: 6419600 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 26/10/94 **Total Depth**: 75m

DEPTH (m)	CUTTINGS DESCRIPTION
0-4	SOIL - Light brown, silty, clayey. Unconsolidated.
4-10	CLAY - Brown-yellow, soft.
10-48	CLAY - Off white to light grey with varying amounts of maroon and yellow limonitic staining, mottling and grit, puggy, moderately to very compact.
48-72	CLAY/SILTSTONE (weathered bedrock) - Predominantly ochreous yellow-brown clay and soft siltstone with occasional off white and red-brown clay at top of interval. Occasional black-brown iron?/manganese? laminae and coatings on joint surfaces.
72-75	SILTSTONE/SHALE - Khaki-brown with occasional light grey. Moderately to well indurated, well bedded siltstone/shale bedrock.
	EOH = 75m

INTERPRETED STRATIGRAPHY: 0-4m - Recent
4-10m - Quaternary
10-48m - Quaternary-Tertiary
48-75m - Adelaidean, weathered Tapley Hill Formation?

SAMPLING: **Bedrock assay** : 64-68m, 74-75m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W16

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 246470 Northing: 6398790 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 28/10/94 **Total Depth**: 62m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Brown, silty, clayey. Unconsolidated.
2-26	CLAY/GRAVEL (70:30) - Brown-yellow, soft to moderately compact clay, with occasional lenses and bands of lithic gravel and pebbles with minor brown clay matrix and occasional calcareous cement.
26-32	CLAY - Off white (occasional light brown), puggy with varying amounts of red-yellow limonitic mottling. Minor silt from 30 to 32m.
32-34	SILT - Off white with trace pink and yellow. Occasional lenses of off white-yellow puggy clay.
34-50	CLAY/SILTSTONE (weathered bedrock) - Off white and yellow-brown soft clay with occasional moderately indurated yellow-brown siltstone becoming more common with depth.
50-62	SILTSTONE/SHALE - Light grey-brown soft to moderately indurated siltstone with occasional yellow ferruginous staining on joint/bedding planes. Grading into brown-maroon well indurated well bedded siltstone/shale with occasional light grey-brown laminations. Trace mica?
	EOH = 62m

INTERPRETED STRATIGRAPHY:
0-2m - Recent
2-26m - Quaternary
26-32m? - Quaternary-Tertiary
32?-34m? - Tertiary?
34-62m - Adelaidean, weathered Tapley Hill Formation?

SAMPLING: **Bedrock assay** : 60-62m
Sand-Gravel (bulk samples) : 22-26

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W17

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 240620 Northing: 6402690 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 28/10/94 **Total Depth**: 101m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Brown, silty, clayey. Unconsolidated.
2-12	GRAVEL/CLAY (70:30) - Lithic gravel and pebbles in a light brown and off white soft clay matrix. Minor hard calcareous cement and occasional silty clay lenses.
12-20	CLAY - Soft, light brown with occasional silt and minor lithic gravel and pebble bands.
20-52	CLAY - Off white to light grey with varying amounts of red-maroon and yellow limonitic mottling and hard concretions and grit, puggy, soft to moderately compact. Minor silt from 26 to 42m and 48 to 52m with occasional hard silica? cemented laminae within the latter interval.
52-60	SAND - Fining upwards sequence of fine to medium grained, well to sub-rounded, poorly consolidated quartz sand. Minor silt at top of interval.
60-66	SAND/CLAY (70:30) - Sand as above with silty clay from 60-62m and occasional interbeds and lenses of silty clay throughout rest of interval Water struck - sample airlifted from 60m, flow estimate = 270 Gallons/hr.
66-70	CLAY (weathered bedrock) - Soft and slippery (talcose texture), white grading into light yellow and light green, micaceous.
70-98	CLAY/SILTSTONE(talcose) - Light grey and light green, laminated, soft, micaceous, weathered siltstone with a distinctive talcose texture. Common yellow-brown-red staining and hard ferruginous fragments and grit (78-88m and 92-96m) possibly due to iron infilling of fracture zones within the siltstone.
98-101	TALCOSE SILTSTONE - Light grey-green, laminated, micaceous siltstone with occasional yellow ferruginous staining. Distinctive talcose (slippery) texture which may be due to mild metamorphism? possibly associated with sub-surface diapiric breccias or dolerites which have been shown, by previously exploration drilling (approximately 5 to 10 kilometres to the north), to be present in the general area. EOH = 101m

INTERPRETED STRATIGRAPHY:
0-2m - Recent
2-20m - Quaternary
20-52m - Quaternary-Tertiary
52-66m - Tertiary
66-101m - Adelaidean, Uroonda Siltstone Member?

SAMPLING:
Bedrock assay : 86-88m, 94-96m, 98-101m
Sand-Gravel (bulk samples) : 64-66m, 86-88m, 94-96m, 98-101m
Water : sample airlifted from 60m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W18

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 238820 Northing: 6406350 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 28/10/94 **Total Depth**: 44m

DEPTH (m)	CUTTINGS DESCRIPTION
0-4	CLAY - Light brown, moderately compact. Covered by a thin veneer of soil at the surface.
4-12	CLAY - Off white and light green, puggy with occasional dispersed quartz grains.
12-25	CLAY - Off white, puggy, compact with trace red-maroon limonitic grit and occasional quartz grains as above.
25-28	SANDY SILT - Off white to light grey with occasional clay lenses and silica cemented bands.
28-44	CLAY/SILTSTONE (weathered bedrock) - Off white and ochreous yellow, soft sticky and dry clay with occasional soft crumbly siltstone becoming more common towards base.
	EOH = 44m

INTERPRETED STRATIGRAPHY: 0-4m - Recent/Quaternary
4-25m - Quaternary-Tertiary
25-28m - Tertiary?
28-44m - Adelaidean

SAMPLING: Nil

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W19

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 244820 Northing: 6400126 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 29/10/94 **Total Depth**: 68m

DEPTH (m)	CUTTINGS DESCRIPTION
0-8	CLAY/GRAVEL (70:30) - Brown-yellow, soft to moderately compact clay with occasional lenses of lithic gravel and pebbles of predominantly ironstone and quartz. Thin soil layer at surface.
8-16	GRAVEL - Gravel as above with brown-yellow clay as matrix.
16-42	CLAY - Off white and light grey/yellow-brown (26-46m), puggy with common red and yellow limonitic mottling and occasional bands/lenses of hard red-maroon limonitic nodules and grit (mostly from 22-24m). Clay is occasionally cemented in lenses/bands by hard calcium carbonate cement (20-24m).
42-58	CLAY (weathered bedrock) - Soft and sticky, off white-yellow (bright in places), with occasional soft claystone/siltstone? becoming more common with depth.
58-68	CLAY/SILTSTONE - as above but ochreous yellow-brown with more common soft to moderately indurated, platey siltstone. Siltstone shows common red-brown limonitic? spots and is in general highly to moderately weathered.
	EOH = 68m

INTERPRETED STRATIGRAPHY: 0-8m - Recent/Quaternary
8-16m - Quaternary
16-42m - Quaternary-Tertiary
42-68m - Adelaidean

SAMPLING: **Bedrock assay** : 66-68m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W20

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 248960 Northing: 6394000 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 29/10/94 **Total Depth**: 60m

DEPTH (m)	CUTTINGS DESCRIPTION
0-10	GRAVEL/CLAY (70:30) - Angular to sub-rounded lithic gravel (siltstone, shale and quartzite) with occasional light brown-yellow soft clay lenses and as a matrix supporting the gravel. Poorly consolidated. Thin soil layer at surface.
10-20	CLAY - Off white with orange-yellow limonitic staining and occasional light green blebs. Common red-maroon limonitic nodules and grit throughout.
20-28	CLAY - Predominantly off white with pink, yellow and light brown. Soft with occasional dispersed silt and fine grained sand increasing with depth.
28-30	CLAY (weathered bedrock) - Soft, sticky and dry texture, slightly silty.
30-60	SILTSTONE/SANDSTONE (60:40) - Variably weathered red-brown and yellow, soft clayey siltstone interbedded with variably consolidated fine to medium grained, occasionally silty, quartz sandstone. Minor grey manganese? staining from 42-50m, and white angular/blocky vein quartz observed within 50-52m sample. Water struck - sample airlifted from 44m, flow estimate = 340 Gallons/hr.
	EOH = 60m,

INTERPRETED STRATIGRAPHY: 0-10m - Recent/Quaternary
10-20m - Quaternary-Tertiary
20-28m - Tertiary?
28-60m - Adelaidean, weathered ABC Range Quartzite?

SAMPLING: **Sand-Gravel** (bulk samples) : 8-10m
Water : Sample airlifted from 44m

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: W21

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 251000 Northing: 6386240 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 29/10/94 **Total Depth**: 10m

DEPTH (m)	CUTTINGS DESCRIPTION
0-1	SOIL - Light brown, silty, clayey. Unconsolidated.
1-10	SILTSTONE (bedrock) - Light brown-yellow with occasional off white-yellow. Platey, moderately indurated siltstone. Moderately to slightly weathered.
	EOH = 10m

INTERPRETED STRATIGRAPHY: 0-1m - Recent
1-10m - Adelaidean, weathered Tapley Hill Formation?

SAMPLING: **Bedrock assay** : 8-10m

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DRILLHOLE GEOLOGICAL LOG

Drillhole Number: RH1

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 242506 Northing: 6424493 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 27/10/94 **Total Depth**: 28m

DEPTH (m)	CUTTINGS DESCRIPTION
0-1	SOIL - Light brown sandy clayey alluvium, minor dispersed surface gravel. Unconsolidated.
1-10	SILTSTONE - Yellow-brown with occasional maroon banding. Moderately indurated, finely laminated in places. Moderately to slightly weathered bedrock.
10-20	SILTSTONE/SHALE - Yellow-brown to maroon-brown, commonly well laminated with massive bedding in places, moderately to well indurated. Occasional hard red-brown iron oxide and black manganese on bedding surfaces.
20-27	SHALE - maroon-brown and light grey-brown, commonly laminated. Occasionally off white to light brown thin laminations. Becoming harder and more grey with depth. Minor black manganese staining on bedding surfaces and occasional thin white quartz? veinlets crosscutting bedding. Moderately to slightly weathered bedrock - oxidised Tapley Hill Formation ?
27-28	SILTY SHALE - very hard, medium to dark grey finely laminated (approximate dip = 40 degrees (from RC cores)). Minor thin white quartz veinlet crosscutting bedding. Good contact in RC core at approximately 27m between the grey-brown (partly oxidised?) shale above and this lithology. Too hard to continue drilling beyond 28m. Fresh bedrock (Tapley Hill Formation - Tindelpina Shale Member ?) EOH = 28m

INTERPRETED STRATIGRAPHY: 0-1m - Recent
1-27m - Adelaidean, weathered Tapley Hill Formation ?
27-28m - Adelaidean, Tapley Hill Formation - Tindelpina Shale Member ?

SAMPLING: **Bedrock assay** : 12-16m, 22-26m, 27-28m

Note - Drillhole RH1 was sited to test an anomalous gravity high defined by the 1994 MESA Round Hill Gravity/Ground Magnetics Survey (Traverse 2423E, station 1800N)

F07951.RS

DEPARTMENT OF MINES AND ENERGY

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: RH2

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 241880 Northing: 6423520 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 27/10/94 **Total Depth**: 44m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Light brown, silty, clayey alluvium with occasional dispersed gravel and pebbles. Unconsolidated.
2-14	CLAY - Off white to light grey, with common red-brown (minor yellow) limonitic staining, puggy. Occasional limonitic grit and minor alluvial gravel towards top of interval.
14-24	CLAY - Brightish off white, soft and sticky. Occasional soft crumbly claystone/siltstone chips throughout. Highly weathered and leached bedrock.
24-34	CLAY/SILTSTONE - as above but becoming ochreous yellow-brown in colour with the soft siltstone chips becoming more common and firmer with depth.
34-38	SILTSTONE/SHALE - Yellow-brown (minor maroon) with occasional grey manganese? staining in joints and on bedding surfaces. Bedding is generally massive with occasional thin laminations. Moderately indurated, moderately to slightly weathered bedrock.
38-44	SHALE - medium to dark grey (minor yellow-brown, red-brown and grey-green throughout (partly oxidised zones?)), finely laminated (approximate dip = 30 to 40 degrees), well to very well indurated towards base (too hard to continue drilling). Slightly weathered to fresh bedrock (Tapley Hill Formation - Tindelpina Shale Member ?). EOH = 74m

INTERPRETED STRATIGRAPHY: 0-2m - Recent
2-14m - Quaternary
14-34m - Adelaidean, weathered Tapley Hill Formation?
34-44m - Adelaidean, Tapley Hill Formation -Tindelpina Shale Member?

SAMPLING: **Bedrock assay** : 34-38m, 42-44m

Note - Drillhole RH2 was sited to test an anomalous magnetic high defined by the 1994 MESA Round Hill Gravity/Ground Magnetics Survey (Magnetic Traverse 4235N, line location 1275N)

F07951.RS

APPENDIX B

BEDROCK ASSAY RESULTS

AUSTRALIAN LABORATORY SERVICES P/L
A.C.N. 009 936 029

ANALYTICAL REPORT

CONTACT: MR R SHAW
CLIENT: DEPARTMENT MINES & ENERGY
ADDRESS: P O BOX 151
EASTWOOD
SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 0
No. OF SAMPLES: 13
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT / UNIT / METHOD / L.O.R.	Cu ppm IC587 5	Pb ppm IC587 5	Zn ppm IC587 5	Fe % IC587 0.01	Mn ppm IC587 5	Mo ppm IC587 5
W3 R112254		8	11	16	2.18	11	<5
W3 R112255		10	19	24	1.42	7	<5
W5 R112259		45	24	301	5.74	205	<5
W6 R112260		N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
W7 R112261		28	10	87	4.07	173	<5
W9 R112266		7	7	17	3.13	29	<5
W13 R112278		10	11	37	1.80	60	<5
W14 R112283		21	16	37	3.13	194	<5
W15 R112284		29	42	190	3.73	4290	<5
W16 R112287		26	20	77	3.88	230	<5
W19 R112292		55	28	148	4.11	125	<5
W21 R112294		34	13	76	4.28	35	<5
W15 R112285		32	15	142	4.05	261	<5

COMMENTS:

For bedrock samples Nb has been also analysed for by MS532 for comparison. There will be no charge for this method.

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• Results apply to sample(s) as submitted by client.

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ANALYTICAL REPORT

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EASTWOOD
SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 0
No. OF SAMPLES: 13
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT UNIT METHOD L.O.R.	Co ppm IC587 5	Bi ppm IC587 5	Cr ppm IC587 5	Ni ppm IC587 5	Nb ppm IC587 10	Nb ppm MS532 0.2
W3 R112254		<5	<5	129	18	15	11.1
W3 R112255		20	<5	132	50	18	12.5
W5 R112259		64	<5	111	136	10	6.9
W6 R112260		N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
W7 R112261		32	<5	99	71	<10	7.0
W9 R112266		<5	<5	196	10	<10	6.1
W13 R11227		17	<5	125	33	<10	6.1
W14 R11228		<5	<5	118	21	<10	5.9
W15 R11228		44	<5	130	58	10	7.9
W16 R11228		14	<5	106	43	10	6.5
W19 R11229		31	<5	114	70	<10	5.6
W21 R11229		8	<5	105	28	<10	4.0
W15 R112285		27	<5	164	101	<10	6.0

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LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 0
No. OF SAMPLES: 13
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT UNIT METHOD L.O.R.	Au ppm PM219 0.001	Au PM219 ppm CHECKS 0.001				
W3 R112254		0.001					
W3 R112255		0.001					
W5 R112259		0.001					
W6 R112260		N.R.					
W7 R112261		0.004	0.003				
W9 R112266		0.001	0.001				
W13 R11227		0.001	0.001				
W14 R11228		0.001					
W15 R11228		<0.001					
W16 R11228		0.002					
W19 R11229		0.002					
W21 R11229		0.001					
W15 R112285		<0.001					

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EASTWOOD
SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 0
No. OF SAMPLES: 13
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: QUALITY CONTROL PROJECT:

SAMPLE NUMBER	ELEMENT / UNIT / METHOD / L.O.R.	Cu ppm IC587 5	Pb ppm IC587 5	Zn ppm IC587 5	Fe % IC587 0.01	Mn ppm IC587 5	Mo ppm IC587 5
*** W15 R11228		31	46	197	3.80	4340	<5
*** W16 R11228		25	20	76	3.73	228	<5

COMMENTS:

Results which appear on this report are routine laboratory checks for QUALITY CONTROL purposes.

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ADDRESS: P O BOX 151
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SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 0
No. OF SAMPLES: 13
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: QUALITY CONTROL PROJECT:

SAMPLE NUMBER	ELEMENT / UNIT / METHOD / L.O.R.	Co ppm IC587 5	Bi ppm IC587 5	Cr ppm IC587 5	Ni ppm IC587 5	Nb ppm IC587 10	Nb ppm MS532 0.2
*** W15 R11228		45	<5	150	60	10	6.8
*** W16 R11228		14	<5	103	43	10	6.1

COMMENTS:

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ANALYTICAL REPORT

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ADDRESS: P O BOX 151
EASTWOOD
SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT	Cu	Pb	Zn	Ag	As	Fe
	UNIT	ppm	ppm	ppm	ppm	ppm	%
	METHOD	IC587	IC587	IC587	IC587	IC587	IC587
	L.O.R.	5	5	5	1	5	0.01
RH1 R112295		30	27	75	<1	8	4.48
RH1 R112296		23	20	77	1	6	4.04
RH1 R112297		27	21	66	<1	<5	4.09
RH2 R112298		30	27	100	<1	13	4.21
RH2 R112299		23	14	57	<1	<5	3.69
W17 R112289		5	5	12	1	6	1.79
W17 R112290		44	9	31	<1	<5	5.79
W17 R112291		21	5	33	<1	<5	2.46

COMMENTS:

Zr may bias low by IC587. XRF1 recommended.

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ANALYTICAL REPORT

CONTACT: MR R SHAW
CLIENT: DEPARTMENT MINES & ENERGY
ADDRESS: P O BOX 151
EASTWOOD
SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT / UNIT / METHOD / L.O.R.	Mn ppm IC587 5	Mo ppm IC587 5	Cd ppm IC587 5	Co ppm IC587 5	Bi ppm IC587 5	Cr ppm IC587 5
RH1 R112295		261	<5	<5	14	<5	103
RH1 R112296		400	<5	<5	9	<5	91
RH1 R112297		438	<5	<5	12	<5	95
RH2 R112298		1120	<5	<5	23	<5	115
RH2 R112299		450	<5	<5	9	<5	89
W17 R112289		3130	<5	<5	8	<5	52
W17 R112290		298	<5	<5	22	<5	99
W17 R112291		39	<5	<5	13	<5	77

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BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT / UNIT / METHOD / L.O.R.	Ni ppm IC587 5	P ppm IC587 10	Sr ppm IC587 10	V ppm IC587 10	Zr ppm IC587 20	Nb ppm IC587 10
RH1 R112295		43	997	39	161	195	<10
RH1 R112296		38	1400	80	142	194	<10
RH1 R112297		39	896	129	139	200	10
RH2 R112298		58	1070	38	170	187	<10
RH2 R112299		33	871	125	138	199	<10
W17 R112289		<5	661	220	17	101	<10
W17 R112290		42	368	70	59	146	<10
W17 R112291		36	196	85	63	123	<10

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BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT	Sn	W	Ba	U	Th	Ce
	UNIT	ppm	ppm	ppm	ppm	ppm	ppm
	METHOD	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1
	L.O.R.	5	10	10	4	4	10
RH1 R112295		<5	<10	575	<4	9	107
RH1 R112296		<5	<10	632	<4	11	78
RH1 R112297		<5	<10	646	<4	9	81
RH2 R112298		<5	<10	865	<4	9	75
RH2 R112299		<5	<10	593	<4	5	81
W17 R112289		<5	<10	330	<4	<4	43
W17 R112290		10	<10	254	<4	15	77
W17 R112291		<5	<10	534	<4	9	84

COMMENTS:

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BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT	La	Nb	Rb	Sb	Se	Y
	UNIT	ppm	ppm	ppm	ppm	ppm	ppm
	METHOD	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1
	L.O.R.	10	2	2	4	2	2
RH1 R112295		53	13	148	<4	<2	28
RH1 R112296		37	12	124	<4	<2	32
RH1 R112297		37	14	128	<4	<2	27
RH2 R112298		35	14	176	4	<2	32
RH2 R112299		37	11	113	11	<2	31
W17 R112289		18	<2	68	<4	<2	2
W17 R112290		33	9	131	9	<2	16
W17 R112291		37	8	130	<4	<2	16

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AUSTRALIAN LABORATORY SERVICES P/L
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ANALYTICAL REPORT

CONTACT: MR R SHAW
CLIENT: DEPARTMENT MINES & ENERGY
ADDRESS: P O BOX 151
EASTWOOD
SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT UNIT METHOD L.O.R.	Nb ppm MS532 0.2	Pt ppm MS534 0.001	Pd ppm MS534 0.001	Au ppm MS534 0.001		
RH1 R112295		4.9	0.001	0.001	0.001		
RH1 R112296		7.7	0.001	0.002	0.002		
RH1 R112297		8.1	0.001	0.002	0.004		
RH2 R112298		7.0	0.001	0.001	0.002		
RH2 R112299		7.0	0.001	0.002	0.039		
W17 R112289		1.0	0.001	0.002	0.003		
W17 R112290		4.2	0.001	0.002	0.003		
W17 R112291		4.9	0.001	0.002	0.003		

COMMENTS:

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• Results apply to sample(s) as submitted by client.

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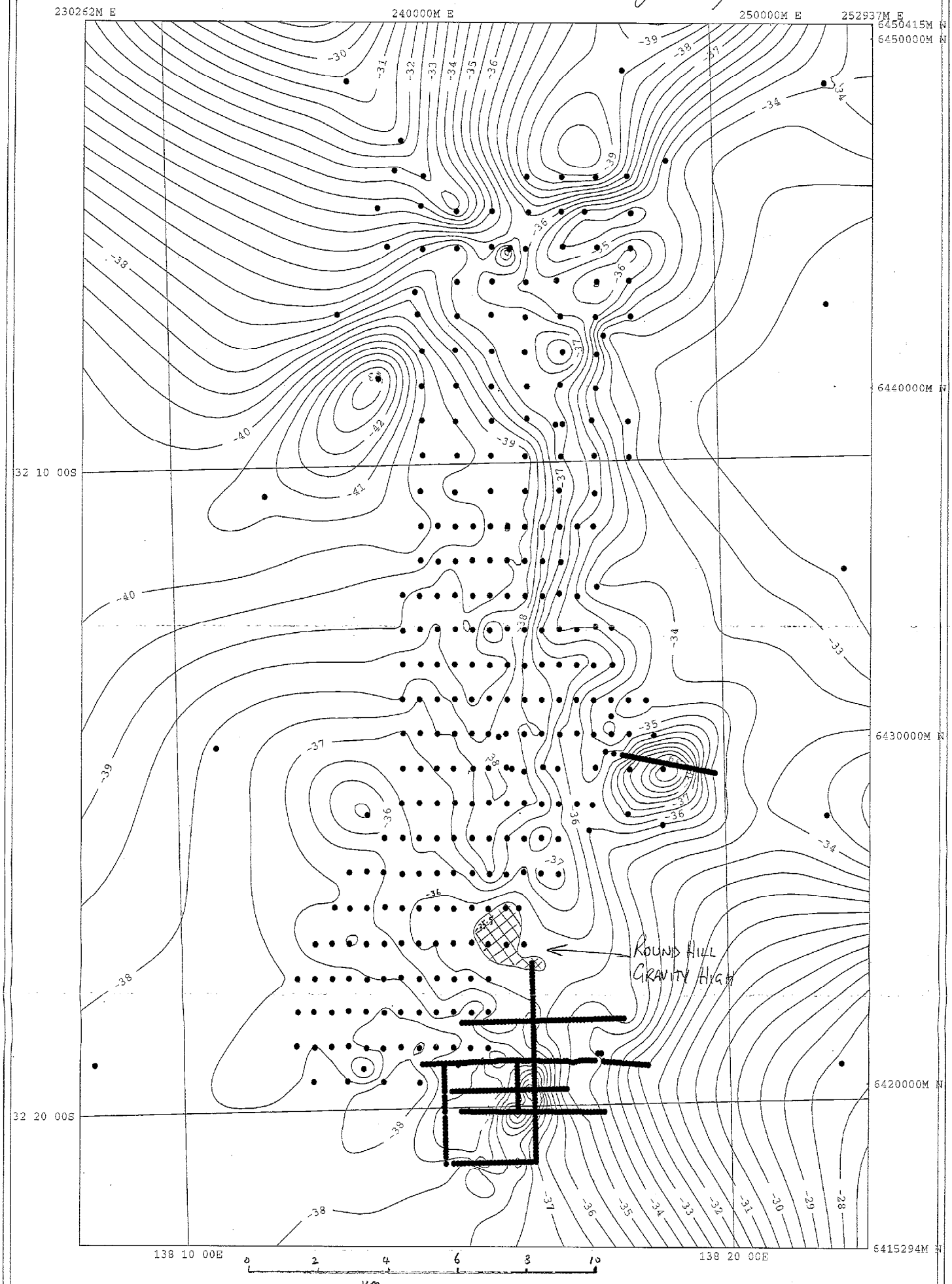
APPENDIX C

GRAVITY, MAGNETICS AND DRILLING FOR MINERALS IN THE ROUND HILL AREA

QUORN EAST - Gravity Survey



Contour Interval = 0.5 mgal Source : MESA Gravity Database (1993)

FIGURE 1

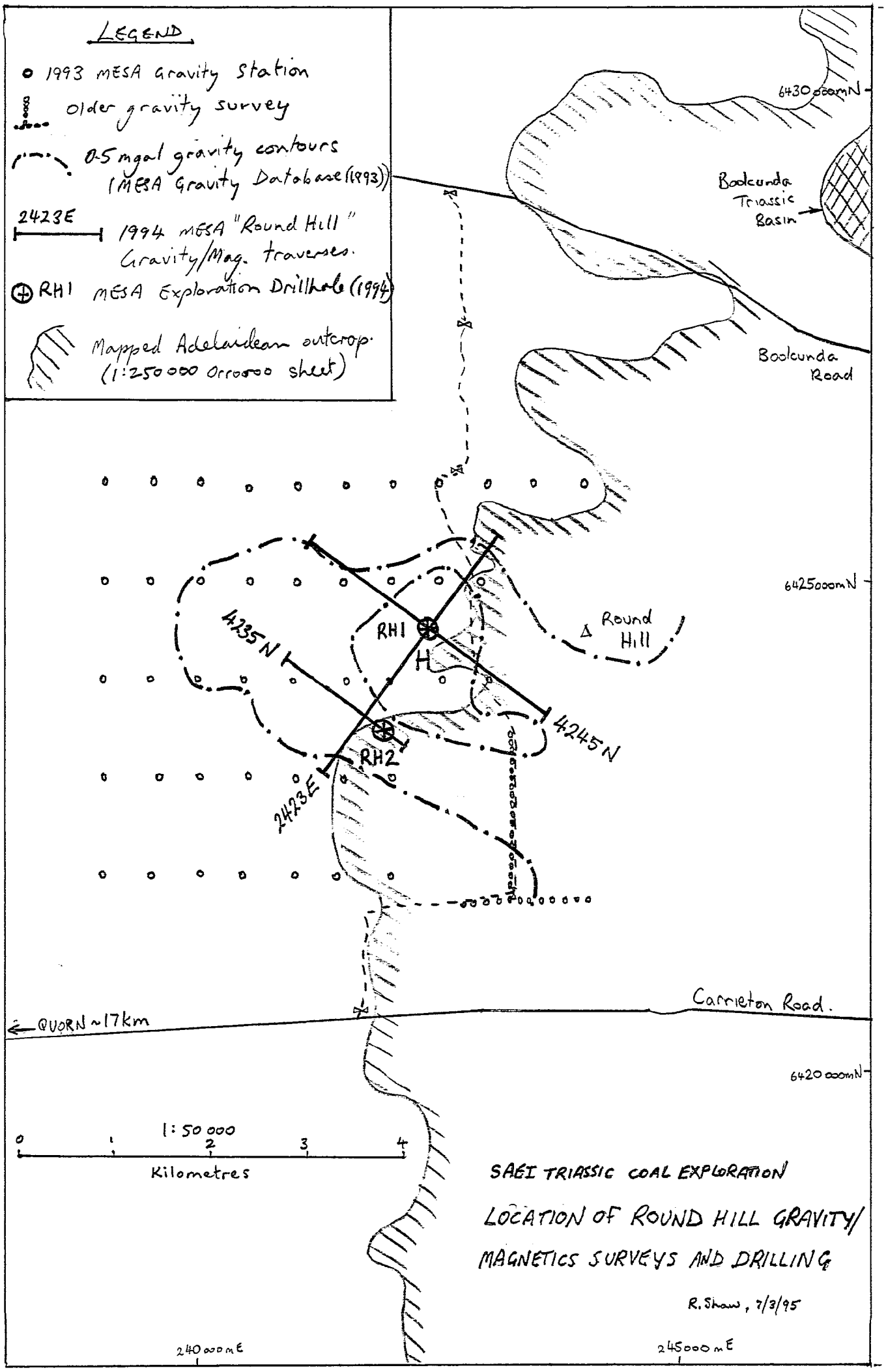

LEGEND
1993 MESA Gravity Station
Older gravity survey
0.5 mgal gravity contours (MESA Gravity Database (1993))
2423E
1994 MESA "Round Hill" Gravity/Mag. traverses.
RH1 MESA Exploration Drillhole (1994)
Mapped Adelaidean outcrop (1:250 000 or 100 000 sheet)
6430 000mN
Boolcunda Triassic Basin
Boolcunda Road
6425000mN
4235N
RH1
Round Hill
4245N
RH2
2423E
Carrieton Road.
QUORN ~17km
6420 000mN
1:50 000
0 1 2 3 4
Kilometres
SAGI TRIASSIC COAL EXPLORATION
LOCATION OF ROUND HILL GRAVITY/ MAGNETICS SURVEYS AND DRILLING
R. Shaw, 7/3/95
240 000mE
245000mE

FIGURE 2

ROUND HILL

2423E

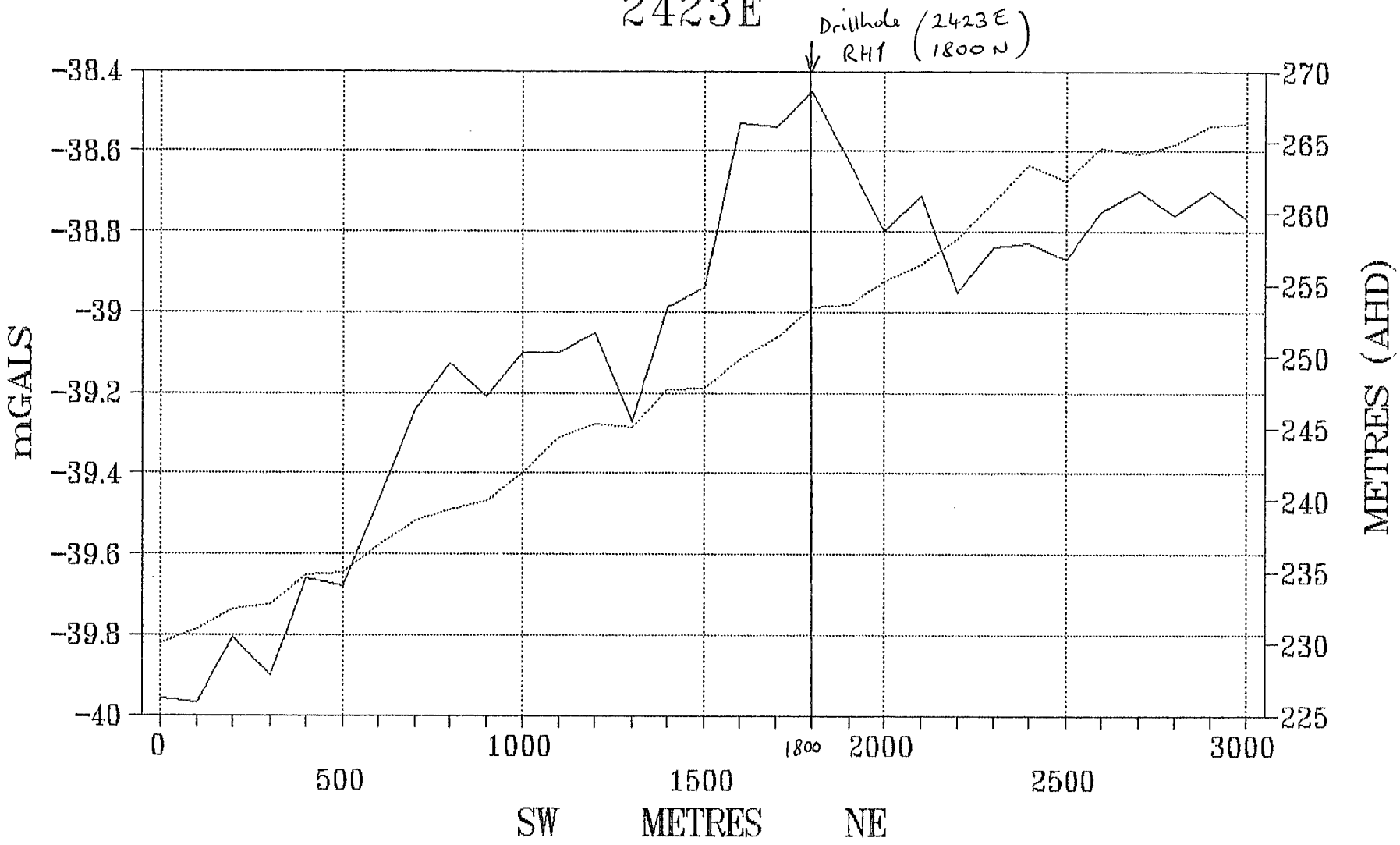


Figure 3

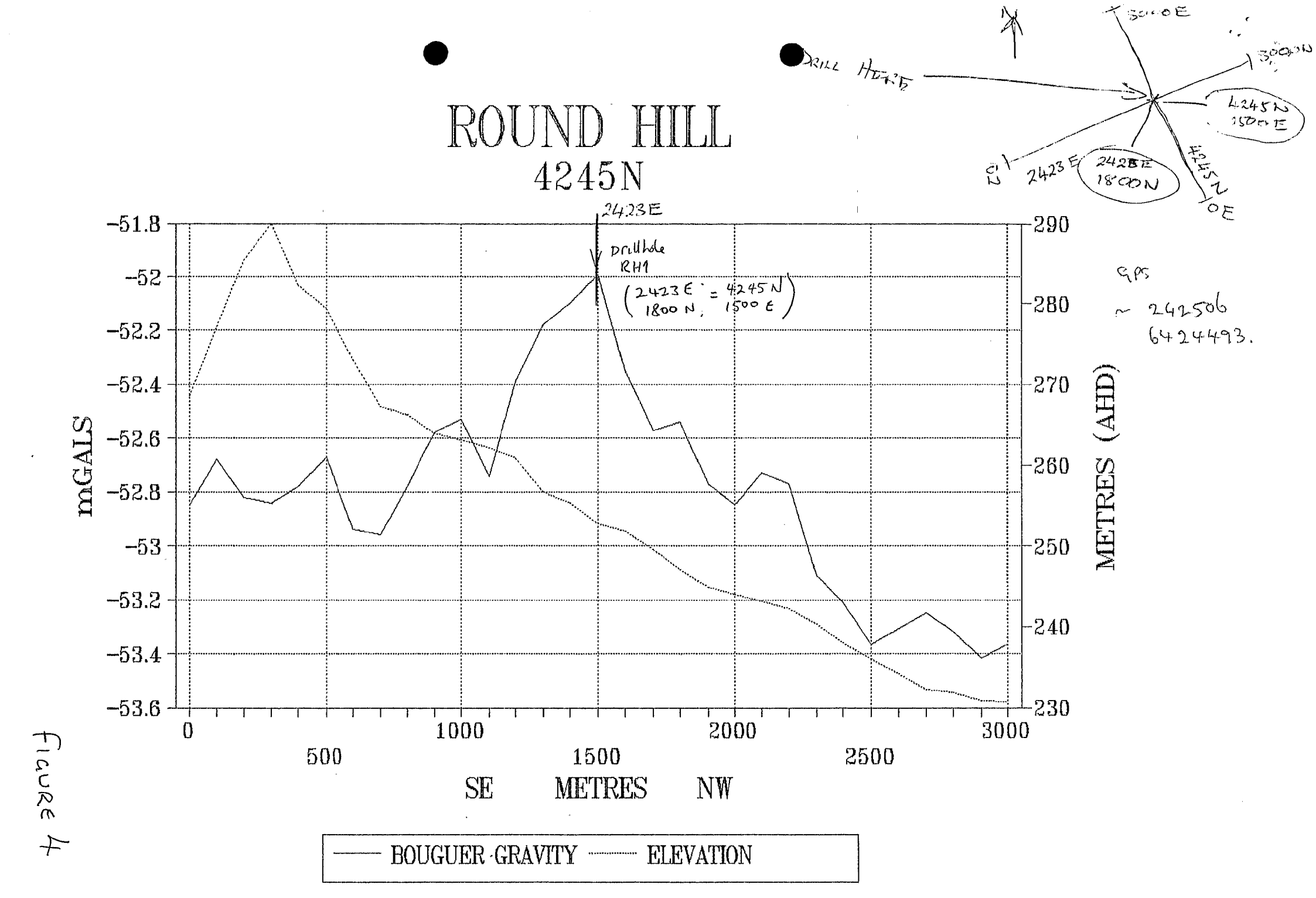

ROUND HILL
4245N
2423E
drillhole
RH1
(2423E = 4245N
1800N, 1500E)
-51.8
-52
-52.2
-52.4
-52.6
-52.8
-53
-53.2
-53.4
-53.6
mGALS
290
280
270
260
250
240
230
METRES (AHD)
0
500
1000
1500
2000
2500
3000
SE METRES NW
BOUGUER GRAVITY
ELEVATION
DRILL HOLE
4245N
1500E
2423E
1800N
GPS
~ 242506
6424493.

figure 4

ROUND HILL

4235N (2423E, 700N)

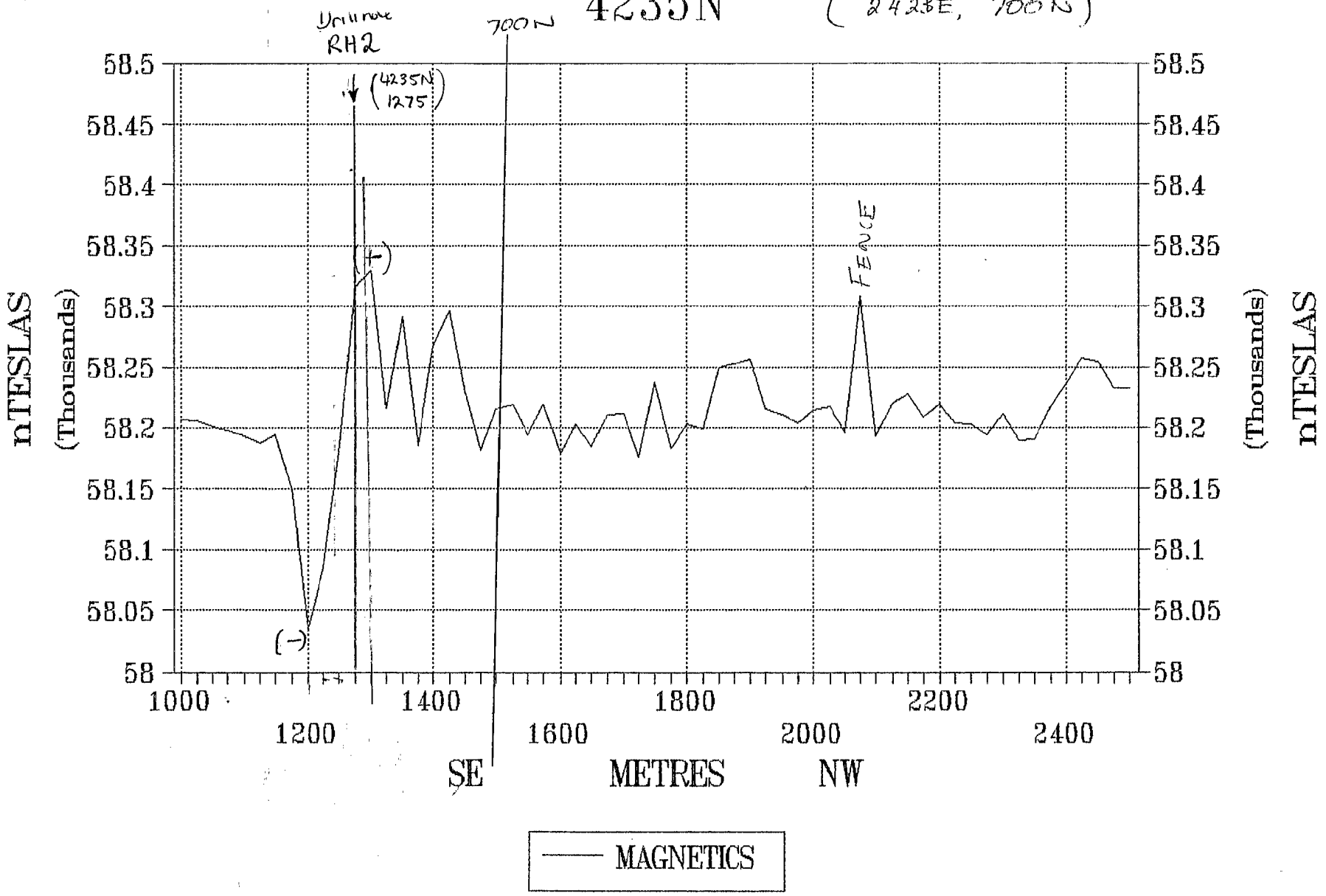
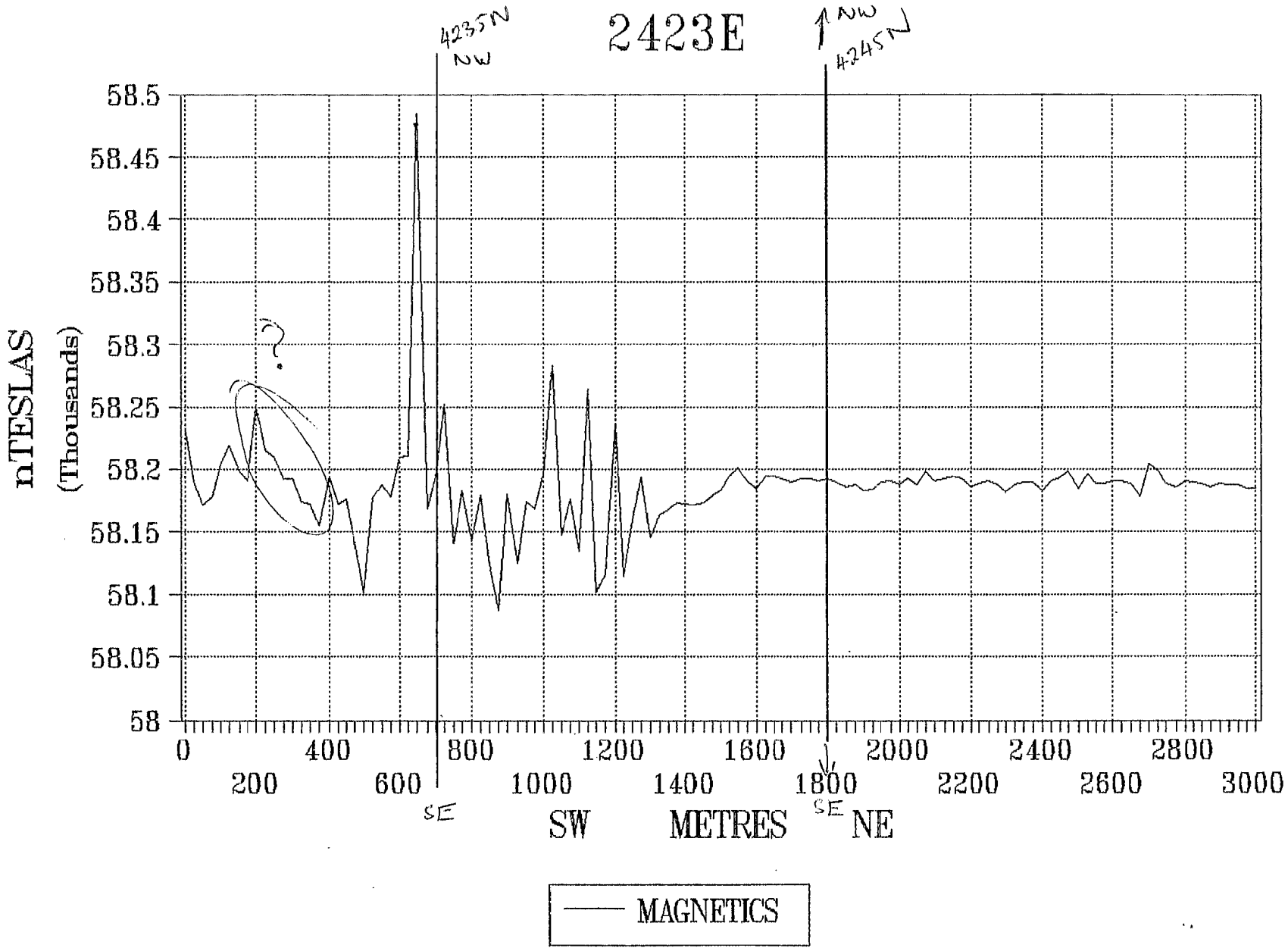
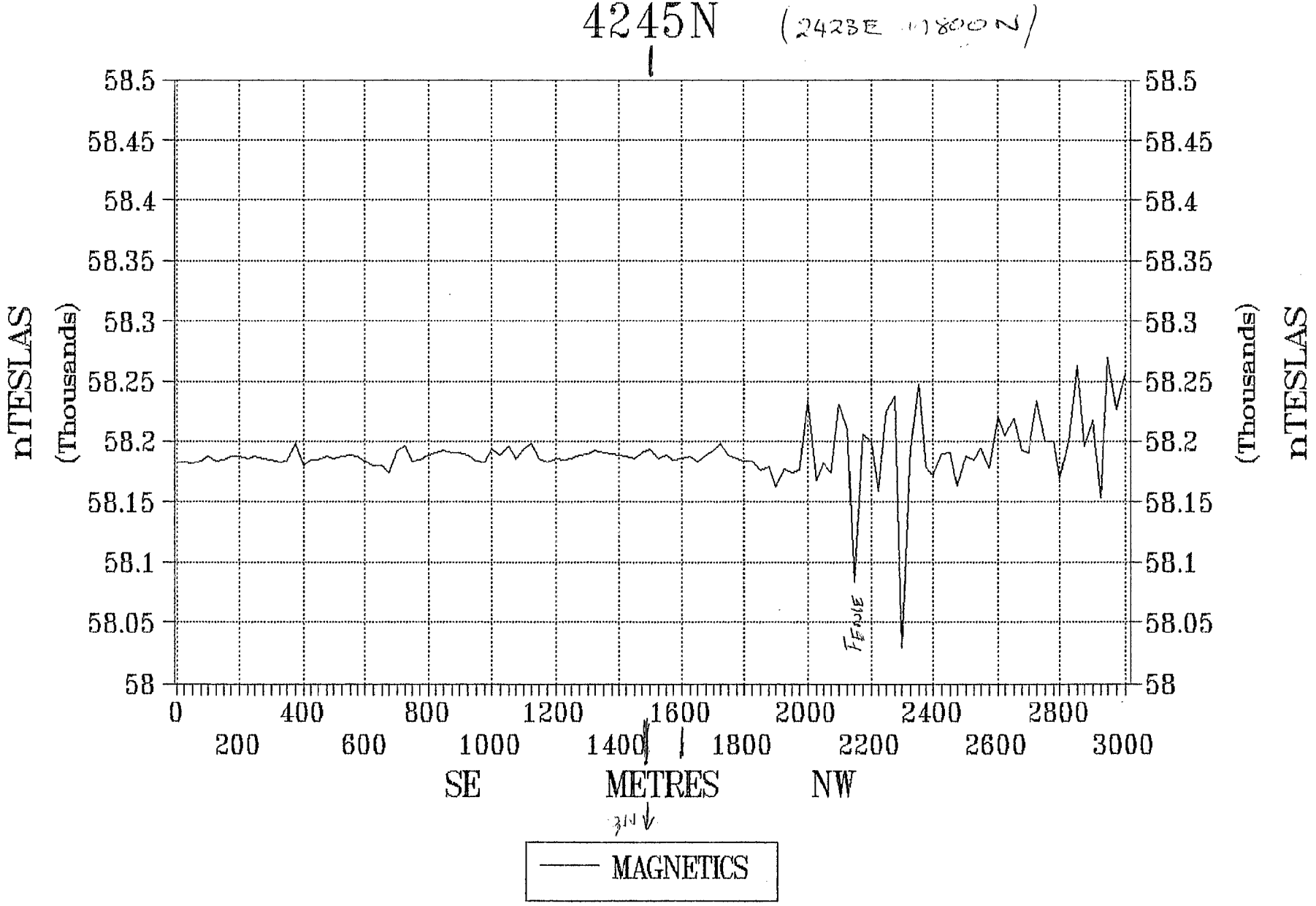


FIGURE 5

ROUND HILL TRAVERSE



ROUND HILL


4245N
(2425E 1800N)
58.5
58.45
58.4
58.35
58.3
58.25
58.2
58.15
58.1
58.05
58
nTESLAS
(Thousands)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
SE
METRES
NW
FENCE
MAGNETICS

DEPARTMENT OF MINES AND ENERGY

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: RH1

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 242506 Northing: 6424493 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 27/10/94 **Total Depth**: 28m

DEPTH (m)	CUTTINGS DESCRIPTION
0-1	SOIL - Light brown sandy clayey alluvium, minor dispersed surface gravel. Unconsolidated.
1-10	SILTSTONE - Yellow-brown with occasional maroon banding. Moderately indurated, finely laminated in places. Moderately to slightly weathered bedrock.
10-20	SILTSTONE/SHALE - Yellow-brown to maroon-brown, commonly well laminated with massive bedding in places, moderately to well indurated. Occasional hard red-brown iron oxide and black manganese on bedding surfaces.
20-27	SHALE - maroon-brown and light grey-brown, commonly laminated. Occasionally off white to light brown thin laminations. Becoming harder and more grey with depth. Minor black manganese staining on bedding surfaces and occasional thin white quartz? veinlets crosscutting bedding. Moderately to slightly weathered bedrock - oxidised Tapley Hill Formation ?
27-28	SILTY SHALE - very hard, medium to dark grey finely laminated (approximate dip = 40 degrees (from RC cores)). Minor thin white quartz veinlet crosscutting bedding. Good contact in RC core at approximately 27m between the grey-brown (partly oxidised?) shale above and this lithology. Too hard to continue drilling beyond 28m. Fresh bedrock (Tapley Hill Formation - Tindelpina Shale Member ?) EOH = 28m

INTERPRETED STRATIGRAPHY:
0-1m - Recent
1-27m - Adelaidean (weathered Tapley Hill Formation ?)
27-28m - Adelaidean (Tapley Hill Formation - Tindelpina Shale Member ?))

SAMPLING: **Bedrock assay** : 12-16m, 22-26m, 27-28m

Note - Drillhole RH1 was sited to test an anomalous gravity high defined by the 1994 MESA Round Hill Gravity/Ground Magnetics Survey (Traverse 2423E, station 1800N)

DEPARTMENT OF MINES AND ENERGY

DRILLHOLE GEOLOGICAL LOG

Drillhole Number: RH2

Project: SAEI Triassic Coal Exploration - Hawker/Quorn area (ELA 228/93)
AMG Co-ordinates: Zone: 54 Easting: 241880 Northing: 6423520 Elevation: N.A.
Drilling Company: MESA **Rig Type**: Almet Masters Explorer 200
Drilling Method: Reverse Circulation **Logged By**: R. Shaw
Completion Date: 27/10/94 **Total Depth**: 44m

DEPTH (m)	CUTTINGS DESCRIPTION
0-2	SOIL - Light brown, silty, clayey alluvium with occasional dispersed gravel and pebbles. Unconsolidated.
2-14	CLAY - Off white to light grey, with common red-brown (minor yellow) limonitic staining, puggy. Occasional limonitic grit and minor alluvial gravel towards top of interval.
14-24	CLAY - Brightish off white, soft and sticky. Occasional soft crumbly claystone/siltstone chips throughout. Highly weathered and leached bedrock.
24-34	CLAY/SILTSTONE - as above but becoming ochreous yellow-brown in colour with the soft siltstone chips becoming more common and firmer with depth.
34-38	SILTSTONE/SHALE - Yellow-brown (minor maroon) with occasional grey manganese? staining in joints and on bedding surfaces. Bedding is generally massive with occasional thin laminations. Moderately indurated, moderately to slightly weathered bedrock.
38-44	SHALE - medium to dark grey (minor yellow-brown, red-brown and grey-green throughout (partly oxidised zones?)), finely laminated (approximate dip = 30 to 40 degrees), well to very well indurated towards base (too hard to continue drilling). Slightly weathered to fresh bedrock (Tapley Hill Formation - Tindelpina Shale Member ?).
	EOH = 74m

INTERPRTETED STRATIGRAPHY:
0-2m - Recent
2-14m - Quaternary
14-34m - Adelaidean (weathered Tapley Hill Formation?)
34-44m - Adelaidean (Tapley Hill Formation -Tindelpina Shale Member?)

SAMPLING: **Bedrock assay** : 34-38m, 42-44m

Note - Drillhole RH2 was sited to test an anomalous magnetic high defined by the 1994 MESA Round Hill Gravity/Ground Magnetics Survey (Magnetic Traverse 4235N, line location 1275N)

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ANALYTICAL REPORT

CONTACT: MR R SHAW
CLIENT: DEPARTMENT MINES & ENERGY
ADDRESS: P O BOX 151
EASTWOOD
SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT / UNIT / METHOD / L.O.R.	Cu ppm IC587 5	Pb ppm IC587 5	Zn ppm IC587 5	Ag ppm IC587 1	As ppm IC587 5	Fe % IC587 0.01
RH1 R112295		30	27	75	<1	8	4.48
RH1 R112296		23	20	77	1	6	4.04
RH1 R112297		27	21	66	<1	<5	4.09
RH2 R112298		30	27	100	<1	13	4.21
RH2 R112299		23	14	57	<1	<5	3.69
W17 R112289		5	5	12	1	6	1.79
W17 R112290		44	9	31	<1	<5	5.79
W17 R112291		21	5	33	<1	<5	2.46

Bedrock Assays

(Extended Analysis)

COMMENTS:
Zr may bias low by IC587. XRF1 recommended.

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All pages of this report have been checked and approved for release.

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ANALYTICAL REPORT

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SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT / UNIT / METHOD / L.O.R.	Mn ppm IC587 5	Mo ppm IC587 5	Cd ppm IC587 5	Co ppm IC587 5	Bi ppm IC587 5	Cr ppm IC587 5
RH1 R112295		261	<5	<5	14	<5	103
RH1 R112296		400	<5	<5	9	<5	91
RH1 R112297		438	<5	<5	12	<5	95
RH2 R112298		1120	<5	<5	23	<5	115
RH2 R112299		450	<5	<5	9	<5	89
W17 R112289		3130	<5	<5	8	<5	52
W17 R112290		298	<5	<5	22	<5	99
W17 R112291		39	<5	<5	13	<5	77

COMMENTS:

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ANALYTICAL REPORT

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ADDRESS: P O BOX 151
EASTWOOD
SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT / UNIT / METHOD / L.O.R.	Ni ppm IC587 5	P ppm IC587 10	Sr ppm IC587 10	V ppm IC587 10	Zr ppm IC587 20	Nb ppm IC587 10
RH1 R112295		43	997	39	161	195	<10
RH1 R112296		38	1400	80	142	194	<10
RH1 R112297		39	896	129	139	200	10
RH2 R112298		58	1070	38	170	187	<10
RH2 R112299		33	871	125	138	199	<10
W17 R112289		<5	661	220	17	101	<10
W17 R112290		42	368	70	59	146	<10
W17 R112291		36	196	85	63	123	<10

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ANALYTICAL REPORT

CONTACT: MR R SHAW
CLIENT: DEPARTMENT MINES & ENERGY
ADDRESS: P O BOX 151
EASTWOOD
SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT UNIT METHOD L.O.R.	Sn ppm XRF1 5	W ppm XRF1 10	Ba ppm XRF1 10	U ppm XRF1 4	Th ppm XRF1 4	Ce ppm XRF1 10
RH1 R112295		<5	<10	575	<4	9	107
RH1 R112296		<5	<10	632	<4	11	78
RH1 R112297		<5	<10	646	<4	9	81
RH2 R112298		<5	<10	865	<4	9	75
RH2 R112299		<5	<10	593	<4	5	81
W17 R112289		<5	<10	330	<4	<4	43
W17 R112290		10	<10	254	<4	15	77
W17 R112291		<5	<10	534	<4	9	84

COMMENTS:

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ANALYTICAL REPORT

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ADDRESS: P O BOX 151
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SA 5063

LABORATORY: STAFFORD
BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT / UNIT / METHOD / L.O.R.	La ppm XRF1 10	Nb ppm XRF1 2	Rb ppm XRF1 2	Sb ppm XRF1 4	Se ppm XRF1 2	Y ppm XRF1 2
RH1 R112295		53	13	148	<4	<2	28
RH1 R112296		37	12	124	<4	<2	32
RH1 R112297		37	14	128	<4	<2	27
RH2 R112298		35	14	176	4	<2	32
RH2 R112299		37	11	113	11	<2	31
W17 R112289		18	<2	68	<4	<2	2
W17 R112290		33	9	131	9	<2	16
W17 R112291		37	8	130	<4	<2	16

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BATCH NUMBER: ST10625
SUB BATCH: 1
No. OF SAMPLES: 8
DATE RECEIVED: 15/12/94
DATE COMPLETED: 27/01/95

ORDER No.: DM9510 SAMPLE TYPE: ROCK PROJECT:

SAMPLE NUMBER	ELEMENT UNIT METHOD L.O.R.	Nb ppm MS532 0.2	Pt ppm MS534 0.001	Pd ppm MS534 0.001	Au ppm MS534 0.001		
RH1 R112295		4.9	0.001	0.001	0.001		
RH1 R112296		7.7	0.001	0.002	0.002		
RH1 R112297		8.1	0.001	0.002	0.004		
RH2 R112298		7.0	0.001	0.001	0.002		
RH2 R112299		7.0	0.001	0.002	0.039		
W17 R112289		1.0	0.001	0.002	0.003		
W17 R112290		4.2	0.001	0.002	0.003		
W17 R112291		4.9	0.001	0.002	0.003		

COMMENTS:

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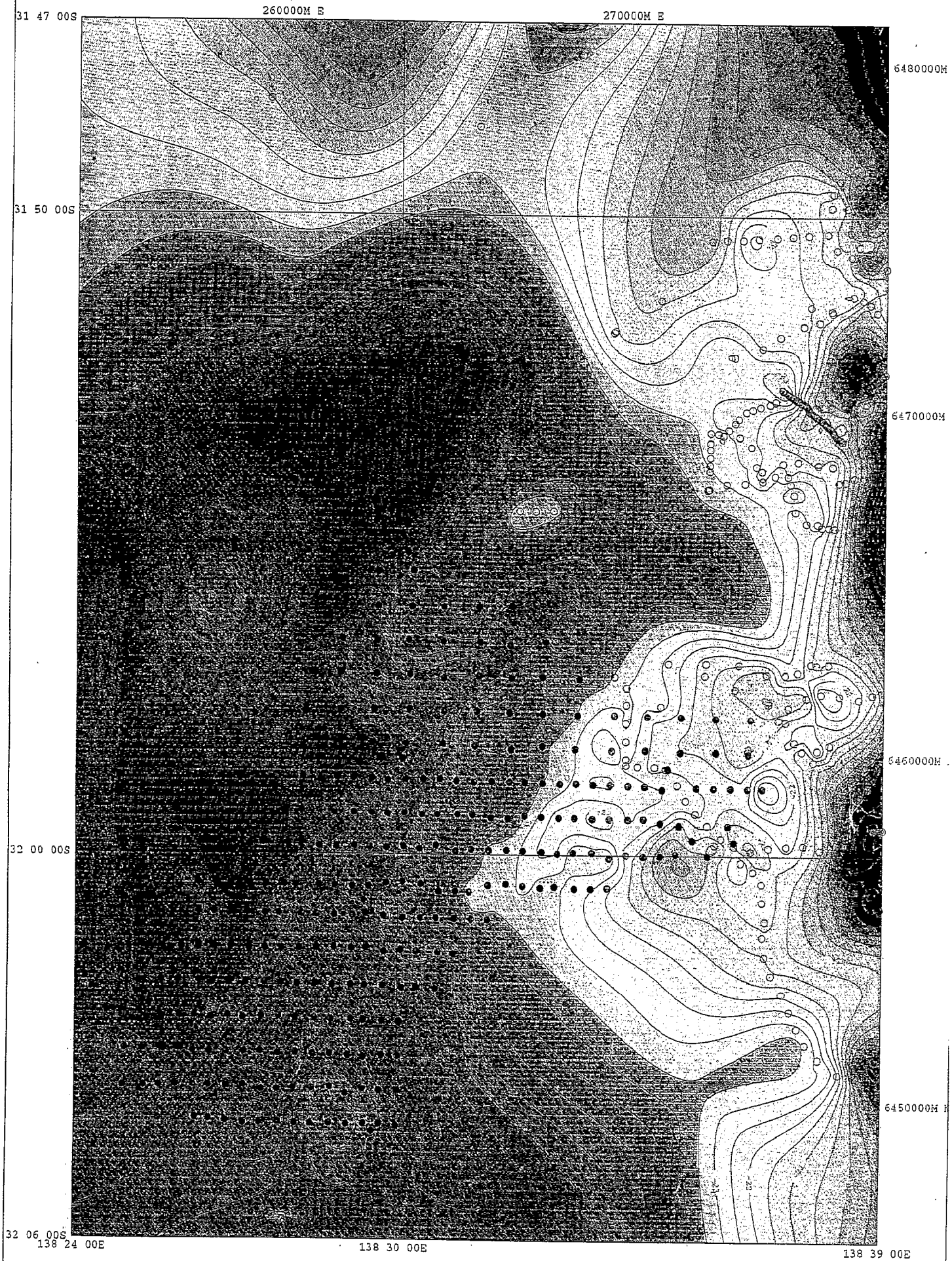
Phone: (077) 79 9155 Fax: (077) 79 9729

APPENDIX D

MESA GRAVITY SURVEYS - BOUGUER CONTOURS

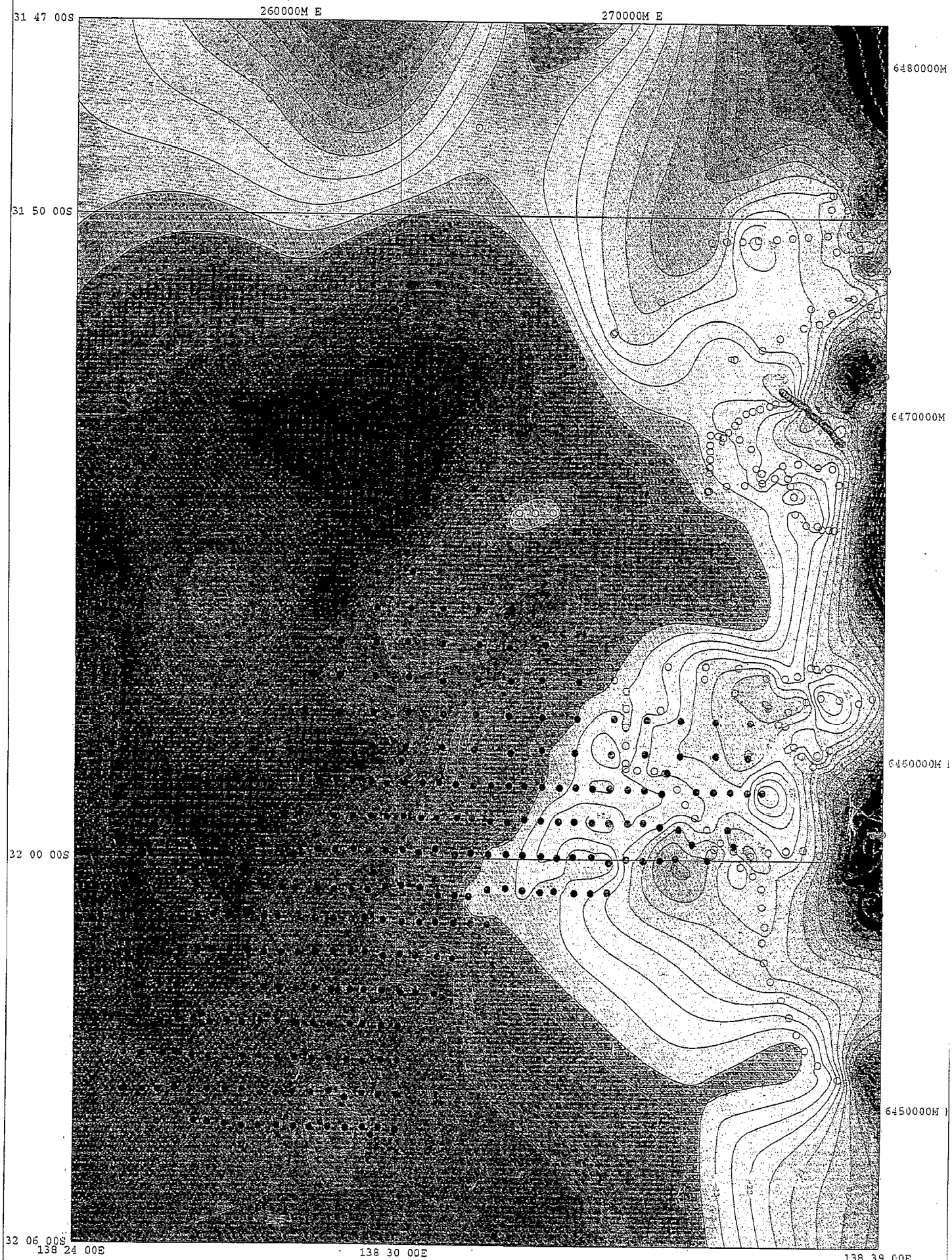
Department of Mines and Energy South Australia - WILLOW PLAIN SURVEY



Bouguer Gravity Contours (0.5 mgal)

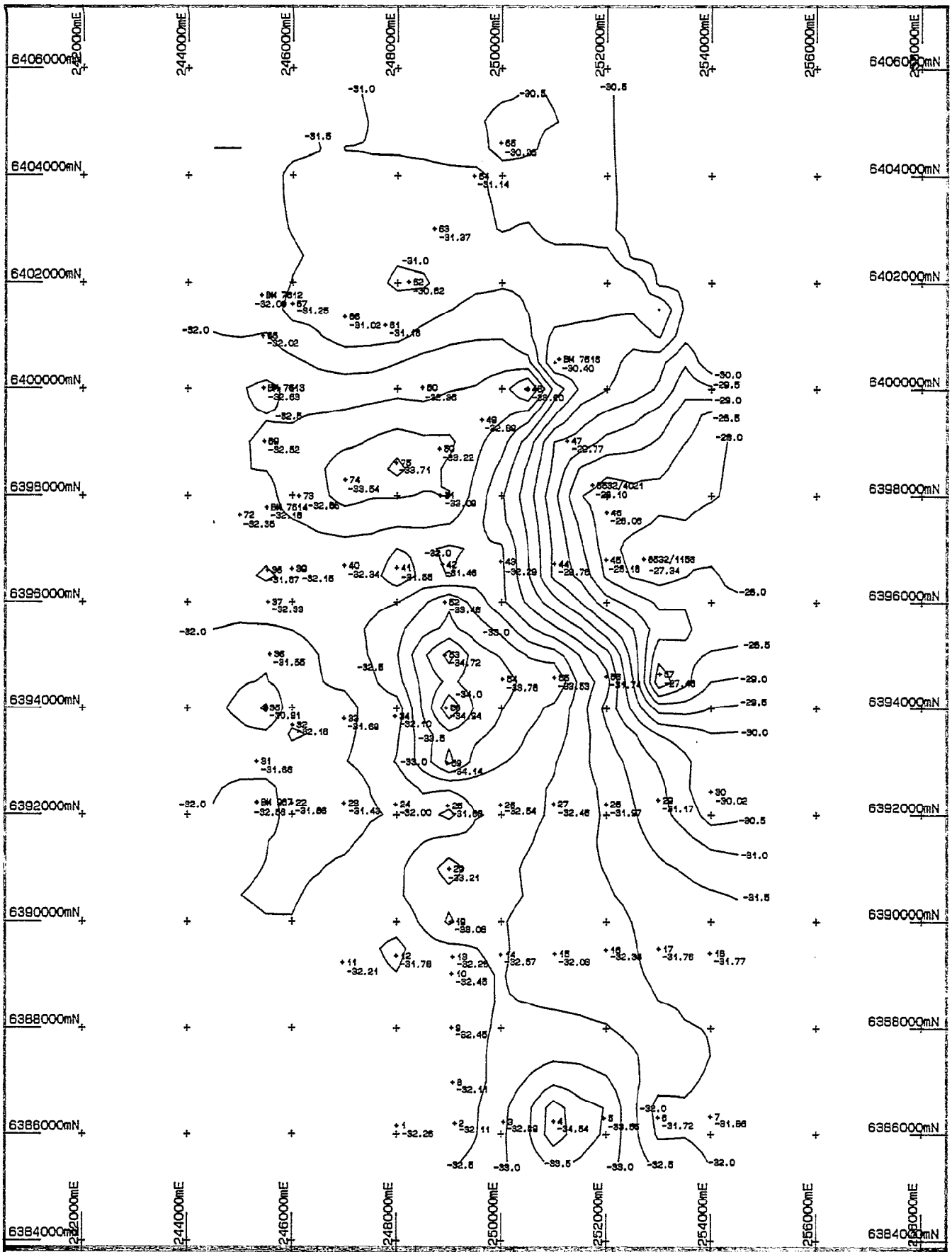
Date : December 1993

Department of Mines and Energy South Australia - WILLOW PLAIN SURVEY



Bouguer Gravity Contours (0.5 mgal)

Date : December 1993



+1 GRAVITY STATION WITH
-32.26 BOUGUER GRAVITY VALUE

Scale	DATE	SHEET
1: 100000	20/12/94	1 of 1
	REF No. 1	

0 5000m

MINES AND ENERGY - SA
HAMMOND GRAVITY SURVEY
OCTOBER 1994
BOUGUER GRAVITY CONTOURS

APPENDIX E

WATER SAMPLE TEST RESULTS

DM C 138 DEPT. OF MINES AND ENERGY – SOUTH AUSTRALIA

WATER SAMPLE ANALYSIS ADVICE

PERMIT HOLDER SAEI COAL EXPLORATION T.D.S. / OTHER

ADDRESS C/O ROB SHAW SADME. PERMIT No. HOLE W17

HUND

W. No. W4214/94(111948) SECT

DRILLER - DATE 28-10-94.

RESULTS TO ROB SHAW DME UNIT No.

COLLECTED BY OBS. No.

METHOD: PUMP / (AIRLIFT) / FLOWING / BAILER / TANK / DAM / RIVER

SAMPLE / PUMP DEPTH 60 m TIME

REMARKS ECA 228/~~94~~93

CONDUCTIVITY 6170 µS @ 25°C pH 7.92 SALINITY 3464 mg/L

TO AMDEL FOR ANALYSIS AMDEL No.

SPSA A1424-R3592

DM C 138 DEPT. OF MINES AND ENERGY – SOUTH AUSTRALIA

WATER SAMPLE ANALYSIS ADVICE

PERMIT HOLDER SAEI COAL EXPLORATION T.D.S. / OTHER

ADDRESS C/O ROB SHAW SADME. PERMIT No. HOLE W20

HUND

W. No. W4216/94(111950) SECT

DRILLER - DATE 29-10-94.

RESULTS TO ROB SHAW DME. UNIT No.

COLLECTED BY OBS. No.

METHOD: PUMP / (AIRLIFT) / FLOWING / BAILER / TANK / DAM / RIVER

SAMPLE / PUMP DEPTH 44 m TIME

REMARKS ECA 228/93

CONDUCTIVITY 17800 µS @ 25°C pH 7.16 SALINITY 10490 mg/L

TO AMDEL FOR ANALYSIS AMDEL No.

SPSA A1424-R3592

DM C 138 DEPT. OF MINES AND ENERGY – SOUTH AUSTRALIA

WATER SAMPLE ANALYSIS ADVICE

PERMIT HOLDER SAEI COAL EXPLORATION T.D.S. / OTHER

ADDRESS C/O ROB SHAW SADME. PERMIT No. HOLE W5.

HUND

W. No. W4215/94(111949) SECT

DRILLER - DATE 21-10-94

RESULTS TO ROB SHAW DME. UNIT No.

COLLECTED BY - OBS. No.

METHOD: PUMP / (AIRLIFT) / FLOWING / BAILER / TANK / DAM / RIVER

SAMPLE / PUMP DEPTH 69 m TIME

REMARKS ECA 228/93.

CONDUCTIVITY 6050. µS @ 25°C pH 7.29 SALINITY 3395. mg/L

TO AMDEL FOR ANALYSIS AMDEL No.

SPSA A1424-R3592

DM C 138 DEPT. OF MINES AND ENERGY – SOUTH AUSTRALIA

WATER SAMPLE ANALYSIS ADVICE

PERMIT HOLDER SAEI COAL EXPLORATION T.D.S. / OTHER

ADDRESS C/O ROB SHAW SADME. PERMIT No. HOLE W12

HUND

W. No. W4217/94(111951) SECT

DRILLER DATE 25-10-94

RESULTS TO ROB SHAW DME UNIT No.

COLLECTED BY OBS. No.

METHOD: PUMP / (AIRLIFT) / FLOWING / BAILER / TANK / DAM / RIVER

SAMPLE / PUMP DEPTH 95 m TIME

REMARKS ECA 228/93.

CONDUCTIVITY 10090 µS @ 25°C pH 7.30 SALINITY 5728 mg/L

TO AMDEL FOR ANALYSIS AMDEL No.

SPSA A1424-R3592

DM C 138 DEPT. OF MINES AND ENERGY – SOUTH AUSTRALIA

WATER SAMPLE ANALYSIS ADVICE

PERMIT HOLDER SAEI COAL EXPLORATION T.D.S. / OTHER

ADDRESS C/O ROB SHAW SADME. PERMIT No. HOLE W8.

W. No. W4218/94 (111994) HUND SECT

DRILLER DATE 22-10-94

RESULTS TO ROB SHAW DME UNIT No.

COLLECTED BY OBS. No.

METHOD: PUMP / AIRLIFT / FLOWING / BAILER / TANK / DAM / RIVER

SAMPLE / PUMP DEPTH 47 m TIME

REMARKS ELA 228/93

CONDUCTIVITY 3530 µS @ 25°C pH 7.39 SALINITY 1962 mg/L

TO AMDEL FOR ANALYSIS AMDEL No.

SPSA A1424-R3592

DM C 138 DEPT. OF MINES AND ENERGY – SOUTH AUSTRALIA

WATER SAMPLE ANALYSIS ADVICE

PERMIT HOLDER SAEI COAL EXPLORATION T.D.S. / OTHER

ADDRESS C/O ROB SHAW SADME. PERMIT No. HOLE W10.

W. No. W4219/94 (111995) HUND SECT

DRILLER DATE 23-10-94

RESULTS TO ROB SHAW DME UNIT No.

COLLECTED BY OBS. No.

METHOD: PUMP / AIRLIFT / FLOWING / BAILER / TANK / DAM / RIVER

SAMPLE / PUMP DEPTH 103 m TIME

REMARKS ELA 228/93

CONDUCTIVITY 8690 µS @ 25°C pH 7.22 SALINITY 4927 mg/L

TO AMDEL FOR ANALYSIS AMDEL No.

SPSA A1424-R3592

DM C 138 DEPT. OF MINES AND ENERGY – SOUTH AUSTRALIA

WATER SAMPLE ANALYSIS ADVICE

PERMIT HOLDER SAEI COAL EXPLORATION T.D.S. / OTHER

ADDRESS C/O ROB SHAW SADME. PERMIT No. HOLE W2

W. No. W4220/94 (111996) HUND SECT

DRILLER DATE

RESULTS TO ROB SHAW DME UNIT No.

COLLECTED BY OBS. No.

METHOD: PUMP / AIRLIFT / FLOWING / BAILER / TANK / DAM / RIVER

SAMPLE / PUMP DEPTH 80 m TIME

REMARKS ELA 228/93

CONDUCTIVITY 3940 µS @ 25°C pH 7.28 SALINITY 2137 mg/L

TO AMDEL FOR ANALYSIS AMDEL No.

SPSA A1424-R3592

DM C 138 DEPT. OF MINES AND ENERGY – SOUTH AUSTRALIA

WATER SAMPLE ANALYSIS ADVICE

PERMIT HOLDER SAEI COAL EXPLORATION T.D.S. / OTHER

ADDRESS C/O ROB SHAW SADME. PERMIT No. HOLE W8.

W. No. W4221/94 (111997) HUND SECT

DRILLER DATE

RESULTS TO ROB SHAW DME UNIT No.

COLLECTED BY OBS. No.

METHOD: PUMP / AIRLIFT / FLOWING / BAILER / TANK / DAM / RIVER

SAMPLE / PUMP DEPTH 68 m TIME

REMARKS ELA 228/93

CONDUCTIVITY 4760 µS @ 25°C pH 7.32 SALINITY 2658 mg/L

TO AMDEL FOR ANALYSIS AMDEL No.

SPSA A1424-R3592

)M C 138

DEPT. OF MINES AND ENERGY – SOUTH AUSTRALIA

WATER SAMPLE ANALYSIS ADVICE

PERMIT HOLDER SAEI COAL EXPLORATION T.D.S. / OTHER

ADDRESS C/O ROB SHAW
SADME.

~~PERMIT~~ No. HOLE W11.

HUND

W. No W 42 22/94 (111940)

SECT

DRILLER -

DATE 23-10-99.

RESULTS TO ROB SHAW DME.

UNIT No.

COLLECTED BY

OBS. No.

METHOD: PUMP / AIRLIFT / FLOWING / BAILER / TANK / DAM / RIVER

SAMPLE / PUMP DEPTH 110 M

TIME

REMARKS ELA 228/93.

CONDUCTIVITY 6770 µS @ 25°C pH 7.45 SALINITY 3810 mg/L

TO AMDEL FOR ANALYSIS

AMDEL No.

SFSA A1424–R3592

APPENDIX F

DRILLSITE INSPECTION REPORT
(MESA Environment Branch)

FIELD INSPECTION REPORT

Inspection Date: 28 & 29 October 1994

Officer: Brenton Grear - Environmental Officer

Location: East of Hawker on the Willow Plain and the eastern margins of the Willochra Plain.

FIELD INSPECTION REPORT

Inspection Date:	28 & 29 October 1994
Officer:	Brenton Grear - Environmental Officer
Location:	East of Hawker on the Willow Plain and the eastern margins of the Willochra Plain.
Geologist in Charge:	Rob Shaw
Drilling Company:	Drilling Services, MESA
Activity:	Coal Exploration (SAEI)
Tenement:	ELA 228/93 'A' and 'B'

Overview

A field inspection was undertaken to monitor drilling activities being carried out in the Willow / Willochra Plains region of the Central Flinders Ranges. The exploration was undertaken by the Department of Mines and Energy in conjunction with the Electricity Trust of South Australia as part of the South Australian Exploration Initiative. The purpose of the exploration program was to investigate areas close to major infrastructure for concealed Triassic coal basins. The Willow / Willochra Plain Drilling Program was the second stage of this coal exploration program, the first stage comprised closer spaced drilling around the deposits of Leigh Creek.

Drilling was undertaken over a 2 week period using MESA's reverse circulation rig using both air and water. Twenty - three holes were drilled for a total of 1506 metres with depths to basement ranging from 10 metres at W21 to 113 metres at W2.

The landscapes of the drillsites are generally flat to gently undulating alluvial plains and marginal fans associated with the north - south trending ranges. Vegetation cover generally comprises a grass understorey and very open low chenopod shrubland; small areas of low open woodland and cereal cropland are situated across the tenement area. Livestock graze throughout the region.

Observations

All drillsites were located adjacent existing roads and pastoral tracks and did not require creation of new access tracks. Drillsites were also positioned in clearings so as not to unnecessarily disturb shrubs or trees. Sample pits were positioned in natural clearings and/or between the bluebush / blackbush so as not to significantly disturb the low shrubland environment.

At the conclusion of drilling sample pits were covered over; the small drainage channels dug to direct water away from the rig were pushed in and raked over; mounds of dirt in the vicinity of the "cyclone" were levelled and raked over and the drillholes backfilled with octa - plugs put in place.

None of the drillsites inspected had any visible rubbish left lying around the site. The most visible impact of the drilling operation after clean - up was the varying colours of substrate samples that collect in the small drainage channels leading away from the cyclone. These channels were always raked over but some colour variation always remains. In addition, when aquifers are encountered in the drillhole it often leads to a relatively large amount of sand being deposited at the surface. This is raked over level with the natural landsurface but the colour variation still remains.

The drilling and geological personnel were staying in the nearby towns throughout the period of the project, consequently, there are no campsite impacts to report.

Conclusion

The program's environmental management of its drillsites was very good. Every effort was made to site holes in locations that did not impact upon remnant vegetation, all rubbish was removed from the area and sites were left in a condition that made them hard to distinguish from the surrounding environment. The most noticeable impact remaining from the activities was some discolouration around the drillsites from samples returned to the surface. Attempts were made to break - up and rake - in these areas but it was inevitable some discolouration would be left on the surface. These areas should be indistinguishable after next winter's grass germination.

Brenton Grear
14 December 1994

Plate 1 - Drillhole W7 - Cuttings raked over and drainage channels backfilled

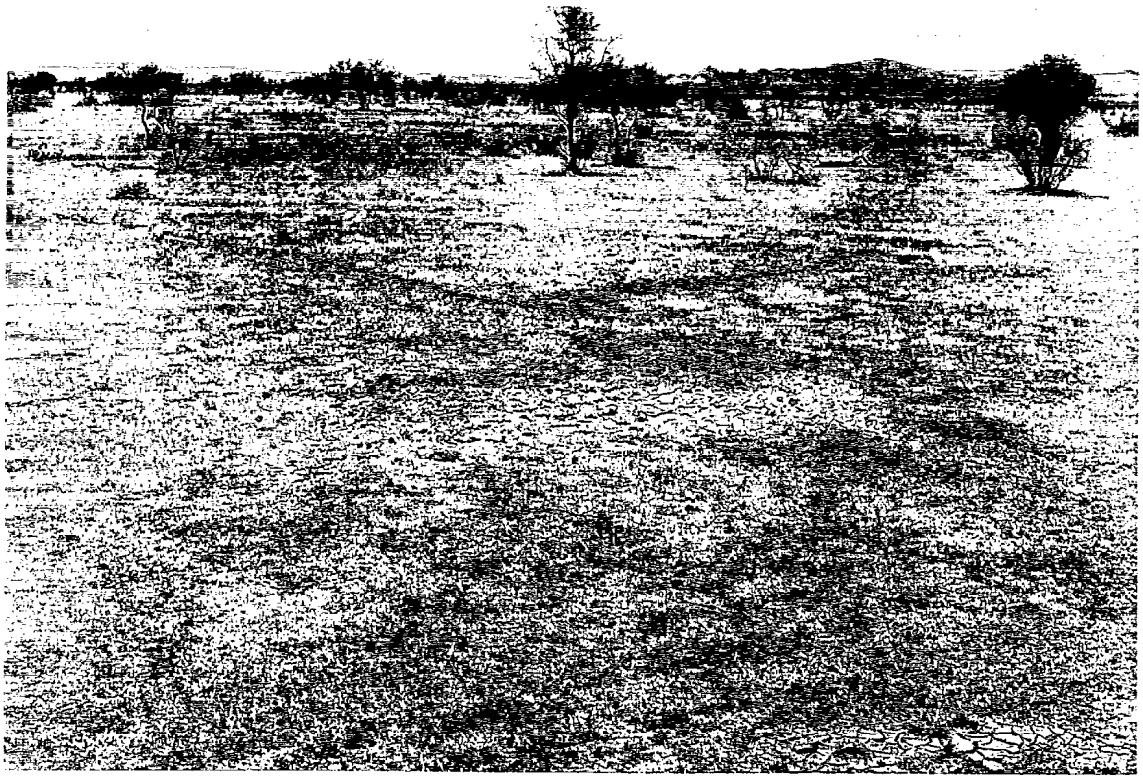


Plate 2 - Drillhole W1 - Discoloured surface material at completion of drillhole

Plate 3 - Drillhole W16 - Sample pits covered with topsoil and raked over

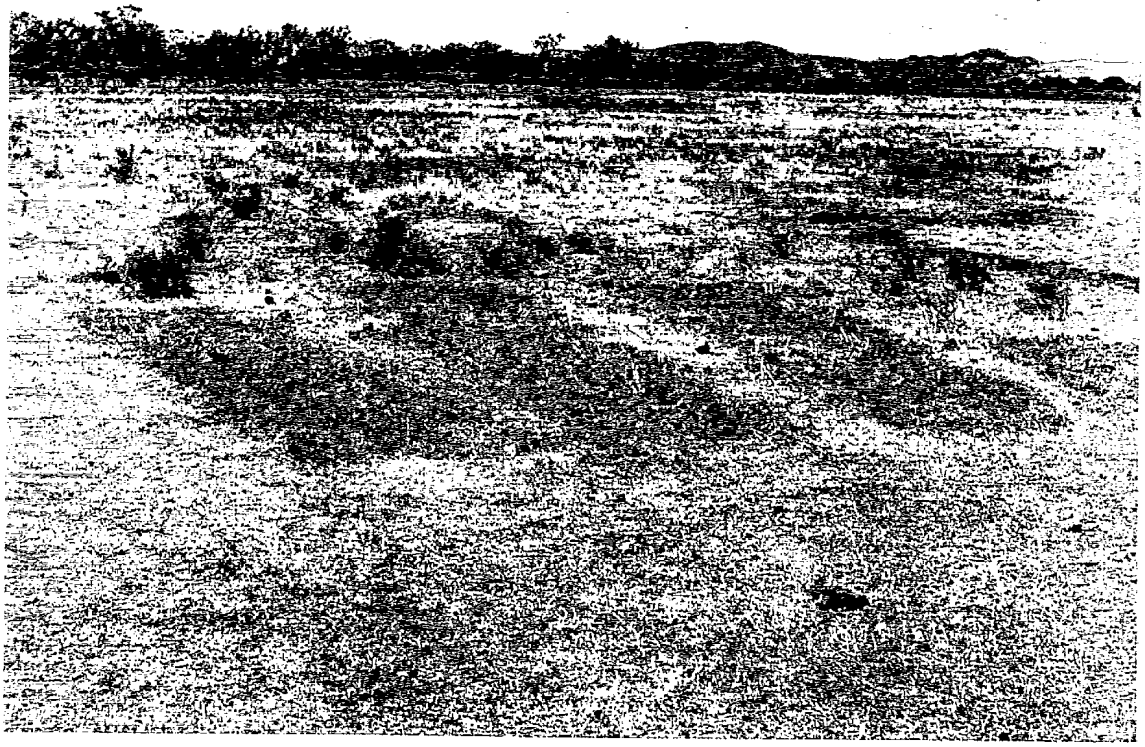


Plate 4 - Drillhole W17 - Large amount of sand from drillhole spread out and raked over

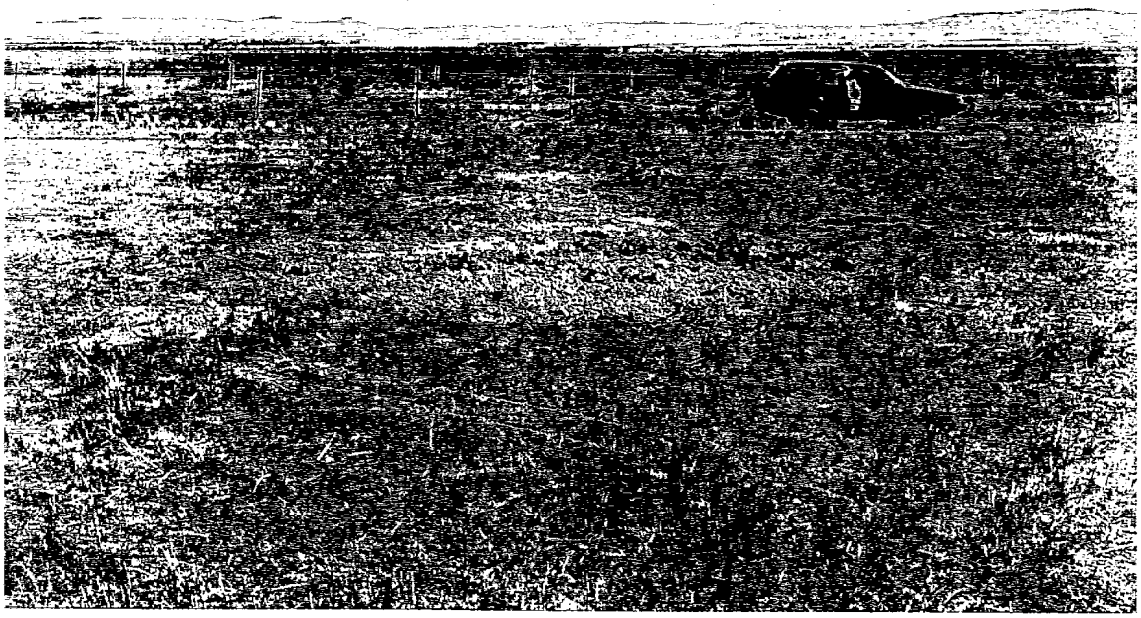


Plate 5 - Drillhole W18 - Site post clean - up

Plate 6 - Drillhole W17 - Drillrig used in the drilling program