SOUTH AUSTRALIAN STEEL AND ENERGY

Coober Pedy Iron Ore Investigation

Peculiar Knob Prospect

MINES and ENERGY RESOURCES SOUTH AUSTRALIA

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100568

DEPARTMENT OF MINES AND ENERGY

GEOLOGICAL SURVEY

SOUTH AUSTRALIA

REPORT BOOK 97/9

SOUTH AUSTRALIAN STEEL AND ENERGY PROJECT
COOBER PEDY IRON ORE INVESTIGATION

PECULIAR KNOB PROSPECT

by

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Mineral Resources Branch

FEBRUARY 1997 DME 87/95

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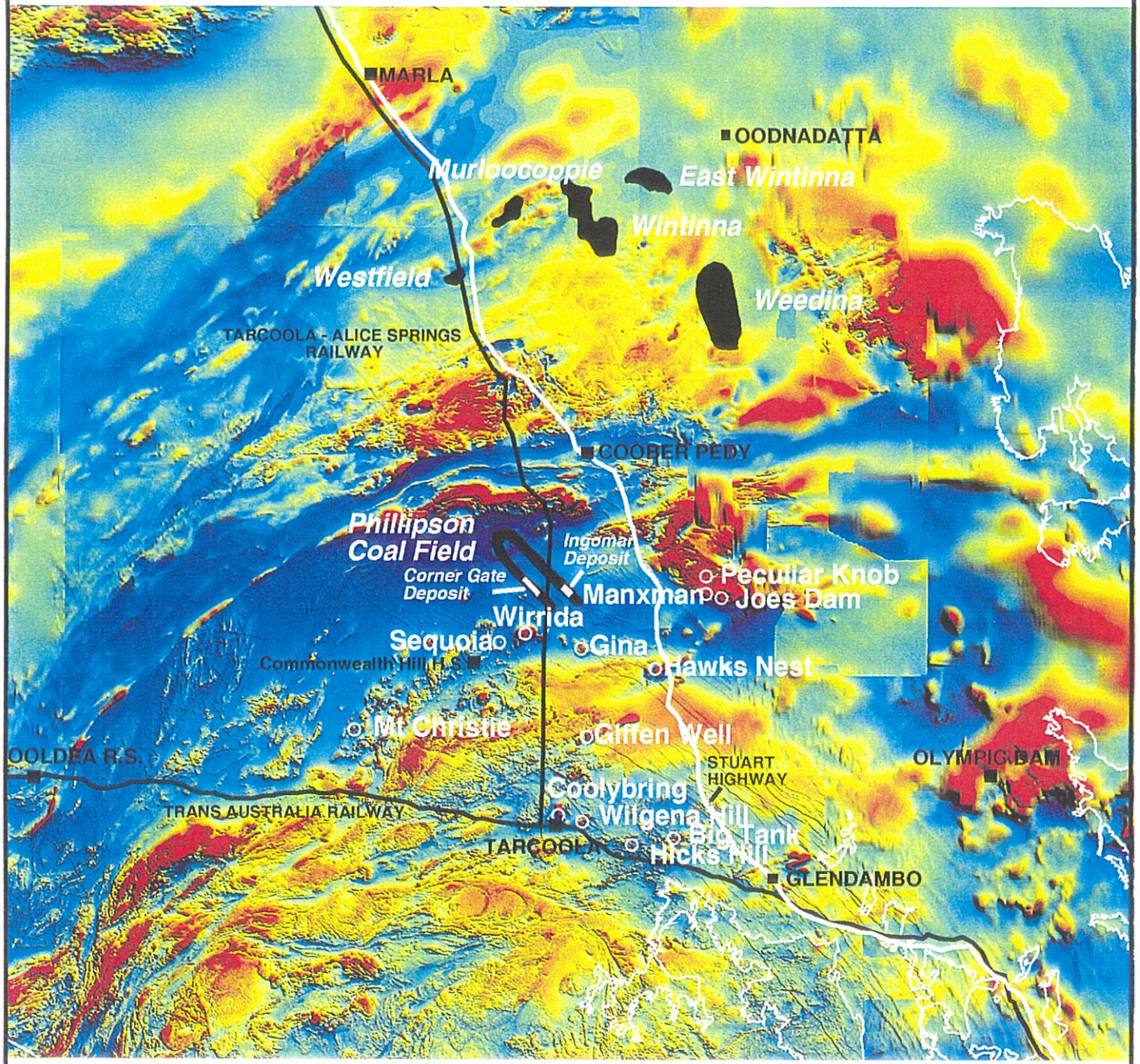

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BRIAN J MORRIS and
JOANNE K HOUGH

As part of the South Australian Steel and Energy Project MESA targeted significant aeromagnetic anomalies for a possible iron ore resource. At Peculiar Knob prospect previous Company exploration drilling had encountered significant iron intersections. Ground magnetics, gravity, RC-hammer and diamond drilling has outlined an Inferred Resource of 13 975 000 tonnes of coarse grained specular haematite grading 63.2% Fe, 0.31% Al_2O_3, 0.02% P_2O_5 and 4.8% SiO_2. The ore zone is 15-36m wide extends for 1100m and is steeply dipping. The purity of the coarse grained specular haematite ore indicates that two stage crushing and screening may be the only beneficiation required. Further drilling is recommended to test the continuity and strike extent of the deposit.

INTRODUCTION

As part of the South Australian Steel and Energy Project (SASE) Mines and Energy, South Australia (MESA) commenced a search for iron ore on the northern Gawler Craton in January. 1995. The project, in conjunction with Meekatharra Minerals Ltd (MML) and Ausmelt Ltd, aims to produce pig iron near Coober Pedy using local iron ore, coal from MML's Phillipson Coalfield and the direct smelting Ausmelt technology.

Peculiar Knob prospect was originally discovered by CRAE in 1985 while exploring the region primarily for base metal mineralisation.

Ground magnetic surveys were carried out by Mineral Resources Branch and followed by RC-hammer (MESA Drilling Branch) and diamond drilling (Strata Exploration) programmes. Drill cuttings and quarter NQ diamond core from selected intervals were sent to Amdel Laboratories Ltd for whole rock and selected trace element analysis. Selected samples were forwarded to Pontifex and Associates Pty Ltd for petrographic descriptions.

CLIMATE, TOPOGRAPHY AND ACCESS

The prospect area is flat-lying and located within the arid zone of South Australia with vegetation consisting of bluebush and saltbush. Rainfall averages 150mm per year but is irregular with the area prone to drought and summer thunderstorms. Temperatures are extreme during the summer with the mean maximum temperature for January being 35°C.

The chief activity of the area is sheep grazing with the prospect situated on McDouall Peak Pastoral Lease.

The prospect is 30 km due east of the Stuart Highway and about 87 km southeast of Coober Pedy, the nearest population centre. Access form the sealed Stuart Highway is eastward via 30 km of reasonable station track to Joes Dam then northwesterly via a bush track for 14 km.

The prospect lies on the Billa Kalina 1:250 000 sheet and on the Peak 1:100 000 sheet.

MESA exploration was carried out with the permission of Normandy Exploration NL-Metals Exploration Ltd who hold a current Exploration Licence over the area (EL 1868).

A site avoidance survey carried out by MESA's Liaison Officer (Mr R Larkins) with representatives of the Antakarinja people, cleared the Peculiar Knob prospect area.

PREVIOUS INVESTIGATION

Details of previous exploration of the region has been compiled by Polito and Davies (1997). CRAE investigated coincident magnetic and gravity anomalies at Peculiar Knob in the 1980's (Finch, 1986) for possible base metal mineralisation. The exploration included ground magnetics, gravity and in loop Sirotem. The first of four diamond drillholes (Figs 1 and 2) DDHEN19, drilled to 100m, intersected massive haematite quartz gneiss assaying 64.5% Fe. DDHEN20, drilled to 296.6m, intersected two zones of massive haematite; zone one was not assayed for iron; zone two assayed 61.8% Fe between

61.8% Fe between 210.7 and 273.5m. A true width of 36m was indicated. DDHEN21 drilled to 139.06m intersected a massive haematite horizon between 109 and 124m at 59.16% Fe. Dip estimates indicate the ore dips 80° northwest. DDHEN22 drilled to 190.1m intersected four thin bands of haematite-magnetite gneiss between 118 and 140m with assays up to 65.9% Fe. DDHEN19-21 were drilled along one section while DDHEN22 was drilled about 500m north and along strike (Figs 1 and 2).

GEOLOGICAL SETTING

The regional geology is described in detail and presented on the BILLA KALINA 1:250 000 geological series by Ambrose and Flint (1981).

Peculiar Knob prospect is situated on the northern Gawler Craton (Frontispiece) and within the Mount Woods Inlier which comprises Palaeoproterozoic to Mesoproterozoic metasediments, deformed granitoids and granite. Rock types include banded iron formation (BIF), paragneiss, metapelite, migmatite and orthogneiss (Flint and Benbow, 1977). These metasediments have been intruded by the porphyritic, foliated Engenina Adamellite (1691±18 Ma) during the Palaeoproterozoic and by the non-foliated Balta Granite (1584±18 Ma) during the Mesoproterozoic producing intense chloritic alteration at Peculiar Knob. Metamorphic grade is upper amphibolite facies.

The prospect area is covered by Quaternary red-brown clay, sand and silt, which overlies Cretaceous Bulldog Shale, a pale brown shale with minor gypsum, The flat-lying shale overlies basement to a depth of 12m at the southwestern end of the deposit and thickens to about 30m at the northeastern end.

MESA INVESTIGATIONS

Ground Magnetic Survey

Eleven traverses 750m long and 100m apart were completed over the prospect (Figs 1 and 2) by Mineral Resources Branch personnel using an Overhauser GSM-19 Fastman recording at 1 second intervals. All traverses were located using Garmin Survey II GPS receiver in differential mode. Stacked profiles of the data are shown on figure 2.

The magnetic response mirrors the mineralised zone of massive specular haematite which can be accounted for by remnant magnetisation and by remnant magnetite within the haematite. Measurements of drill cuttings show that the magnetic susceptibility is strongest in the central part of the prospect and declines along strike although the thickness of the ore zone appears to continue.

Gravity Survey

A gravity survey was completed by Haines Surveys comprising 600 stations at 25m intervals along selected traverse lines. The central part of the mineralised zone gave the strongest response and a detailed report of the gravity survey is presented in Appendix 1.

Drilling

Fourteen vertical RC-hammer holes totalling 920m were drilled on the magnetic highs to intersect northeasterly trending mineralised zones (Figs 1 and 2). Two holes were abandoned (PK1 and 4) while eight holes (PK2, 3, 5, 6, 7, 8, 9 and 13) successfully intersected the target zones. Representative logging samples were collected at 2m intervals in plastic jars for storage at MESA Core Library, while bulk samples for geochemical analysis were collected at selected intervals ranging from 2 to 10m in the mineralised zone.

Three angled (60°) diamond drillholes totalling 397m were drilled at regular intervals along the mineralised zone (Figs 1 and 2). Core was logged on site then sent to MESA Core Library where ¼ core was cut and selected intervals submitted for assay. Selected samples were also taken for petrological descriptions (Appendix 2).

Geological drill logs with magnetic susceptibility reading and analytical results are presented in Appendix 3.

Geochemistry

RC-hammer drill cuttings were selectively analysed for SiO_2, TiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, CaO, Na_2O, K_2O, P_2O_5 and LOI by Inductively Coupled Plasma (ICP) with mixed acid (including HF) digest and Au by fire assay with atomic absorption spectrometry (AAS) finish in the mineralised zone. The host rocks were analysed for Cu, Pb, Zn, Ni, Cr, Co, Fe and Mn by ICP with aqua regia digest, Au by fire assay/AAS and Th and U by x-ray fluorescence (XRF). All assay results are shown in Appendix 3.

Diamond drill ¼ NQ core samples were selectively analysed for SiO_2, TiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, CaO, Na_2O, K_2O, P_2O_5 and LOI by ICP with mixed acid digest; Au, Pt and Pd by fire assay/AAS; Cu, Pb, Zn, Ni, Cr, Fe, Mn and S by ICP-OES with mixed acid digest and Ce, La, U and Th by ICP-MS with mixed acid digest. Several selected samples were also assayed for a range of rare earths by ICP with mixed acid digest - Li, Ba, Be, Sc, Zr, Y, Ce, Dy, Er, Ev, Gd, Ho, La, Lu, Nd, Pr, Sm, Tb, Tm, Yb, Ga, Hf, Nb, Rb and Ta, these results are in Appendix 4.

RESULTS OF INVESTIGATIONS

Geochemistry and Petrology

Five diamond drillholes, three drilled by MESA and two by CRAE (Finch, 1986) and 6 R C-hammer holes intersected the main ore zone which formed by the hydrothermal alteration of a BIF. Leaching out of silica and concentration of iron produced a coarse mosaic of specular haematite (0.3mm to 4mm in size) with minor remnant banding and some residual magnetite. Metamorphic haematite has largely replaced the magnetite with the remainder subsequently replaced by martite. Minor interstitial subrounded quartz grains (0.1mm to 0.4mm diameter) are present.

Figures 3, 4, 5 and 6 are drillhole sections showing geology, the ore zone and weighted average whole rock analyses of the ore zone. Mineralisation is high grade averaging 63.2%Fe with low alumina (0.31% Al_2O_3) and phosphorous (0.02% P_2O_5) contents.

Anomalous rare earth values for Ce and La were detected between 100 and 144m in PKDDH3, within chloritic altered gneiss. This included 6m of 4600ppm Ce and 4200ppm La (Appendix 3). Samples were re-assayed for a full suite of rare earths and results are presented in Appendix 4, showing highly anomalous Ce, La and Nd.

Resource Assessment

Cross sections show that flat-lying Cretaceous Bulldog Shale overlies the steeply northwesterly dipping crystalline basement to a depth of about 12m at the southwestern end of the deposit and thickens to about 30m at the northeastern end.

Specific gravity (SG) measurements of the ore zone were 5.2 in PK1 at 51.2m and 5.08 at 57.3m in PKDDH3.

Assumptions used for the resource assessment were an SG of 5.0, a near vertical attitude for the ore zone, a 100m depth of ore below Cretaceous cover and only drillholes PKDD1, 2 and 3, PK3 and EN20 were used in calculations because of their even distribution along strike and a complete intersection of the haematite body (Table 1).

Table 1
Resource Assessment

Hole	Depth of Cover (m)	Wt.Av %Fe	Lateral Area of influence (m)	Depth (m)	Width (m)	Volume (m^3)	Tonnes
PKDDH1	22	61.0	250	100	30	750 000	3 750 000
PKDDH3	22	65.8	200	100	20	400 000	2 000 000
EN20	20	61.8	200	100	36	720 000	3 600 000
PK3	16	67.2	250	100	25	625 000	2 125 000
PKDDH2	12	59.9	200	100	15	300 000	1 500 000
						2 795 000	13 975 000

There is an Inferred Resource of 13 975 000 tonnes of coarse grained specular haematite at 63.2% Fe in an estimated 25m wide steeply northwesterly dipping zone that extends for at least 1100m below 12-30m of cover.

Comminution Tests

Samples of ½ NQ drill core of the specular haematite were tested at Amdel Limited Mineral Processing Services for Bond Abrasion Index. An Abrasion Index of 0.128 was determined which is well below the average value for haematite (0.37), magnetite (0.48) and taconite (0.60) ores, but equivalent to limonite ore (0.13) (Amdel Report No N8117).

CONCLUSIONS AND RECOMMENDATIONS

Diamond and RC-hammer drilling has defined an Inferred Resource of 13 975 000 tonnes of coarse grained specular haematite, grading 63.2% Fe, 0.31% Al_2O_3, 0.02% P_2O_5 and 4.8% SiO_2, below 12-30m of Cretaceous cover.

The ore zone is 15-36m wide extends for 1100m and is steeply dipping.

The deposit is open along strike and at depth.

The purity of the material, its coarse grain size and friable nature indicates that two stage crushing and screening to a consistent lump feed size may be the only beneficiation required.

Infill angled diamond and/or RC-hammer drilling is required to test the continuity of the deposit and possible strike extensions.

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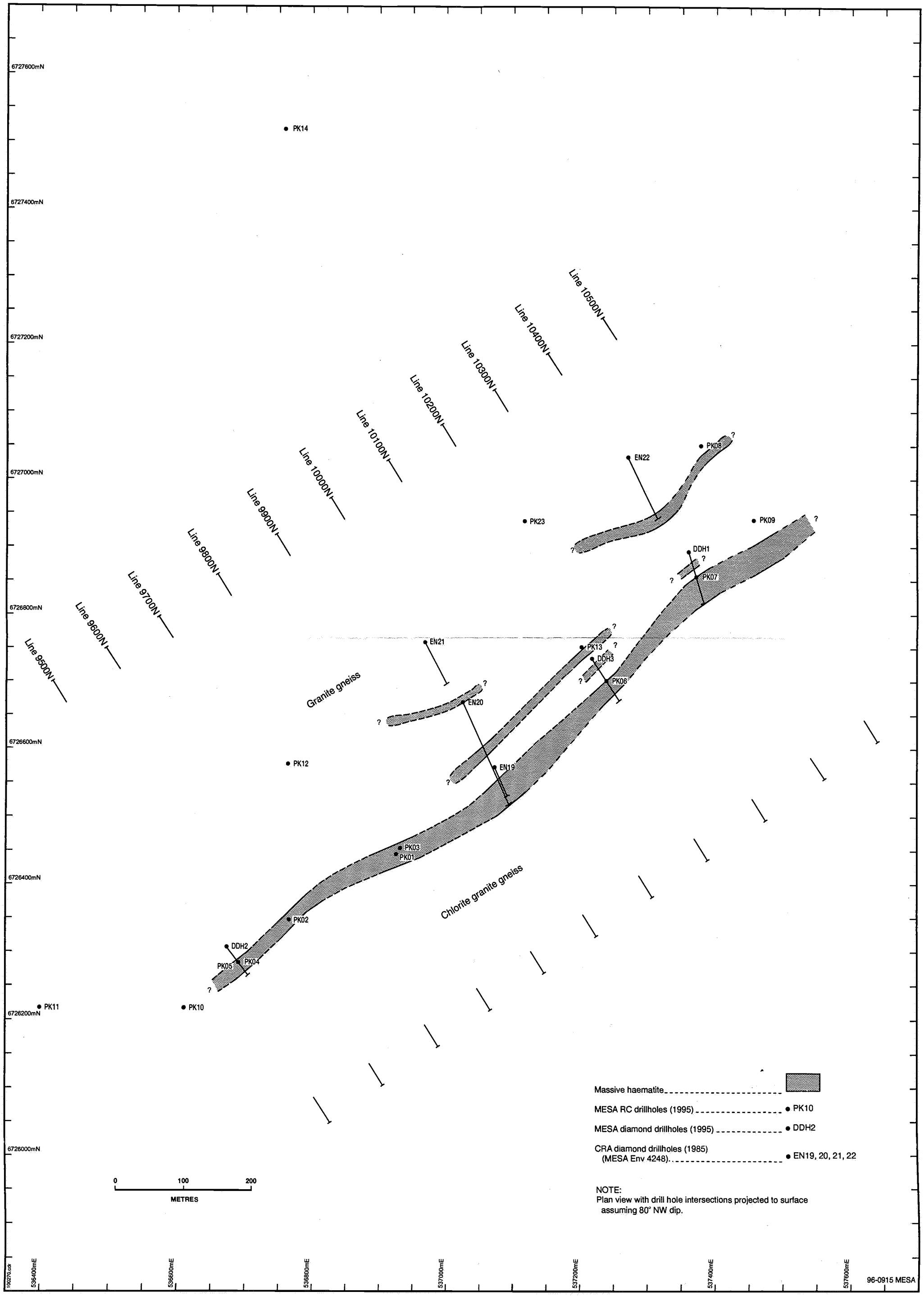


Figure 1 *Drill Hole locations and projected geology, Peculiar Knob prospect*

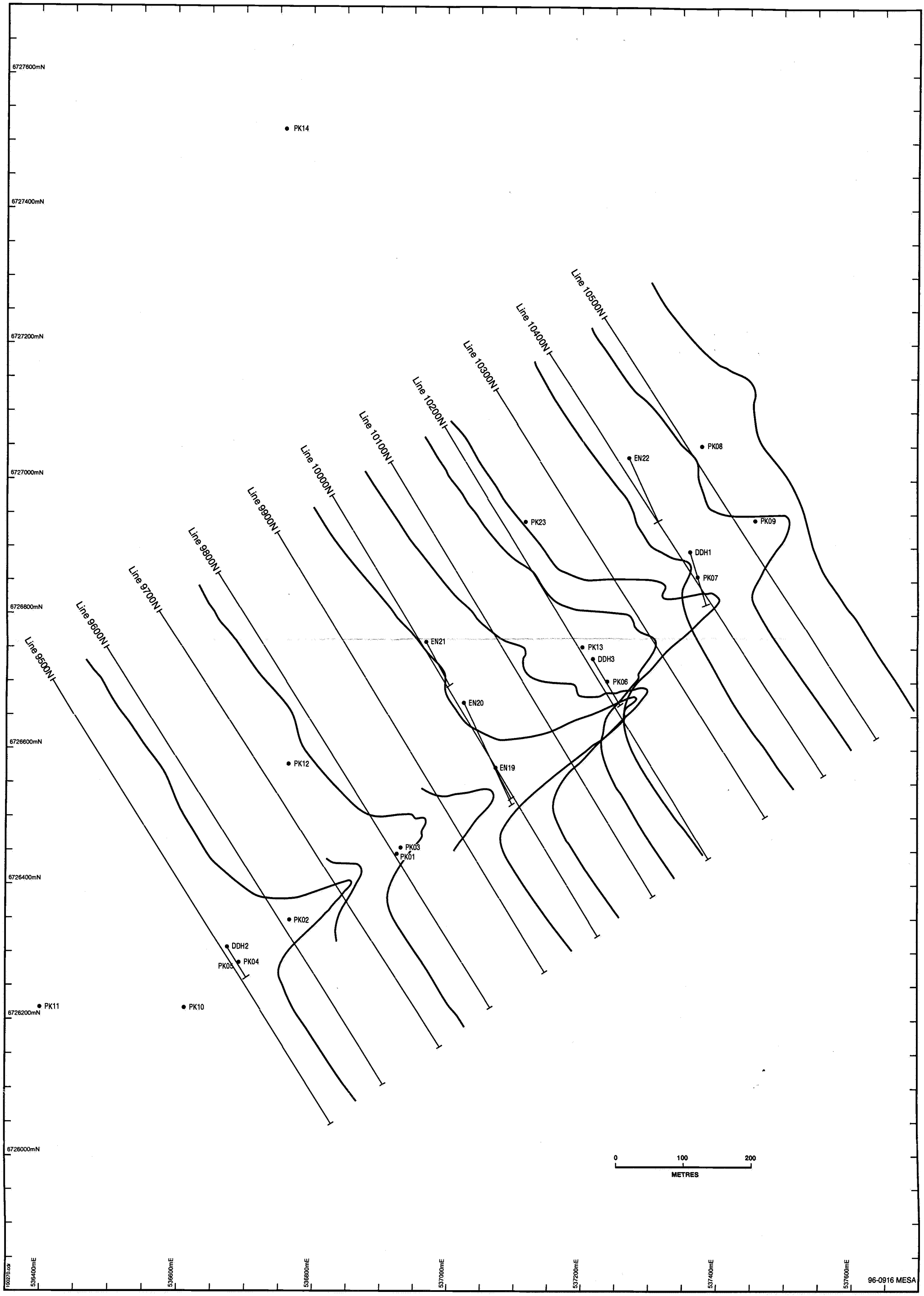
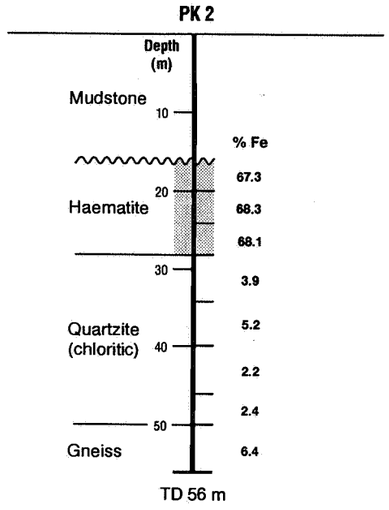
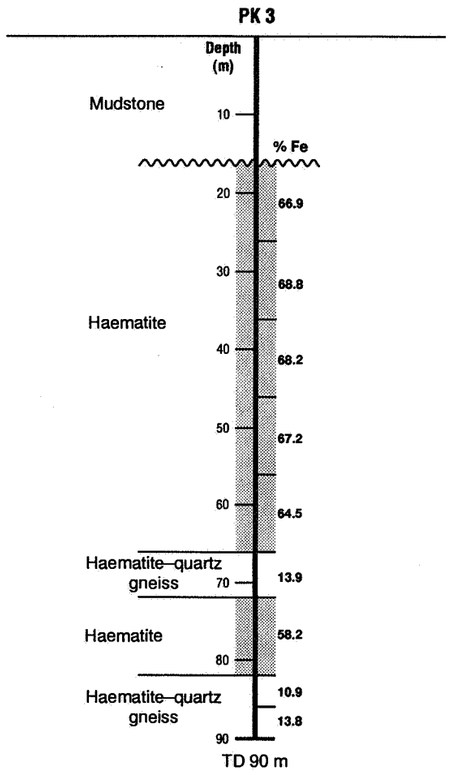


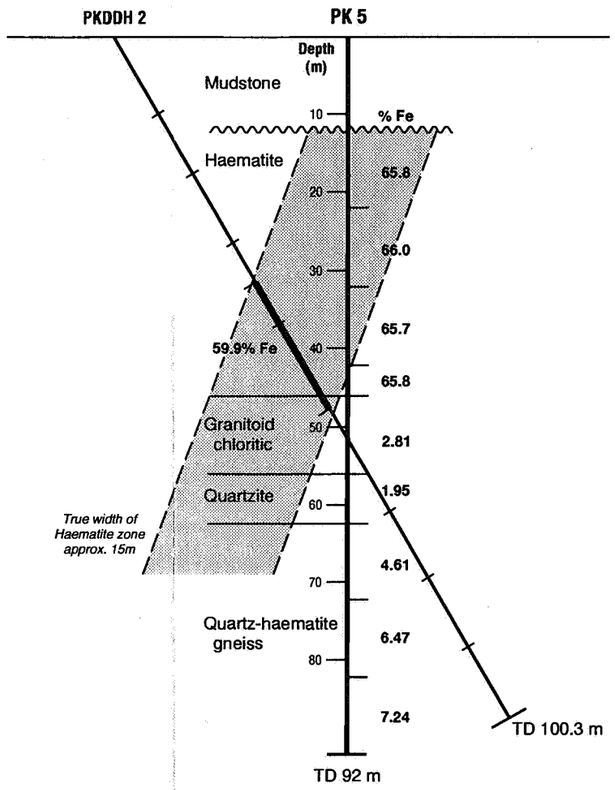
Figure 2 *Ground magnetic stacked profiles, Peculiar Knob prospect*



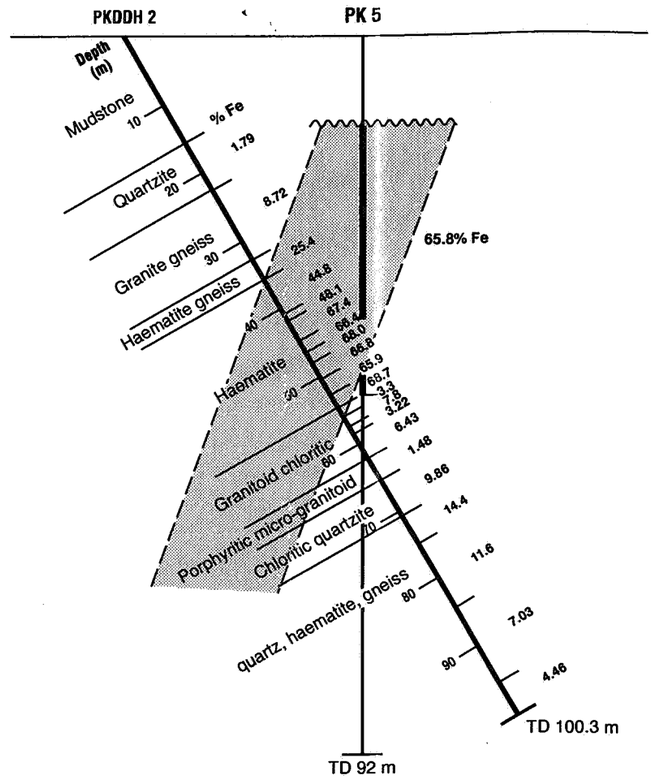
PK 2	
%	16–28m
Fe	67.9
SiO_2	2.33
Al_2O_3	0.16
CaO	0.14
K_2O	<0.01
MgO	0.09
MnO	0.01
Na_2O	0.02
P_2O_5	<0.01
TiO_2	0.6
LOI	0.42



PK 3		
%	16–66m	72–82m
Fe	67.2	58.2
SiO_2	1.97	14.2
Al_2O_3	0.38	0.29
CaO	0.07	0.07
K_2O	0.09	0.07
MgO	0.10	0.10
MnO	<0.01	<0.01
Na_2O	0.03	0.03
P_2O_5	0.01	0.02
TiO_2	0.14	0.37
LOI	0.23	0.89



PK 5	
%	12–46m
Fe	65.8
SiO_2	2.87
Al_2O_3	0.38
CaO	0.07
K_2O	0.10
MgO	0.09
MnO	0.02
Na_2O	0.05
P_2O_5	0.02
TiO_2	0.10
LOI	0.75



PKDDH 2	
%	41.9–54.6m
Fe	67.2
SiO_2	2.39
Al_2O_3	0.18
CaO	0.13
K_2O	0.23
MgO	0.19
MnO	0.04
Na_2O	0.01
P_2O_5	0.04
TiO_2	0.10
LOI	0.94

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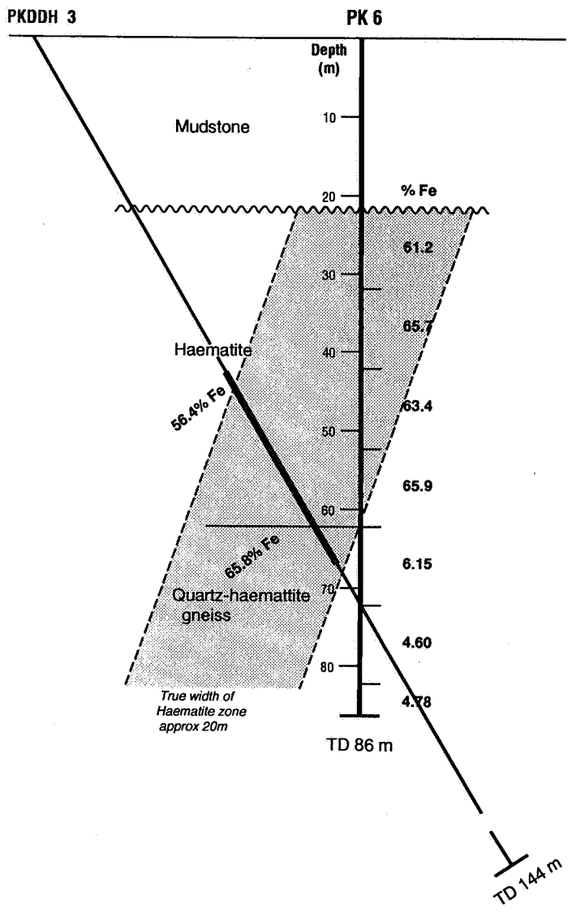
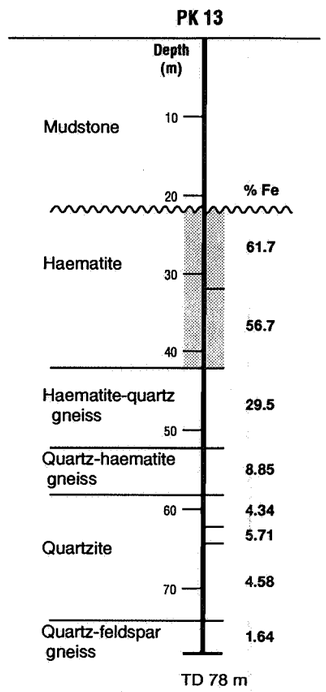
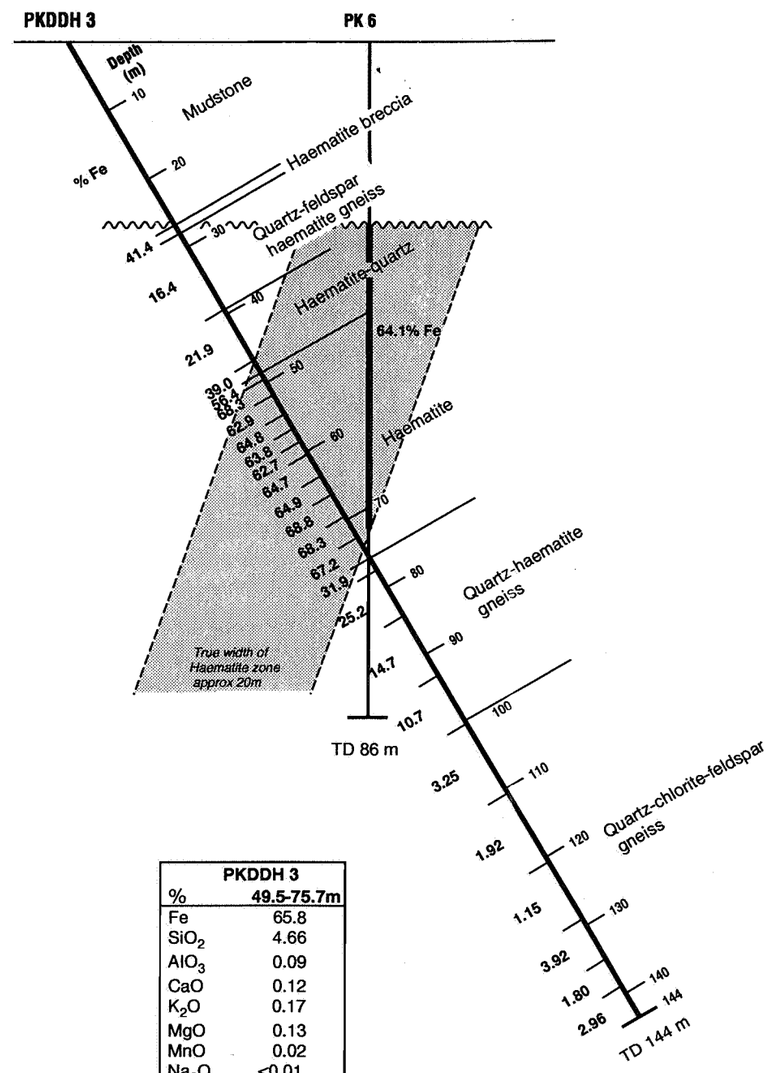
Figure 3 Peculiar Knob Prospect drillhole sections for holes PK2, PK3, PK5 and PKDDH2







PK 6	
%	22–62m
Fe	64.1
SiO_2	6.00
Al_2O_3	0.38
CaO	0.09
K_2O	0.10
MgO	0.10
MnO	0.10
Na_2O	0.06
P_2O_5	0.01
TiO_2	0.10
LOI	0.57

PK 13	
%	22–42m
Fe	59.21
SiO_2	11.7
Al_2O_3	0.59
CaO	0.14
K_2O	0.12
MgO	0.15
MnO	<0.01
Na_2O	0.06
P_2O_5	<0.01
TiO_2	0.23
LOI	1.12

PKDDH 3	
%	49.5-75.7m
Fe	65.8
SiO_2	4.66
AlO_3	0.09
CaO	0.12
K_2O	0.17
MgO	0.13
MnO	0.02
Na_2O	<0.01
P_2O_5	0.04
TiO_2	0.11
LOI	0.07

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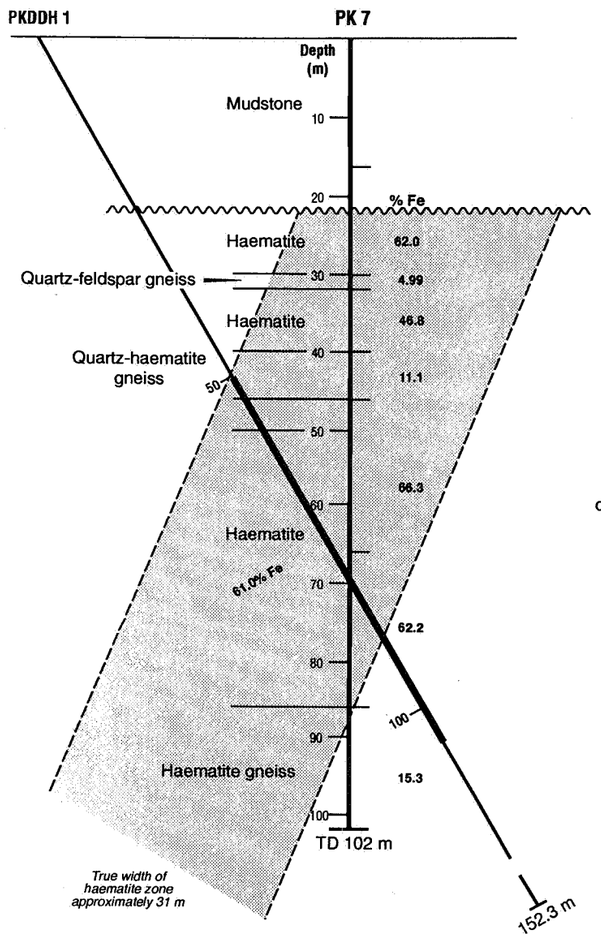
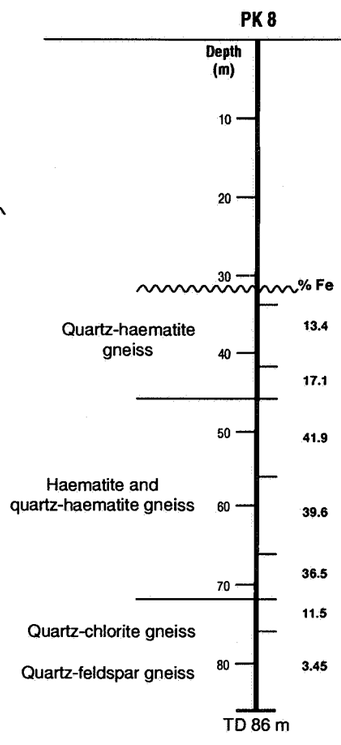
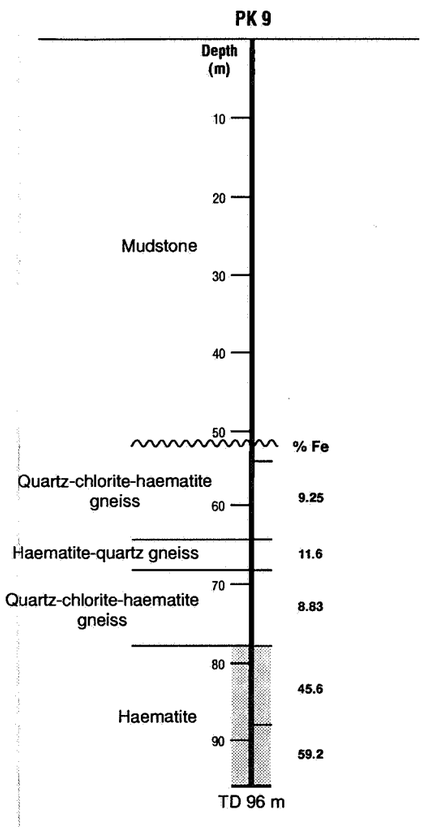
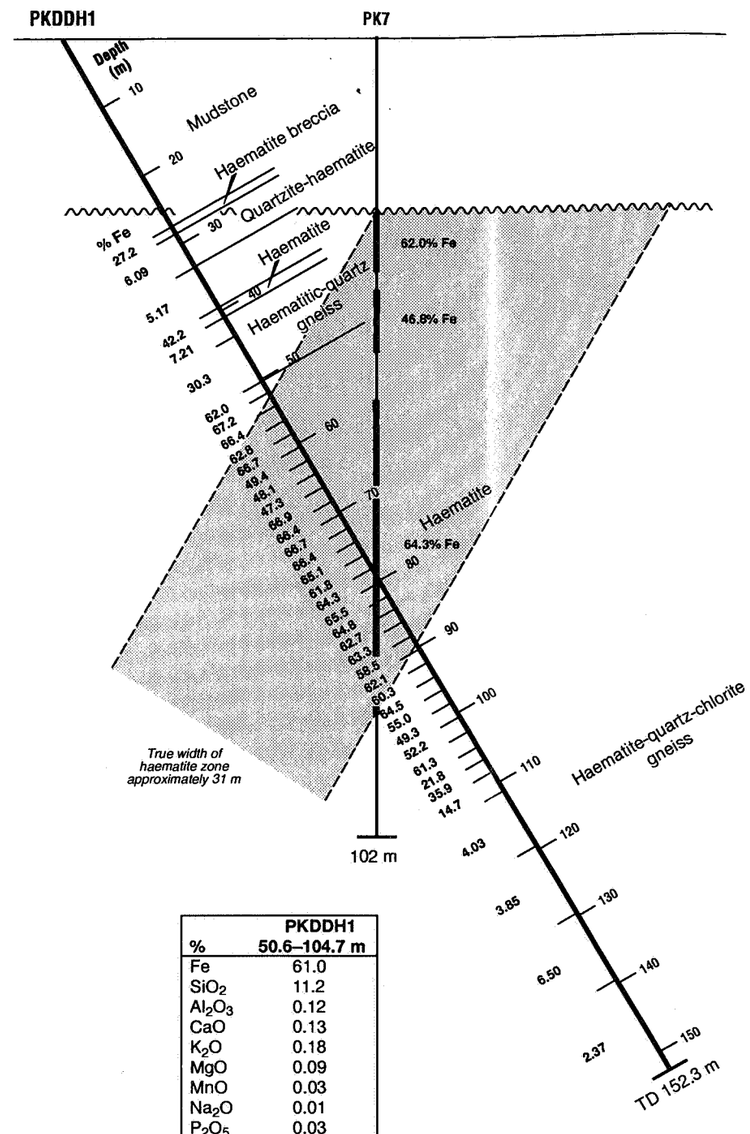
Figure 4 *Drillhole sections for holes PK6, PK13, and PKDDH3*









	PK 7		
%	22–30 m	32–40 m	46–86 m
Fe	62.0	46.8	64.3
SiO_2	6.71	28.8	5.77
Al_2O_3	0.82	0.54	0.26
CaO	0.15	0.07	0.02
K_2O	0.19	0.11	0.07
MgO	0.23	0.13	0.07
MnO	<0.01	<0.01	<0.01
Na_2O	0.07	0.06	0.04
P_2O_5	0.01	<0.01	<0.01
TiO_2	0.16	0.24	0.08
LOI	1.42	0.98	0.40

	PK8
%	46.0–72.0m
Fe	38.7
SiO_2	37.0
Al_2O_3	2.53
CaO	0.23
K_2O	0.97
MgO	0.28
MnO	<0.01
Na_2O	0.08
P_2O_5	0.13
TiO_2	0.37
LOI	0.97

	PK9
%	78.0–96.0m
Fe	51.6
SiO_2	17.7
Al_2O_3	2.23
CaO	0.73
K_2O	0.52
MgO	0.53
MnO	0.01
Na_2O	0.08
P_2O_5	0.06
TiO_2	0.28
LOI	3.17

	PKDDH1
%	50.6–104.7 m
Fe	61.0
SiO_2	11.2
Al_2O_3	0.12
CaO	0.13
K_2O	0.18
MgO	0.09
MnO	0.03
Na_2O	0.01
P_2O_5	0.03
TiO_2	0.14
LOI	0.21

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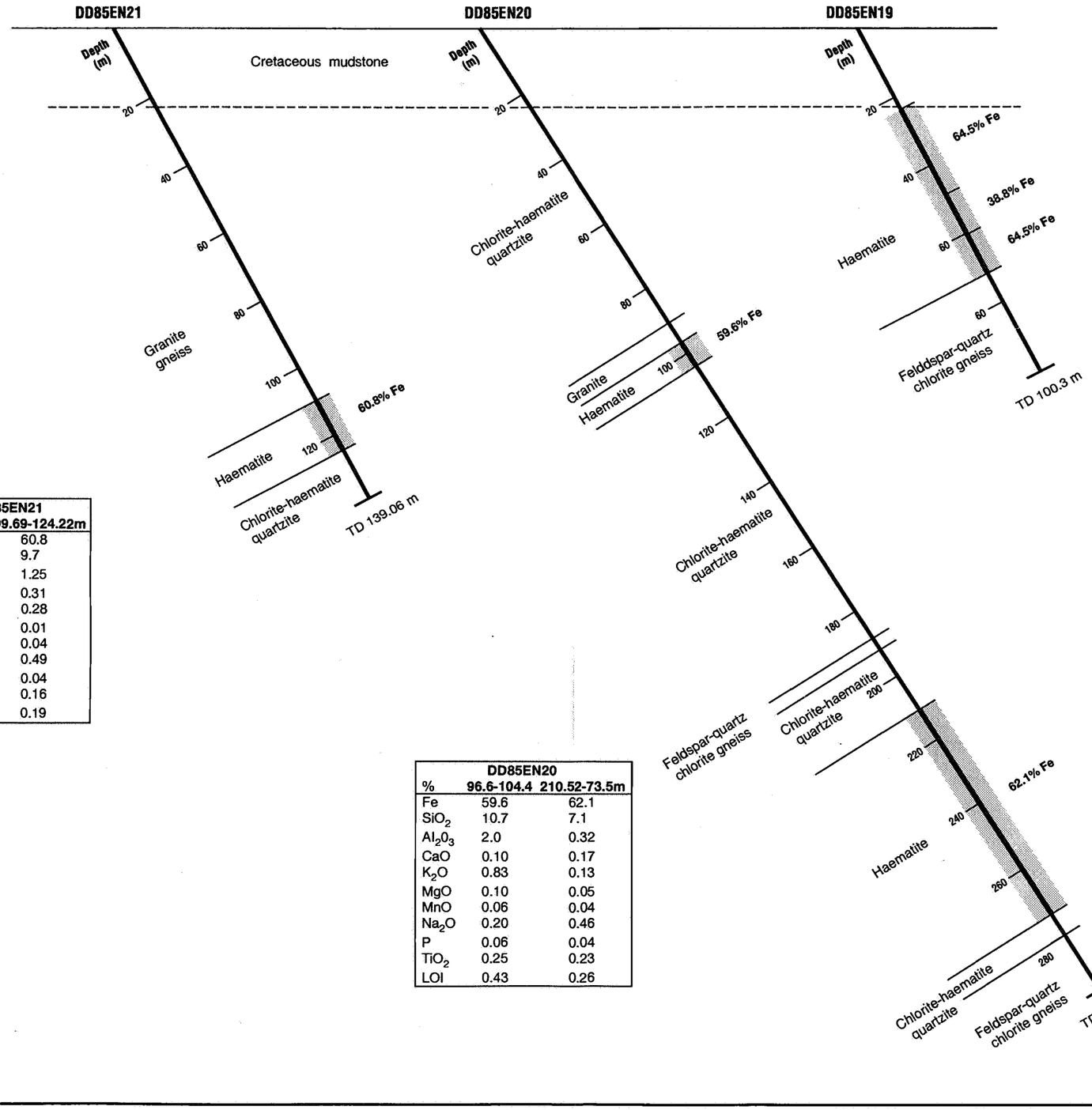
Figure 5 *Peculiar Knob Prospect drillhole sections for holes PK7, PK8, PK9 and PKDDH1*



DD85EN21	
%	109.69-124.22m
Fe	60.8
SiO_2	9.7
Al_2O_3	1.25
CaO	0.31
K_2O	0.28
MgO	0.01
MnO	0.04
Na_2O	0.49
P	0.04
TiO_2	0.16
LOI	0.19

DD85EN20		
%	96.6-104.4	210.52-73.5m
Fe	59.6	62.1
SiO_2	10.7	7.1
Al_2O_3	2.0	0.32
CaO	0.10	0.17
K_2O	0.83	0.13
MgO	0.10	0.05
MnO	0.06	0.04
Na_2O	0.20	0.46
P	0.06	0.04
TiO_2	0.25	0.23
LOI	0.43	0.26

DD85EN19	
%	23.3-73.6m
Fe	58.1
SiO_2	15.1
Al_2O_3	0.37
CaO	0.15
K_2O	0.09
MgO	0.16
MnO	0.05
Na_2O	0.23
P	0.04
TiO_2	0.19
LOI	0.58

Note:

Drill holes EN 19, 20 and 21
by CRA Expl. Pty Ltd., 1985
(MESA Env.4248)

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96-0920 MESA

Figure 6 Drillhole sections for holes DD85EN21,DD85EN20 and DD85EN19

APPENDIX 1

GRAVITY SURVEY

HAINES SURVEYS

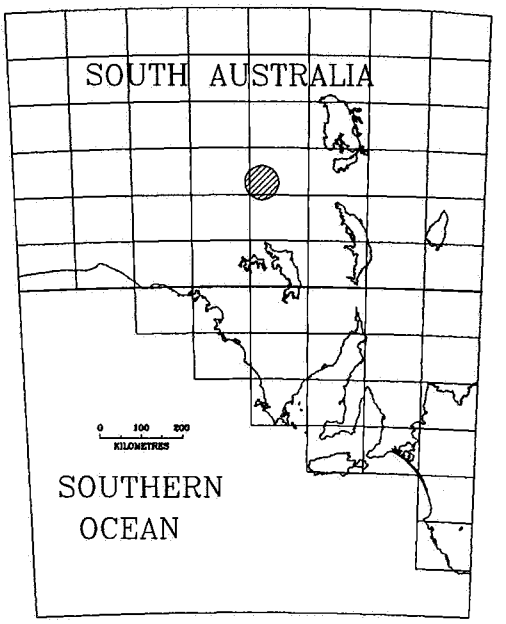
SATELLITE SURVEYING EXPLORATION

SASE GRAVITY SURVEY
FOR THE
SOUTH AUSTRALIAN
DEPARTMENT OF MINES AND ENERGY

COOBER PEDY - TARCOOLA AREA

ADDENDUM 1

JULY 1996



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APPENDICES:

1. INTRODUCTION

1.1 This report is an addendum, the first, to the report titled "SASE Gravity Survey for the South Australian Department of Mines and Energy, Coober Pedy-Tarcoola Area, April - June 1996", referred to below as "the main report". It gives details of work carried out by Haines Surveys Pty Ltd which was additional to that set out in the "Request for Tender for the Acquisition and Processing of Gravity Data Under the South Australian Steel and Energy Project" tender document. This additional work was requested by the South Australian Department of Mines and Energy (MESA) on 26 June 1996.

1.2 See the main report for background reasons for the survey.

1.3 The first stage of the project consists of the surveying of the area designated by MESA as **Peculiar Knob** for the acquisition of horizontal and vertical position and gravity data for a number of gravity stations forming a grid The grid is rotated in relation to the Australian Map Grid (AMG) by -37° 26′ 30″ (that is anticlockwise). and has lines of gravity stations with a (rotated) east -west separation of 100m and a (rotated) north-south separation of 25m contained entirely in the rectangle bounded by the Australian Map Grid (AMG) Zone 53 coordinates:

South West corner:	536000	6725500
North East corner:	538300	6728000

The area has been the subject of previous gravity surveys and some lines are partly or wholly excluded. Details are shown in Appendix A.

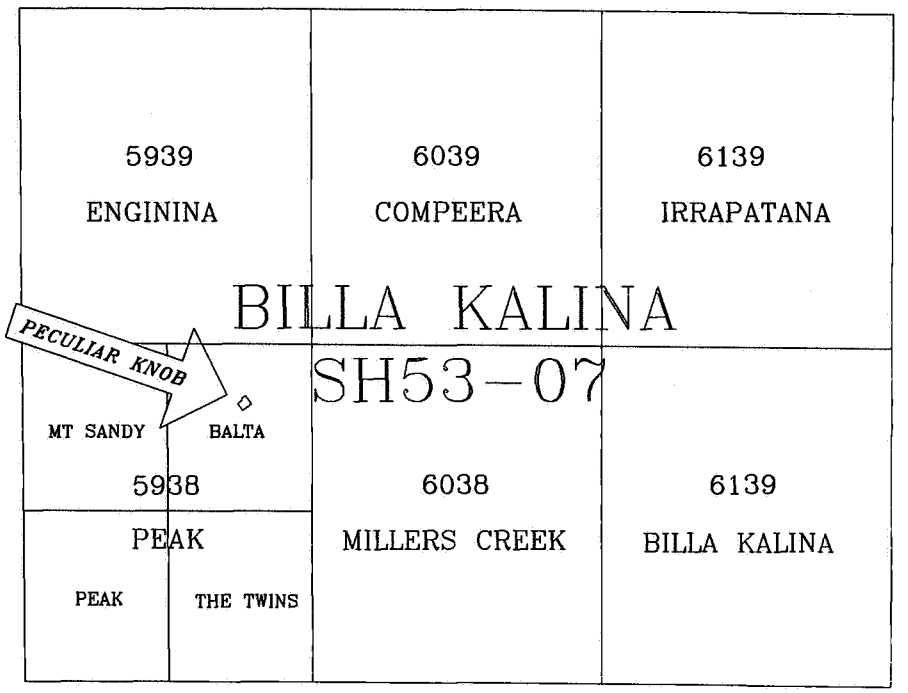


Figure 1: Area designation with 1:50000 map references.

1.4 The second stage of the project consists of the processing of the collected observations to produce gravity data on the ISOGAL84 datum (IGSN71) and Bouguer anomaly data using a density of 2.67 g/cc.

1.5 The third stage of the project consists of producing information in the form of contour maps and images and showing various data at various scales.

1.6 This report addendum comprises 5 parts corresponding to the main report. The data acquisition and processing and Quality Assurance parts only refer to the main report. The remaining parts give details of the results of and statistics on the processing and details of the processed data.

2. ACQUISITION

2.1 Planning and Reconnaissance

2.1.1 Planning commenced in June, 1996 following notification of the required work. The effected pastoralist, Mr. Wayne Rankine of The Twins; was contacted and the necessary arrangements made.

2.1.2 One field party was used and mobilised from Adelaide to The Twins Station on 15 July. A temporary base of operations and office were established at The Twins and occupied until 24 July.

2.1.3 A base station was established within the survey grid to provide control over the survey. It is a steel dropper (or star picket) driven to ground level and marked by a witness dropper with a metal tag attached. The tag is stamped "MESA GRAVITY BASE". See Appendix B for location details.

2.2 Field Operations

2.2.1 See the main report.

2.2.2 There were no situations where terrain could have adversely affected the gravity reading.

2.3 Positional Control

2.3.1 The positional and gravitational control station using Australian Geodetic Datum 1984, Australian Height Datum and ISOGAL84 was established within the survey area. Horizontal and vertical position were derived using the points 5938/5038 and 5938/1005. Gravity was obtained by connecting to the MESA gravity base at Joes Dam.

2.5 Station Identification

2.5.1 For the survey, an identifying system more descriptive than that required by MESA was needed. The existing grid's numbering system was used. Note that the numbering has no relationship with AMG. The line numbers increase from (rotated) west to east and the station numbers along the lines increase from (rotated) **NORTH TO SOUTH** (which is the opposite of Haines Surveys standard practice applied in all

other areas surveyed in this project). The central gravity station may be considered to have the line number 10,000 and the station number 10,000 (MESA point identifier 131) with the number increments/decrements corresponding to the distance in each direction

2.5.2 The sequential numbers required by MESA have been assigned by starting at the western most line and northern most station and numbering firstly from north to south and then from west to east.

2.6 Repeat Stations

2.6.1 The MESA job instruction required that 5% of all stations in the survey have repeat observations. Generally, the stations selected for repeat observations were the southern most point in the main line and then at 500m intervals (every 20th station).

2.6.2 For the repeat observation technique, see the main report.

3. DATA PROCESSING

3.1 See the main report.

4. QUALITY ASSURANCE

4.1 See the main report.

5. SURVEY RESULTS

5.1 General

5.1.1 All aspects of the surveying process are considered to be satisfactory and there were no unusual circumstances or occurrences in the data collection or processing. The accuracy of the horizontal positions of the control conform to Third Order Geodetic accuracy, that is the positions are accurate to within 30 parts per million relative to the local Primary Geodetic Network. Vertical control conforms to Third Order Leveling accuracy criteria, that is, the misclose between benchmarks used for vertical control was less than $12\sqrt{k}$ mm (where k is the distance between the control in kilometres).

5.2 Horizontal and Vertical Control

5.2.1 The horizontal vector misclose for the lines 5938/5038-Gravity Base-5938/1005 was 0.207 over a distance of 32,506.5 giving a rate of misclose 1/157,036 or 6 parts per million.

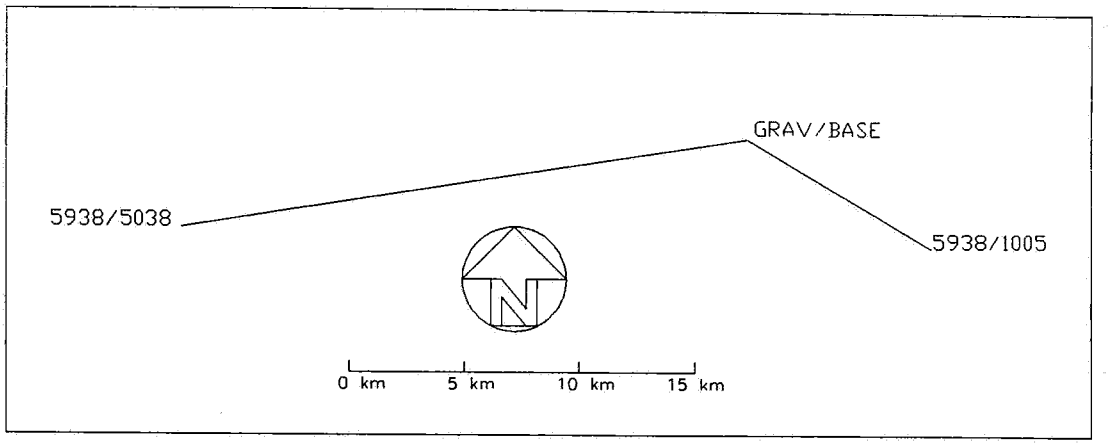


Figure 2. Horizontal and vertical control

5.2.2 It is recommended the horizontal coordinates for the new points in the survey be assigned Class A, Order 3 and the corresponding height coordinates be assigned Class D, Order 4.

5.3 Gravity Control

5.3.1 The difference in gravity from Joes Dam to Peculiar Knob Gravity Base was observed as +5.970, giving a value of 979299.420 mGals.

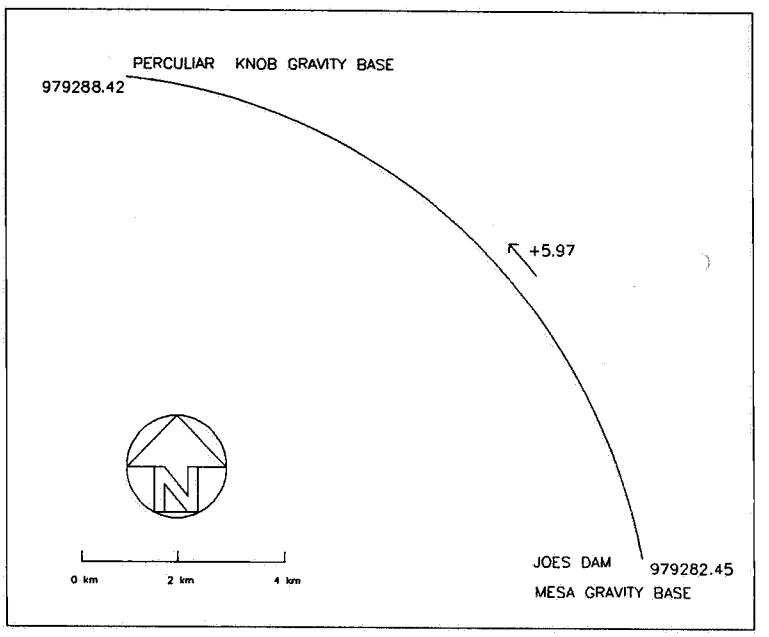


Figure 3: Gravity base observation.

5.4 Repeat Observations

5.4.1 There are 27 repeat observations for 526 gravity stations giving a repeat percentage of 5.1%. A fully detailed listing showing all repeats is given in Appendix F.

5.4.2 See the main report for a description of the full statistical analysis of the repeat readings. The full statistics are:

	diff East:	diff North:	diff Hgt:	diff Grav:	diff B An:
N	27	27	27	27	27
Signed differences:					
Mean	-0.02385	+0.00959	+0.00093	-0.00119	-0.00078
Std Deviation	0.020082	0.04577	0.01454	0.02076	0.02063
Absolute differences:					
MEAN	0.02385	0.03107	0.01174	0.01578	0.01544
MEDIAN	0.01700	0.02200	0.01000	0.01500	0.01500
TRMEAN	0.02172	0.02828	0.01112	0.01520	0.01480
STDEV	0.02082	0.03446	0.00832	0.01319	0.01337
SEMEAN	0.00401	0.00663	0.00160	0.00254	0.00257
MAX	0.10100	0.13200	0.03800	0.04600	0.04700
Q1	0.01100	0.00800	0.00600	0.00400	0.00300
Q3	0.03100	0.03800	0.01700	0.02500	0.02300

Histogram of diff East N = 27

Midpoint	Count	
0.00	1	*
0.01	9	*********
0.02	8	********
0.03	4	****
0.04	2	**
0.05	2	**
0.06	0	
0.07	0	
0.08	0	
0.09	0	
0.10	1	*

Histogram of diff North N = 27

Midpoint	Count	
0.00	8	********
0.02	8	********
0.04	7	*******
0.06	1	*
0.08	0	
0.10	1	*
0.12	1	*
0.14	1	*

Histogram of diff Hgt N = 27

Midpoint	Count	
0.000	1	*
0.005	8	********
0.010	9	*********
0.015	4	****
0.020	3	***
0.025	0	
0.030	1	*
0.035	0	
0.040	1	*

Histogram of diff Grav N = 27

Midpoint	Count	
0.000	4	****
0.005	5	*****
0.010	4	****
0.015	3	***
0.020	3	***
0.025	3	***
0.030	2	**
0.035	1	*
0.040	0	
0.045	2	**

Histogram of diff BAn N = 27

Midpoint	Count	
0.000	5	*****
0.005	6	******
0.010	2	**
0.015	3	***
0.020	4	****
0.025	2	**
0.030	2	**
0.035	0	
0.040	2	**
0.045	1	*

5.4.4 Observation values larger than 2 standard deviations from the mean have been admitted since the small mean and standard deviations are well within the criteria set by the tender document of 0.10 m for height and 0.05 mGal for gravity values.

6. DATA AND INFORMATION BEING PRESENTED

6.1 The appendices follow the same lettering as the main report. Some appendices appear only in the main report and therefore some appendix letters are omitted.

6.2 Appendix A gives full descriptions of the area of the survey.

6.3 Appendix B gives full details of the base station established specifically for the survey.

6.4 Appendix E shows the details of the gravity base station used..

6.5 Appendix F comprises all details of the repeat readings including a spreadsheet listing used to calculate means and standard deviations.

6.6 Appendix G is an A3 size contour plots showing Bouguer Anomaly contours and gravity station numbers, elevations and Bouguer gravity anomalies for the survey area. Accompanying the report addendum is the same plot at full size, that is, at a scale of 1:4,000 (deemed appropriate for the size of the survey).

6.7 Appendix I is an A3 size colour image showing Bouguer Anomalies and gravity station positions for the survey area. Accompanying the report addendum is the same colour image at full size, that is, at a scale of 1:4,000 . The colour zoning is specific to this survey.

6.8 Appendix K is an A3 size plot showing gravity station positions, numbers, elevations and Bouguer gravity anomalies for the survey area. Accompanying the report is the same plot at full size, that is, at a scale of 1:4,000.

6.12 Accompanying the report and contained on an MSDOS compatible floppy disk (numbered in sequence with the disks forwarded with the main report) are the following computer files:

> Disk 5: Data specified at paragraphs 2.3.2 and 2.3.3 in the tender document for the Peculiar Knob survey area. The data is located in a sub directory name PECKNOB, in files called DMEGRAV.DAT and DMEGRAV.RPT respectively. In addition the subdirectory also contains a file of all position and gravity calculation results associated with each observation, called ALLGEO.XYZ , a comparison of repeat observations in a file called RPT.REP and a copy of the digital grid generated for the survey area in a file called ALLAMG.GXF.

7. Report Details

7.1 This report was written by NR Bullen for Haines Surveys. See the main report for further details.

NR Bullen
22 August, 1996

Appendix A Peculiar Knob Survey Area Description

The following descriptions use the assigned line numbers and station identifiers. to define the gravity station. The totals shown are for specified points actually observed.

Line Identifier	Chainage	Start	Finish	Points
9200		9500	10700	42
9300		10000	10500	2
9400		10000	10500	2
9500		9500	10500	3
9600		9500	10500	3
9700		9500	10500	19
9800		9500	10500	3
9900		9300	10700	43
10000		9700	10125	18
10100		9300	10700	43
10200		9700	10150	19
10300		9050	10700	53
10400		9050	10700	53
10500		8825	10700	63
10600		9050	10700	53
10800		9050	10700	53
11000		9050	10700	53

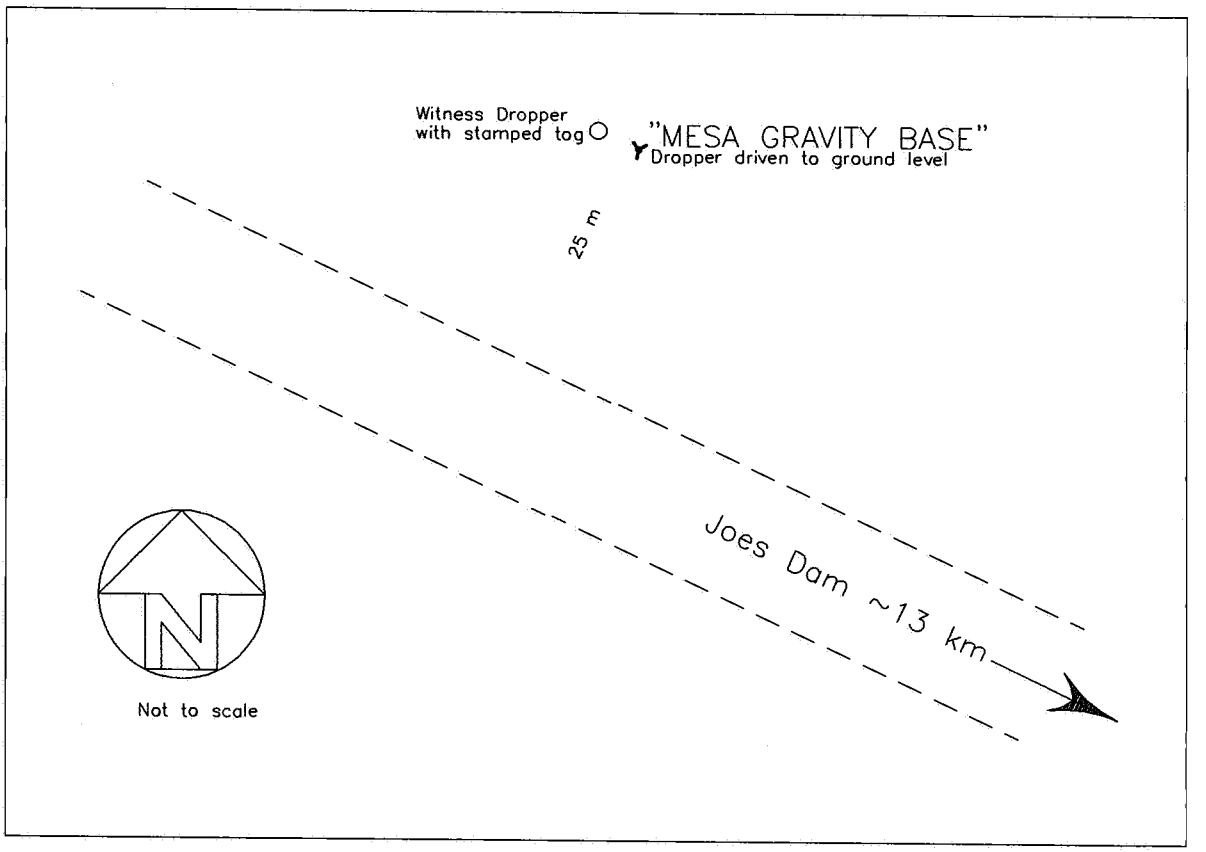
Number of points: 526
Number of lines: 18

PECULIAR KNOB GRAVITY BASE

Recommended Horizontal Class: A
Recommended Vertical Class: C

Recommended Horizontal Order: 3
Recommended Vertical Order: 3

WGS84 :	S29 3518.57130 E135 2303.19604	184.449
-	WGS84 N Value:	4.280
	AHD (Geoidal) Height =	180.169
AGD84	S29 35 23.78603 E135 22 58.42681	180.169
AMG84	A53 537080.622 6726578.623	180.169



Appendix E Gravity Adjustment Input and Output Files

1. Gravity Base Station Control details (following is the control files used in Program GRAVCORR):

1.2 Note: Only one gravity meter used.

Gravity Base at BASE 7 PERCULIAR KNOB
#base reading
4121.62
#base latitude
-29.589
#base longitude
135.3829
#base x-co ordinate
537080.622
base y-co ordinate
6726578.623
#date of reading
17-07-96
#time of reading
14:48:00
#base elevation
180.169
#grid offset angle from magnetic north (+ve clockwise)
0
MESA Station Name
5611.0017 JOES DAM
Observed gravity at BMR station
979282.45
Meter Reading at BMR station
4115.65

Appendix F Peculiar Knob Repeat Observation Details

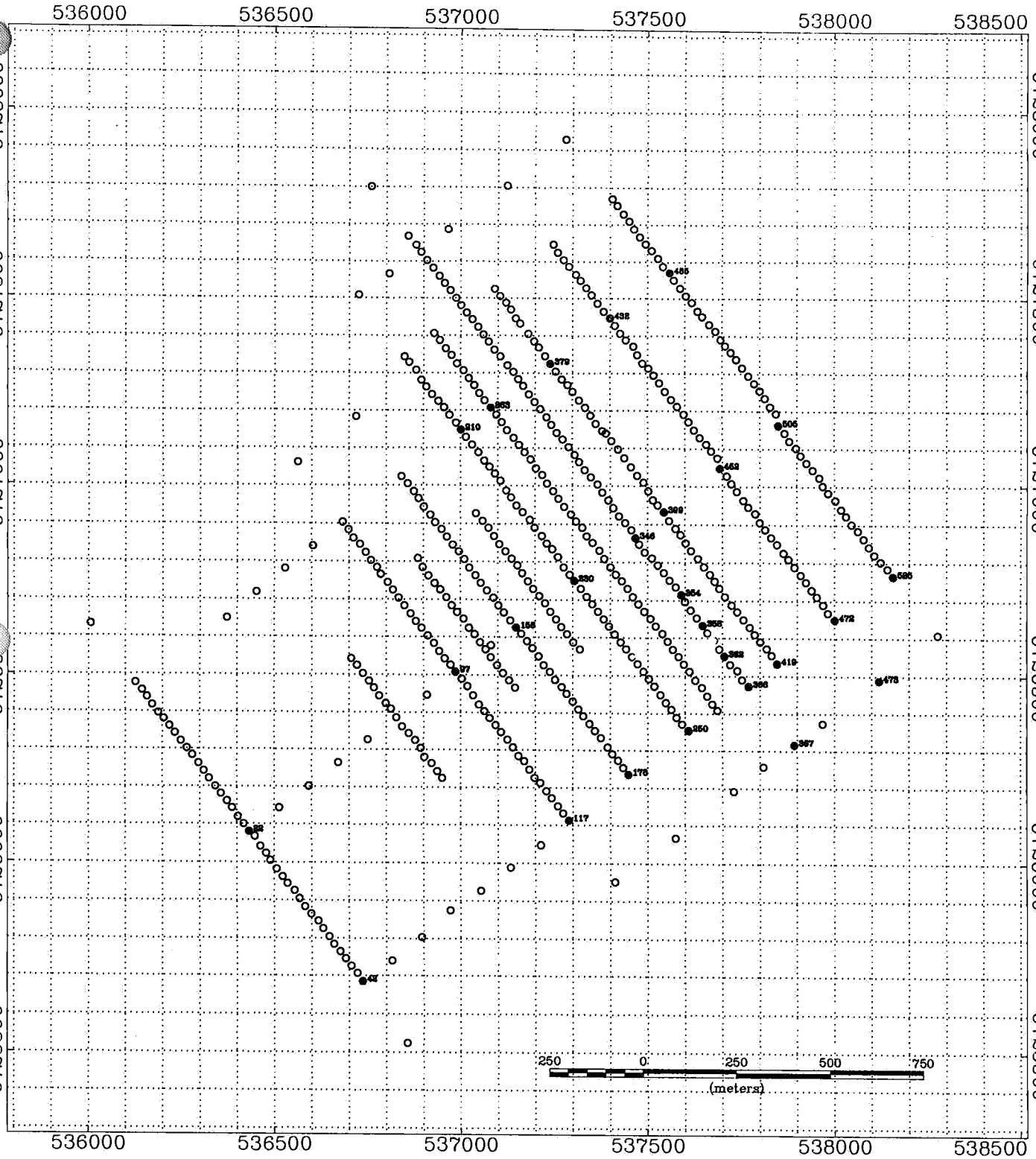
0022	536432.657	6726079.839	180.347	979286.901	30.082
	536432.662	6726079.827	180.341	979286.899	30.081
	-0.005	0.012	0.006	0.002	0.001
0042	536736.349	6725685.023	184.293	979282.218	25.900
	536736.361	6725685.031	184.275	979282.239	25.918
	-0.012	-0.008	0.018	-0.021	-0.018
0097	536985.960	6726507.921	180.309	979288.178	31.652
	536985.982	6726507.986	180.301	979288.178	31.653
	-0.022	-0.065	0.008	0.000	-0.001
0117	537289.286	6726112.328	181.230	979282.229	25.609
	537289.286	6726112.331	181.219	979282.239	25.617
	0.000	-0.003	0.011	-0.010	-0.008
0158	537148.274	6726626.219	179.838	979288.175	31.644
	537148.304	6726626.170	179.855	979288.178	31.644
	-0.030	0.049	-0.017	-0.003	0.000
0178	537448.113	6726235.817	180.124	979282.783	26.032
	537448.125	6726235.828	180.093	979282.828	26.072
	-0.012	-0.011	0.031	-0.045	-0.040
0210	537000.801	6727147.309	174.493	979288.966	31.745
	537000.843	6727147.287	174.479	979288.957	31.736
	-0.042	0.022	0.014	0.009	0.009
0230	537304.429	6726750.223	178.947	979286.640	30.018
	537304.446	6726750.207	178.965	979286.630	30.011
	-0.017	0.016	-0.018	0.010	0.007
0250	537609.277	6726354.259	179.054	979282.802	25.925
	537609.328	6726354.221	179.074	979282.818	25.945
	-0.051	0.038	-0.020	-0.016	-0.020
0263	537080.307	6727206.946	174.753	979288.692	31.564
	537080.317	6727206.934	174.745	979288.677	31.549
	-0.010	0.012	0.008	0.015	0.015
0346	537467.751	6726863.839	178.160	979286.085	29.391
	537467.766	6726863.862	178.172	979286.095	29.398
	-0.015	-0.023	-0.012	-0.010	-0.007
0354	537589.680	6726714.255	178.392	979284.050	27.296
	537589.711	6726714.263	178.404	979284.075	27.319
	-0.031	-0.008	-0.012	-0.025	-0.023
0358	537646.797	6726633.740	178.554	979283.562	26.782
	537646.898	6726633.706	178.553	979283.565	26.785
	-0.101	0.034	0.001	-0.003	-0.003
0362	537704.710	6726552.301	178.188	979283.165	26.254
	537704.729	6726552.304	178.181	979283.165	26.256
	-0.019	-0.003	0.007	0.000	-0.002

0366	537769.727	6726473.665	178.039	979282.749	25.755
	537769.759	6726473.668	178.026	979282.734	25.739
	-0.032	-0.003	0.013	0.015	0.016
0367	537891.855	6726316.628	177.795	979281.830	24.676
	537891.869	6726316.632	177.778	979281.823	24.673
	-0.014	-0.004	0.017	0.007	0.003
0379	537239.974	6727325.490	175.504	979288.306	31.408
	537239.993	6727325.520	175.500	979288.336	31.439
	-0.019	-0.030	0.004	-0.030	-0.031
0399	537543.769	6726932.402	177.746	979285.520	28.790
	537543.813	6726932.367	177.749	979285.520	28.789
	-0.044	0.035	-0.003	0.000	0.001
0399	537543.813	6726932.367	177.749	979285.520	28.790
	537543.820	6726932.357	177.759	979285.525	28.797
	-0.007	0.010	-0.010	-0.005	-0.007
0419	537845.691	6726532.901	177.360	979282.980	25.895
	537845.712	6726532.854	177.352	979282.934	25.848
	-0.021	0.047	0.008	0.046	0.047
0432	537399.300	6727447.286	175.810	979288.153	31.402
	537399.317	6727447.169	175.805	979288.186	31.434
	-0.017	0.117	0.005	-0.033	-0.032
0452	537694.102	6727047.491	176.889	979285.010	28.193
	537694.109	6727047.623	176.896	979284.985	28.167
	-0.007	-0.132	-0.007	0.025	0.026
0472	537999.968	6726650.100	175.890	979283.143	25.851
	537999.976	6726650.072	175.894	979283.124	25.833
	-0.008	0.028	-0.004	0.019	0.018
0473	538119.865	6726489.557	175.350	979282.652	25.140
	538119.892	6726489.557	175.340	979282.634	25.123
	-0.027	0.000	0.010	0.018	0.017
0485	537559.128	6727570.296	175.292	979288.542	31.775
	537559.139	6727570.295	175.282	979288.566	31.797
	-0.011	0.001	0.010	-0.024	-0.022
0505	537849.905	6727162.615	176.355	979284.500	27.665
	537849.959	6727162.525	176.393	979284.469	27.627
	-0.054	0.090	-0.038	0.031	0.038
0525	538157.083	6726764.556	173.812	979283.680	26.060
	538157.099	6726764.518	173.817	979283.684	26.065
	-0.016	0.038	-0.005	-0.004	-0.005

4. Spreadsheet calculation of means and standard deviations of repeat differences:

Area/Pt Id	diff East	diff North	diff Hgt	diff Grav	diff B An	Absolute diff East	Absolute diff North	Absolute diff Hgt	Absolute diff Grav	Absolute diff B An
22	-0.005	0.012	0.006	0.002	0.001	0.005	0.012	0.006	0.002	0.001
42	-0.012	-0.008	0.018	-0.021	-0.018	0.012	0.008	0.018	0.021	0.018
97	-0.022	-0.065	0.008	0.000	-0.001	0.022	0.065	0.008	0.000	0.001
117	0.000	-0.003	0.011	-0.010	-0.008	0.000	0.003	0.011	0.010	0.008
158	-0.030	0.049	-0.017	-0.003	0.000	0.030	0.049	0.017	0.003	0.000
178	-0.012	-0.011	0.031	-0.045	-0.040	0.012	0.011	0.031	0.045	0.040
210	-0.042	0.022	0.014	0.009	0.009	0.042	0.022	0.014	0.009	0.009
230	-0.017	0.016	-0.018	0.010	0.007	0.017	0.016	0.018	0.010	0.007
250	-0.051	0.038	-0.020	-0.016	-0.020	0.051	0.038	0.020	0.016	0.020
263	-0.010	0.012	0.008	0.015	0.015	0.010	0.012	0.008	0.015	0.015
346	-0.015	-0.023	-0.012	-0.010	-0.007	0.015	0.023	0.012	0.010	0.007
354	-0.031	-0.008	-0.012	-0.025	-0.023	0.031	0.008	0.012	0.025	0.023
358	-0.101	0.034	0.001	-0.003	-0.003	0.101	0.034	0.001	0.003	0.003
362	-0.019	-0.003	0.007	0.000	-0.002	0.019	0.003	0.007	0.000	0.002
366	-0.032	-0.003	0.013	0.015	0.016	0.032	0.003	0.013	0.015	0.016
367	-0.014	-0.004	0.017	0.007	0.003	0.014	0.004	0.017	0.007	0.003
379	-0.019	-0.030	0.004	-0.030	-0.031	0.019	0.030	0.004	0.030	0.031
399	-0.044	0.035	-0.003	0.000	0.001	0.044	0.035	0.003	0.000	0.001
399	-0.007	0.010	-0.010	-0.005	-0.007	0.007	0.010	0.010	0.005	0.007
419	-0.021	0.047	0.008	0.046	0.047	0.021	0.047	0.008	0.046	0.047
432	-0.017	0.117	0.005	-0.033	-0.032	0.017	0.117	0.005	0.033	0.032
452	-0.007	-0.132	-0.007	0.025	0.026	0.007	0.132	0.007	0.025	0.026
472	-0.008	0.028	-0.004	0.019	0.018	0.008	0.028	0.004	0.019	0.018
473	-0.027	0.000	0.010	0.018	0.017	0.027	0.000	0.010	0.018	0.017
485	-0.011	0.001	0.010	-0.024	-0.022	0.011	0.001	0.010	0.024	0.022
505	-0.054	0.090	-0.038	0.031	0.038	0.054	0.090	0.038	0.031	0.038
525	-0.016	0.038	-0.005	-0.004	-0.005	0.016	0.038	0.005	0.004	0.005
Mean	-0.02385	0.00959	0.00093	-0.00119	-0.00078	0.02385	0.03107	0.01174	0.01578	0.01544
Std Dev	0.02082	0.04577	0.01454	0.02076	0.02063	0.02082	0.03446	0.00832	0.01319	0.01337

PECULIAR KNOB AREA



PECULIAR KNOB REPEAT STATIONS

HAINES SURVEYS PTY LTD

Field work completed 23 July 96.

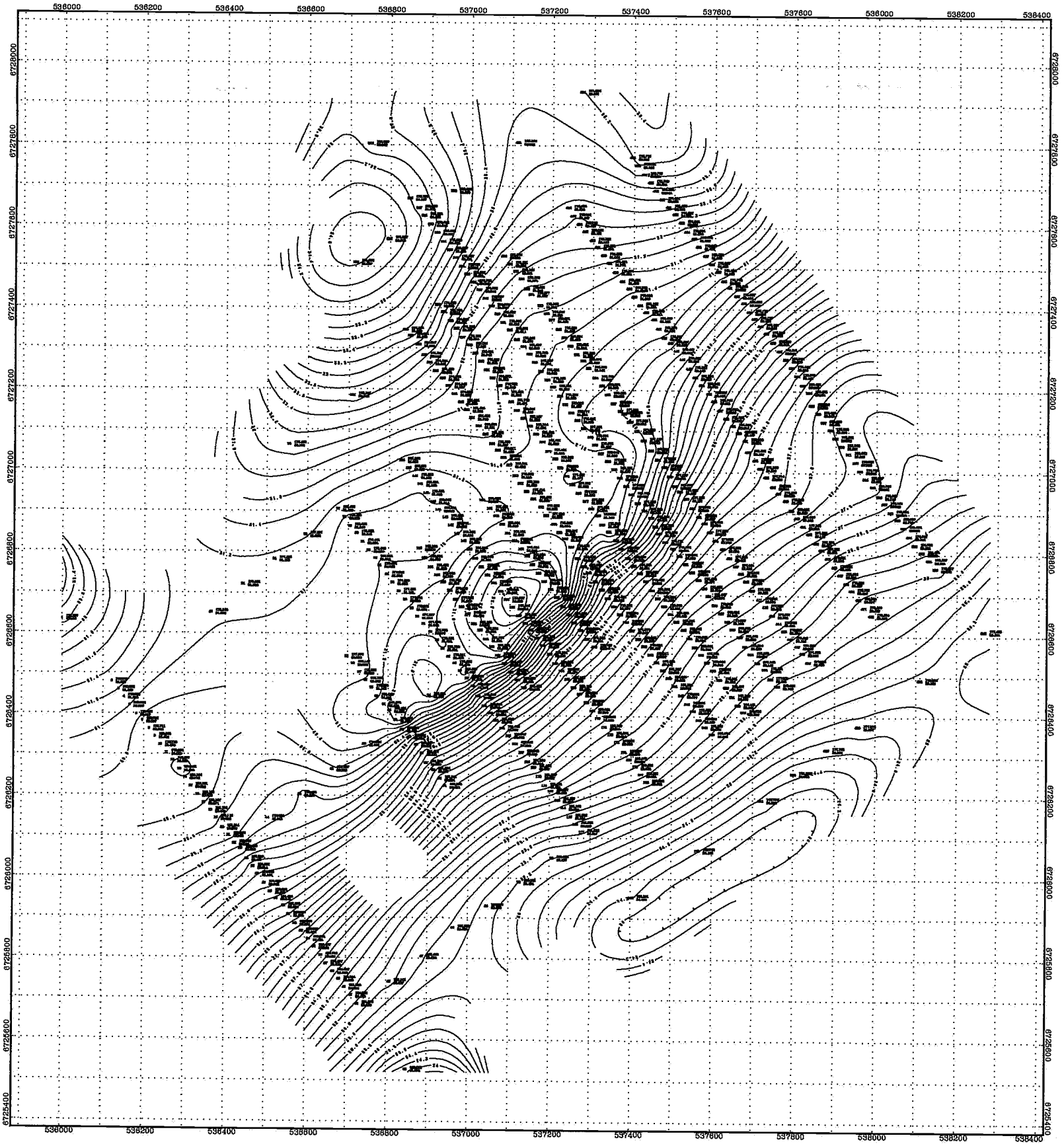
Appendix G: Bouguer Anomaly Contour Plot with Gravity Station Numbers, Elevations and Bouguer Anomaly Values

(Representing 1:4,000 scale plot)

SASE Gravity Survey

PECULIAR KNOB AREA
(Part Billa Kalina 1:250,000, PART BALTA 1:50,000)

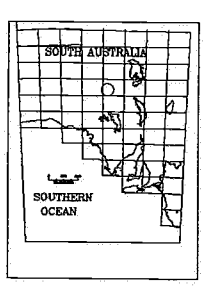
SOUTH AUSTRALIAN EXPLORATION INITIATIVE

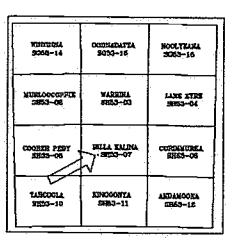


DATA ACQUISITION AND PROCESSING CONTRACTOR:
HAINES SURVEYS PTY LTD
PO Box 196 ALDGATE SA 5154 Ph (08) 370 8779 Fax (08) 370 8758

Field work completed 23 July 98.

Position information from post processed kinematic GPS observations.
Gravity data observed using Scintrex CG3 Autograv Gravity Meters and processed with program GRAVCORR using a rock density of 2.67 g/cc.
Colour image and all mapping detail produced using Geosoft Mapping and Processing System.
Contours and colour images were produced using a grid mesh size of 25m.





REFERENCE TO AUSTRALIA 1:250 000
MAP SERIES

SASE GRAVITY SURVEY – PECULIAR KNOB

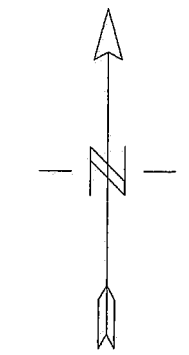
BOUGUER ANOMALY CONTOURS WITH IDENTIFIERS, ELEVATIONS & BOUGUER VALUES

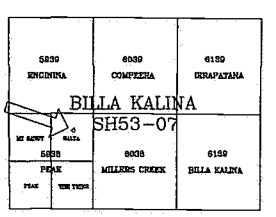
Contour interval: 0.2 mGals

100 0 100 200 300 400
(metres)

Universal Transverse Mercator Projection
Australian Map Grid Zone 53

SOUTH AUSTRALIAN
DEPARTMENT OF MINES AND ENERGY





REFERENCE TO AUSTRALIA 1:100 000
& 1:50 000 MAP SERIES

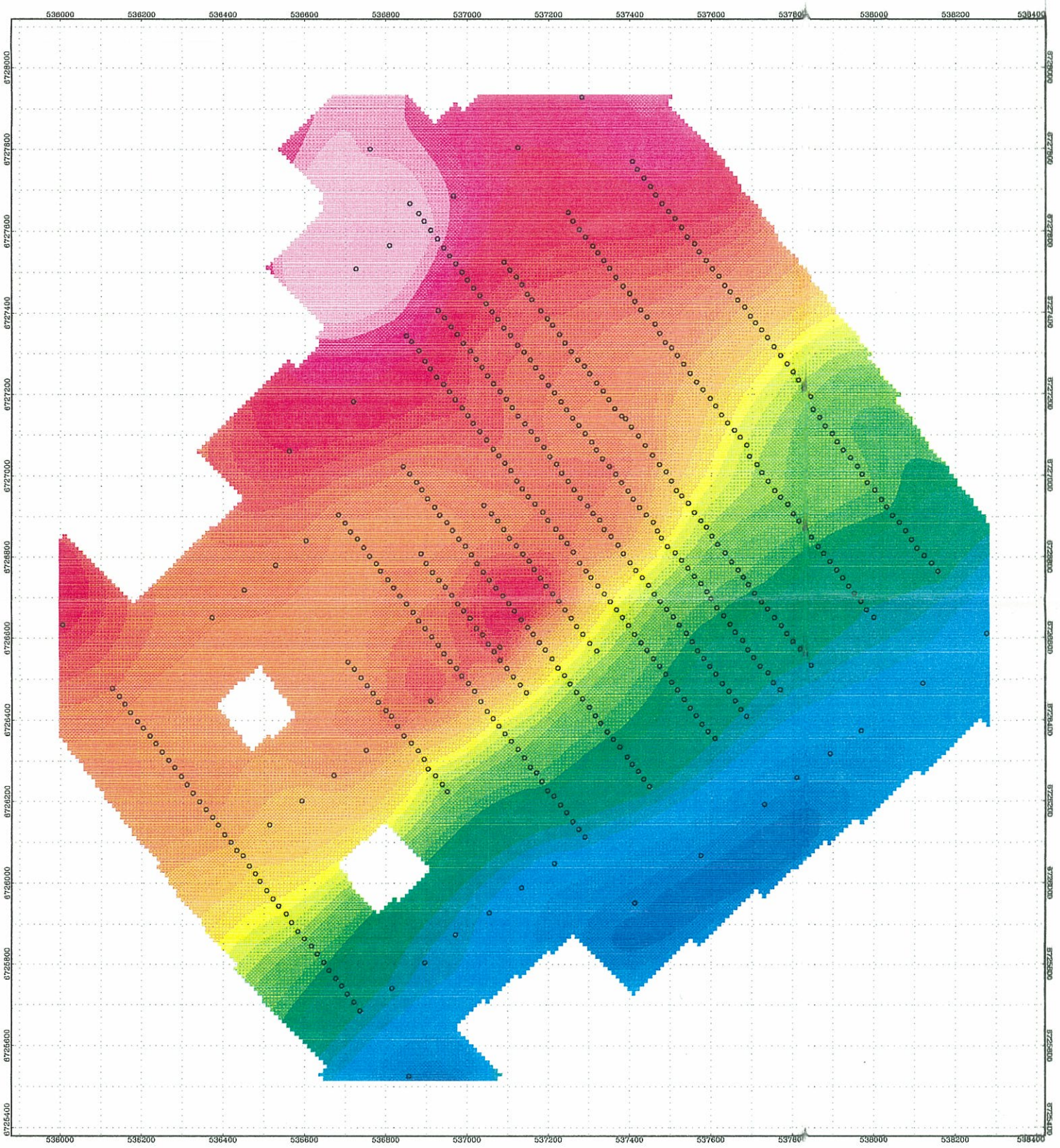
Appendix I: Bouguer Anomaly Colour Image with Gravity Station Positions

(Representing 1:4,000 scale plot)

SASE Gravity Survey

PECULIAR KNOB AREA
(Part Billa Kalina 1:250,000, PART BALTA 1:50,000)

SOUTH AUSTRALIAN EXPLORATION INITIATIVE



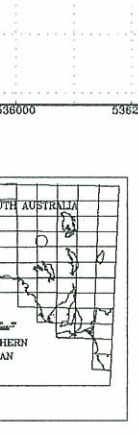
DATA ACQUISITION AND PROCESSING CONTRACTOR:
HAINES SURVEYS PTY LTD
PO Box 198 ALDGATE SA 5154 Ph (08) 370 8778 Fax (08) 370 8788

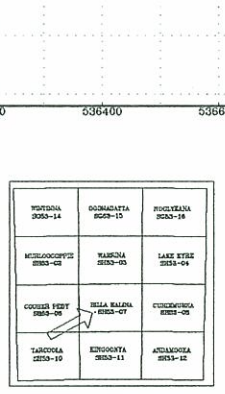
Field work completed 23 July 96.

Position information from post processed kinematic GPS observations.
Gravity data observed using Scintrex CG3 Autogiro Gravity Meters and processed with Integram GRAVSOFT using a rock density of 2.67 g/cc.
Colour image and all mapping detail produced using Geosoft Mapping and Processing System.
Contours and colour images were produced using a grid mesh size of 55m.

33.95
33.78
33.43
33.16
32.89
32.62
32.35
32.09
31.82
31.56
31.28
31.01
30.74
30.48
30.21
29.94
29.67
29.40
29.13
28.87
28.60
28.33
28.06
27.79
27.52
27.26
26.99
26.72
26.45
26.18
25.91
25.65
25.38
25.11
24.84
24.57
24.30
24.04
23.77
23.50

BOUGUER ANOMALY (mGals)
Rock Density: 2.67 g/cc





REFERENCE TO AUSTRALIA 1:250 000
MAP SERIES

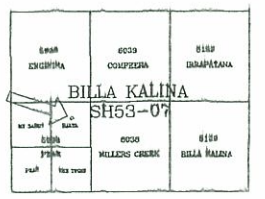
SASE GRAVITY SURVEY – PECULIAR KNOB

BOUGUER ANOMALY COLOUR IMAGE WITH STATION POSITIONS

100 0 100 200 300 400
(metres)

Universal Transverse Mercator Projection
Australian Map Grid Zone 53

SOUTH AUSTRALIAN
DEPARTMENT OF MINES AND ENERGY



REFERENCE TO AUSTRALIA 1:100 000
& 1:50 000 MAP SERIES

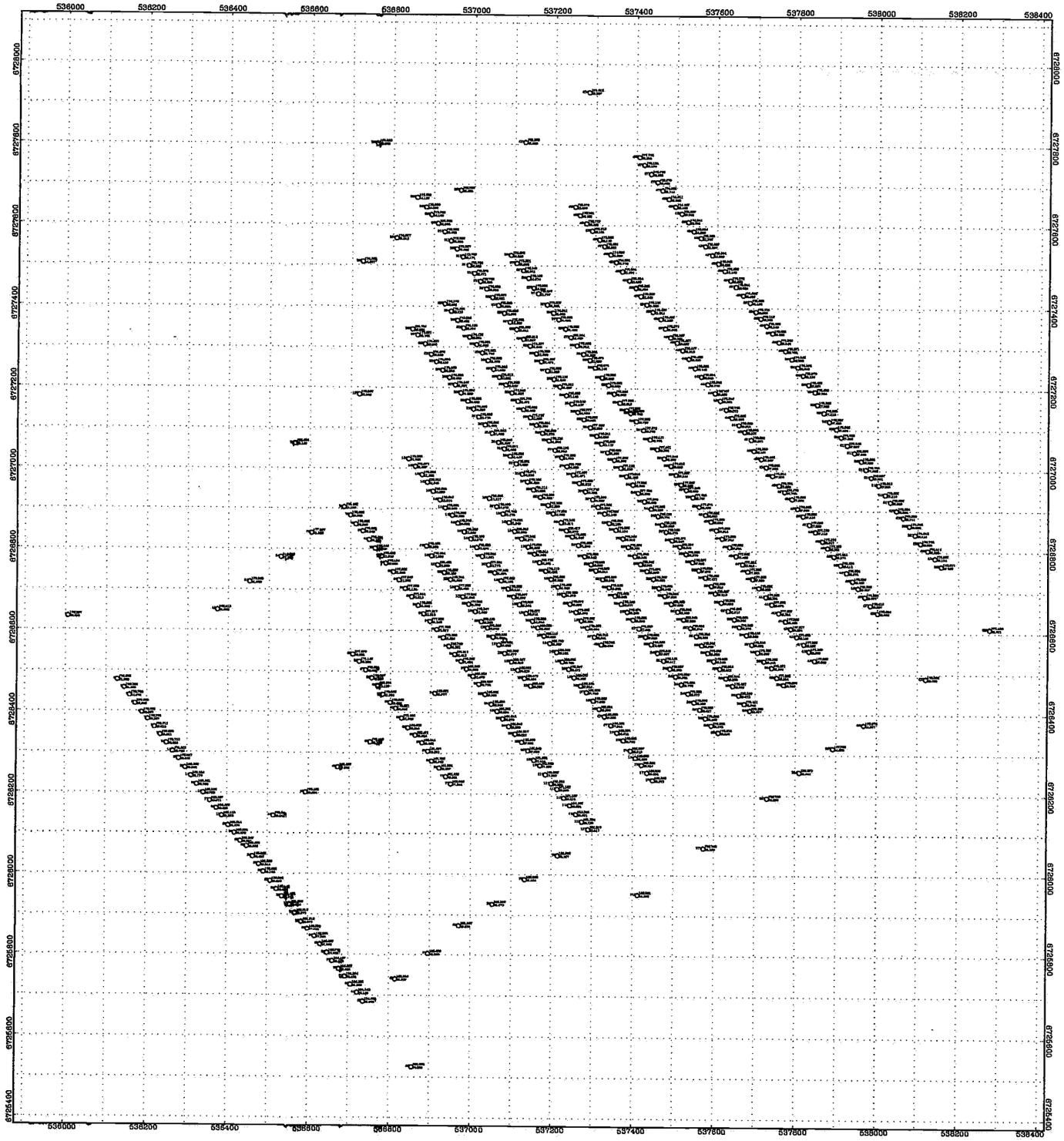
Appendix K: Data Plot Showing Gravity Station Positions, Station Numbers, Elevations and Bouguer Anomaly Values

(Representing 1:4,000 scale plot)

SASE Gravity Survey

PECULIAR KNOB AREA
(Part Billa Kalina 1:250,000, PART BALTA 1:50,000)

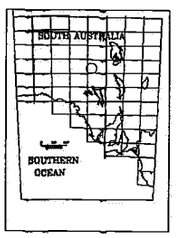
SOUTH AUSTRALIAN EXPLORATION INITIATIVE

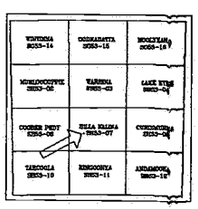


DATA ACQUISITION AND PROCESSING CONTRACTOR:
HAINES SURVEYS PTY LTD
PO Box 186 ALDGATE SA 5154 Ph (08) 370 8770 Fax (08) 370 8758

Field work completed 23 July 98.

Position information from post processed kinematic GPS observations.
Gravity data observed using Scintrex CG3 Autograv Gravity Meters and processed with program GRAVCOR using a rock density of 2.67 g/cc.
Colour image and all mapping detail produced using Geosoft Mapping and Processing System.
Contours and colour images were produced using a grid mesh size of 25m.





REFERENCE TO AUSTRALIA 1:250 000
MAP SERIES

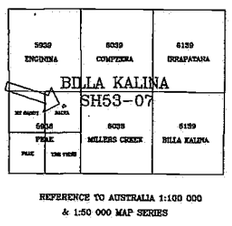
SASE GRAVITY SURVEY – PECULIAR KNOB

STATION POSITIONS WITH IDENTIFIERS, ELEVATIONS AND BOUGUER ANOMALIES

100 0 100 200 300 400
(metres)

Universal Transverse Mercator Projection
Australian Map Grid Zone 53

SOUTH AUSTRALIAN
DEPARTMENT OF MINES AND ENERGY



REFERENCE TO AUSTRALIA 1:100 000
& 1:50 000 MAP SERIES

APPENDIX 2

PETROLOGICAL REPORT

Pontifex & Associates Pty. Ltd.

TELEPHONE (08) 332 6744
FAX (08) 332 5062

26 KENSINGTON ROAD, ROSE PARK
SOUTH AUSTRALIA 5067
A.C.N. 007 521 084

P.O. BOX 91, KENT TOWN
SOUTH AUSTRALIA 5071

MINERALOGICAL REPORT NO. 7053

by I.R. Pontifex MSc. and A.C. Purvis, PhD

February 20, 1996

TO :

The Director
Mines and Energy of S.A.
191 Greenhill Rd
EASTWOOD SA 5063

Attention : Ms Joanne Hough

YOUR REFERENCE :

EX2319
58GR2/ A06/ 9K1

MATERIAL :

Drill Core, Peculiar Knob Prospect

IDENTIFICATION :

164674 to 164695

WORK REQUESTED :

Various thin section and polished thin section preparation, petrographic/mineragraphic descriptions and report, with comments as specified, and photomicrographs

SAMPLES & SECTIONS :

Returned to you with this report.

PONTIFEX & ASSOCIATES PTY. LTD.

SUMMARY COMMENTS

This report discusses twenty two samples of core from three drill-holes in the Peculiar Knob prospect in the Mount Woods area of the Gawler Craton in South Australia. These samples were made into twelve polished thin sections and ten normal thin sections. The drill-holes are PK-DDH-1 to 3, with samples as follows:

Drill Hole PK-DDH-1

No	Depth	Section	Lithology	Oxide(s)	vol%
164674	28.6-28.7	PTS	Massive hematite	hematite	75%
164675	29.8-29.9	TS	Quartzite		
164676	35.2-35.3	TS	Stressed granitoid or metasediment	opaque oxide	20-25%
164677	38.2-38.3	TS	Biotite granodiorite	magnetite	3%
164678	40.1-40.2	PTS	Quartz-hematite-(mica-carbonate) rock	martite, porous	50%
164679	54.2-54.3	PTS	Massive hematite	hematite martite	90% 2-3%
164680	82.4-82.5	PTS	Banded quartz-hematite passing into massive hematite	hematite	35% to 85%
164681	98.2-98.3	PTS	Hematite-plagioclase-quartz-chlorite rock with traces of monazite and apatite	hematite	30-35%
164682	116.7-116.8	TS	Quartz-microcline-sillimanite gneiss (metasediment) with a microcline-quartz-hematite lens	hematite (in the host rock)	7-10%-

Drill-Hole PK-DDH-2

No.	Depth	Section	Lithology	Oxide(s)	vol%
164683	33.9-34.0	PTS	Banded quartz-rich banded iron formation passing into more massive hematite	hematite earthy hematite	35% to 65% minor
164684	41.4-41.5	PTS	Massive hematite	hematite	99%
164685	55.1-55.2	TS	Granodiorite	opaque oxide	<1%
164686	58.4-58.5	TS	Granitoid		
164687	6626	TS	Granitoid		
164688	70.6	PTS	Hematite quartzite	hematite	30%
164689	96.5	TS	Sillimanite-orthoclase-hematite-quartz hornfels or gneiss, minor biotite and apatite (metapelite).	hematite	25%

Drill-hole PK-DDH-3

No.	Depth	Section	Lithology	Oxide(s)	vol%
164690	27.35-27.4	TS	Superficial sandstone with pebbles of hematite 'ore', also carbonate and gypsum	hematite	
164691	30.4-30.5	PTS	Mesobanded banded iron formation with hematite and martite + magnetite, biotite	hematite martite + magnetite	20-25%* 25-30%*
164692	54.3-54.4	PTS	Massive oxides: polygonal hematite and martite + magnetite, trace quartz	hematite magnetite martite	75% 20% 5%
164693	75.6-75.7	PTS	Lenticular-layered banded iron formation, some clays	hematite martite magnetite	40% 25-30% 3%
164694	81.8-81.9	PTS	Microbanded banded iron formation	hematite martite	45% 5%
164695	142.2	TS	Clinopyroxene-albite-?scapolite-clay-carbonate rock (?skarn).		

LITHOLOGICAL GROUPS

The samples include some granitoids as well as pelitic to calcareous metasediments, plus quartz-rich to opaque oxide-rich rocks which are the main subject of this report.

Granitoids

In drill-hole PK-DDH-1 there is definite to possible granodiorite in the interval from 35 to 40 m, with a possibly sheared facies at 35.2 m, apparently enriched in oxides. In drill-hole PK-DDH-2, there are three samples of a porphyritic fine-grained granitoid from 55 to 63 m. These samples are similar, but the proportions of original plagioclase to alkali felspar are commonly obscured by alteration and exsolution.

Metasediments other than banded iron formations

Metasediments other than quartz to oxide-rich samples include quartzite (PK-DDH-1, 29.8 m), quartz-microcline-sillimanite gneiss in the same drill-hole at 116.7 m, sillimanite-orthoclase-hematite-quartz hornfels or gneiss in PK-DDH-2 at 96.5 m, and a clinopyroxene-albite-?scapolite rock with clays and carbonate in PK-DDH-3 at 142.2 m. The quartzite and the high-grade metapelites are to some extent similar to Warrow Quartzite on the one hand and to pelitic schists, also in the Hutchison Group, on the other. In contrast, the clinopyroxene-albite rock is more similar to lithologies in the Doora Schist. This sample also seems to represent a lower metamorphic grade than that seen in the pelitic rocks in this batch (upper amphibolite facies) and it is possible that an unconformable or tectonic contact exists in this area between possible Hutchison Group equivalents and possible Doora Schist equivalents. However there are calcareous to dolomitic rocks within the Hutchison Group (e.g. Katunga Dolomite). An oxide-rich felspathic lithology (PK-DDH-1, 98.2 m) is of uncertain origin, however.

Banded iron formations and hematite ± martite rocks

The iron-rich samples include some which may be classified as normal banded iron formation in terms of the relative proportions of quartz and opaque oxide. These are commonly rich in apparently primary (metamorphic) hematite, but locally contain some martite to earthy hematite apparently after metamorphic magnetite. There are also samples which appear to have experienced iron-enrichment and a depletion in quartz, either throughout or within specific layers or lenses. There are three types of enriched sample:

- Samples composed essentially of a coarse mosaic of well-twinned metamorphic hematite with no residual magnetite and minor to rare quartz (164674, 79, 83 [part], 84).

- Samples with some residual magnetite, suggesting that there was a magnetite mosaic prior to the present hematite-dominated mosaic, which has been largely replaced by prograde metamorphic hematite as in the previous type. Some of the remaining magnetite in these rocks has been replaced at a later stage by compact massive martite (164691).

- Samples which, at the peak of metamorphism, seem to have been composed of a mosaic with some prograde metamorphic magnetite coexisting with a coarse hematite mosaic. In these samples the magnetite has been partly to completely replaced by partly porous to earthy martite ± limonite, apparently of relatively low temperature origin (164678, 91. 92, 93, 94). These samples are largely in PK-DDH-3, but their mineralogy may affect the metallurgical properties of the ore.

INTERPRETATION

The iron-rich samples appear to reflect iron-enrichment processes, some of which may have preceded or accompanied relatively high-grade metamorphism (confirmed by the coexistence of sillimanite and orthoclase or microcline in pelitic rocks in this batch), some of which have taken place at low temperatures. The main process seems to have been a removal of silica and a concentration of remaining iron within certain layers and lenses, possibly due to low-temperature hydrothermal reactions during burial metamorphism, as suggested for some iron-ore deposits in the Hamersley Basin. The ores of the Hamersley Basin show only low-grade (zeolite to greenschist facies) metamorphism however, contrasting with the probably high amphibolite facies seen in the pelitic rocks in this suite.

There seems to have been a lesser degree of iron enrichment seen in some of the rocks other than banded iron formations, such as the sheared possible granitoid in PK-DDH-1 (164676), in a plagioclase-rich lithology (164681) and a pelite (164682) in the same drill-hole, and also in the pelite in PK-DDH-2 (164689). These enrichments may also be of a hydrothermal-metamorphic origin, but have lower opaque oxide contents than the massive hematite ± martite-rich samples discussed above.

INDIVIDUAL DESCRIPTIONS

164674
PK-DDH-1, 28.6-28.7 m

Massive to weakly layered, coarse granuloblastic hematite rock (BIF) incorporating minor scattered finer quartz. Also a band of microspherulitic limonite with scattered ?residual quartz grains.

The essential mineralogical composition of this sample is:

*	hematite, coarse polygonal-granular, forming a weakly layered to massive aggregate	~75%
*	quartz, fine granular, more or less interstitial	15-20%
*	microspherulitic limonite, localised band	7%
*	'grains' of microporous 'limonite' (?oxidised carbonate)	1-2%

The hematite crystals/grains range in size from 0.1 to (rarely) 1mm, average about 0.5mm; they have a more or less polygonal morphology, so that the aggregate they form may be regarded as granuloblastic, and a typically high grade metamorphic texture.

The quartz grains are smaller, average size about 0.8mm, scattered as individuals and small clusters, more or less interstitial to the hematite mosaic, but locally in discontinuous patches or lenses <1mm along the layering.

The band of microspherulitic limonite, minimum thickness 8mm, appears to be supergene (but not pseudomorphing the hematite). This incorporates loosely clustered quartz grains which tend to be angular, broken, and have a residual to "detrital" mode of occurrence. [Is this oxidation along a fissure cutting through the hematite?]

Accessory poorly developed "porosity" in the hematite aggregate consists of small (0.1mm) 'grains' of microporous limonitic (± clay) which may be oxidised carbonate or oxidised magnetite as seen in several samples described below.

Fig 1 **164674** 0.21 mm

Polished section (PS). Relatively low magnification, shows typical massive aggregate of metamorphic polygonal hematite, with minor scattered smaller crystals/grains of quartz.

164675 **PK-DDH-1, 29.8-29.9 m**	**Massive, coarse quartzite, minor microcline, muscovite, opaque oxides (hematite), also clays (partly after plagioclase). Has some similarity to Warrow Quartzite.**

At least 80% of this section consists of a massive aggregate of very irregular quartz grains to 10 mm in size, with a texture indicating exaggerated grain growth during metamorphism. This quartz commonly shows undulose extinction and sutured grain boundaries.

Minor components are fairly evenly scattered as isolated grains and lenses to 3 mm long, and consist of muscovite, microcline, fresh to oxidised opaque oxides, also chloritic clays, and sericitic clays partly after plagioclase. The opaque oxide grains are identified under binocular microspore as hematite.

The essential composition and fabric of this sample shows some similarities with Warrow Quartzite in the Hutchison Group, apart from the presence of opaque oxides and a lack of zircon.

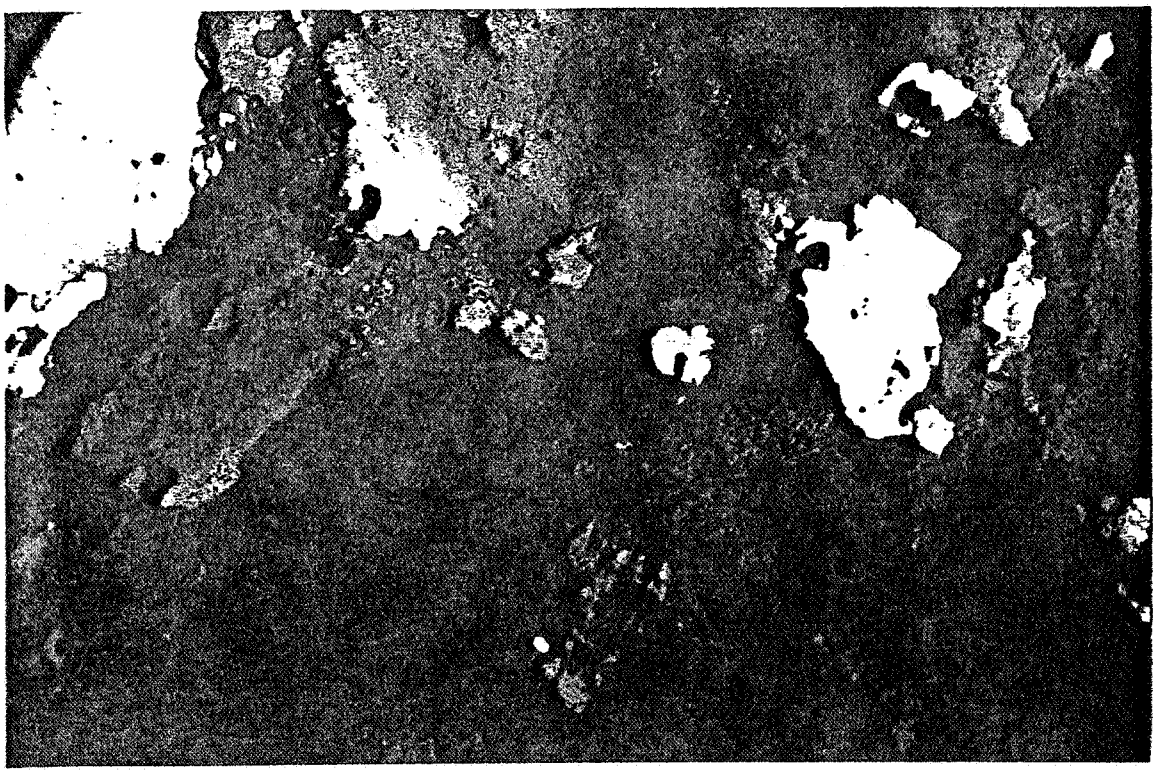


Fig 2 **164675** 0.32 mm

Thin section (TS). Typical quite coarse metamorphic mosaic of quartz showing exaggerated grain growth. Minor interstitial minerals are small patches of yellowish cryptocrystalline clays; black-opaque-hematite, (coloured) muscovite and a microcline lower centre.

164676
PK-DDH-1, 35.2-35.3 m

Massive to weakly layered quartz-microcline, deformed gneissic granitoid (or possible granite-derived), metasediment. Wide-spread oxidised carbonate rhombs interstitial; also minor "patches" of sericite ± biotite chloritic-clay, leucoxene, trace ?zircon. The permeating oxidised carbonate probably supergene.

This rock consists of a massive to weakly layered loose packed and rather poorly sorted aggregate of essential quartz and microcline in subequal abundance (each about 30%), 0.3 to 2mm in size. The coarser quartz grains are irregular and quite strongly deformed.

This aggregate incorporates patches of "sericite" (7%) to 4mm, some enclosing small biotite books, and all with similar orientation along a weak foliation. These patches may be after plagioclase (?or lithic fragments). Locally this 'sericite' merges or becomes a chloritic-clay component with minor associated leucoxene > ?zircon.

This silicate mineral aggregate may be a metamorphosed quartzofelspathic sediment or possibly a stressed inequigranular gneissic granitoid, which may compare with 164677

Fine opaque oxide-rich crystals (20-25%) some with a decussate micro-platy to elongated-rhombic morphology and some + leucoxene, are widespread, intergranular. In transmitted light (and better in reflected light), these crystals are interpreted as pre-existing carbonate rhombs, possibly supergene, which permeated the rock matrix and have since been oxidised to hematite, partly ochreous and partly limonitic.

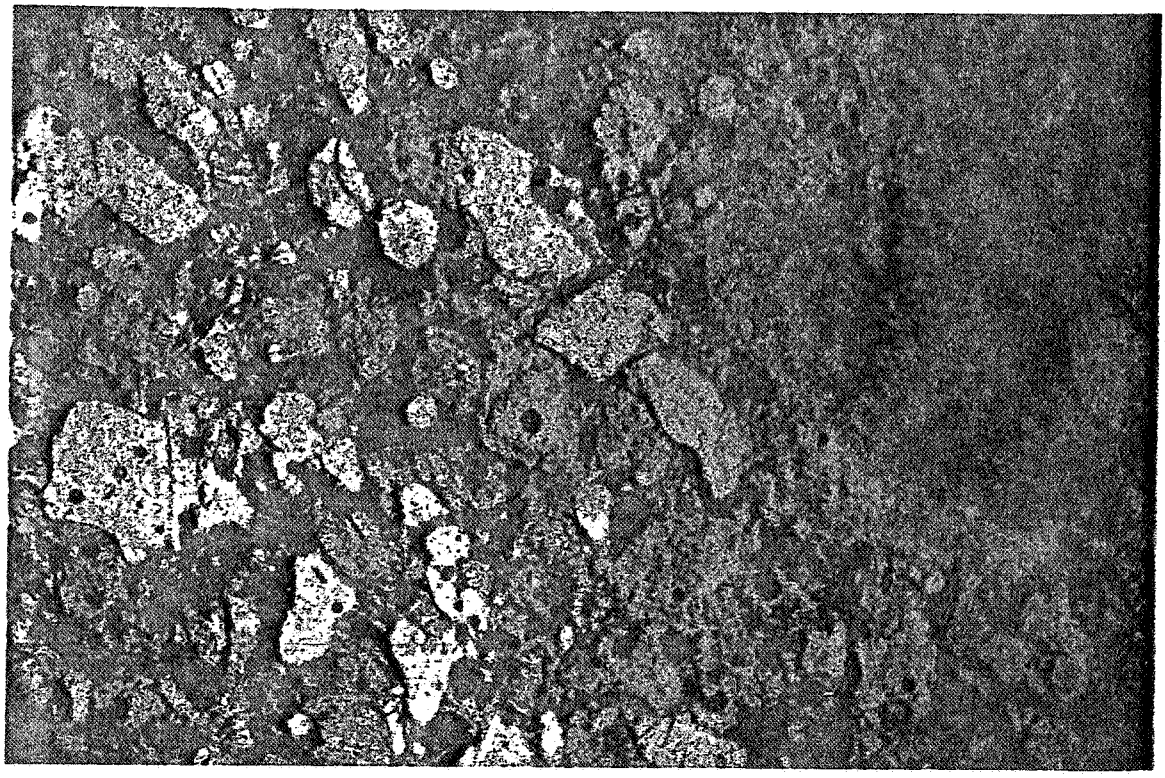


Fig 3 **164676** 0.32mm

TS. Ordinary light (OL), irregular granular/crystalline aggregate of quartz (clear) and clay-altered microcline (clouded) with extensive permeation of intergranular areas by opaque oxide.

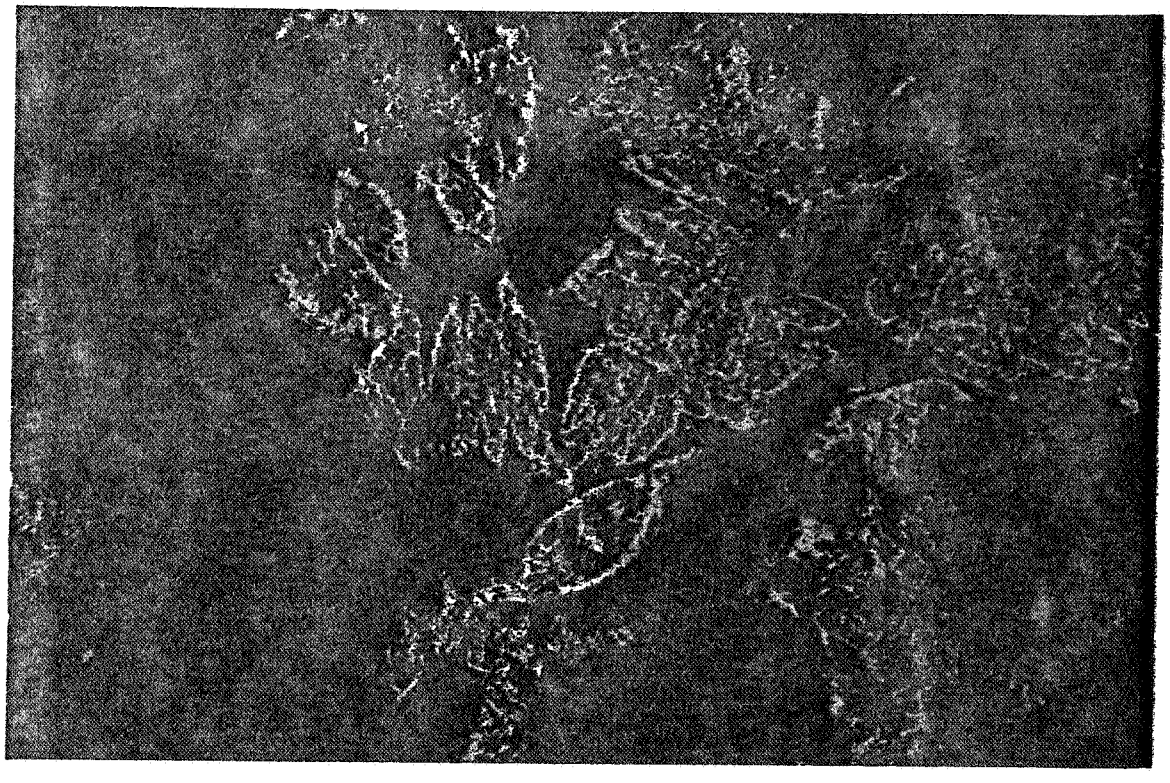


Fig 4 **164676** 0.05 mm

PS. Showing detail of permeating opaque oxides shown in Fig 3, seen as crystals of probable supergene carbonate, selectively oxidised to microporous limonite and/or hematite.

164677
PK-DDH-1, 38.2-38.3 m

Weakly flow-textured inequigranular biotite granodiorite, minor muscovite, oxidised magnetite, accessory apatite, sphene, zircon. Plagioclase sericitised ± limonite and dusty hematite.

This is a somewhat inequigranular granitoid with a visually estimated mineralogy as follows:

Quartz	25%
Altered plagioclase	50%
Microcline	15-20%
Biotite	3-5%
Magnetite	3%
Apatite, zircon, sphene	tr
Muscovite	3%

The plagioclase has been intensely altered to sericite ± limonite ± dusty hematite. Some of the biotite has been altered to chlorite, and the intergranular amoeboidal shaped grains of accessory magnetite has been oxidised.

The felspars occur as grains from 0.5 to 8 mm long, with the larger grains having an overall subparallel elongation direction. However the quartz is undeformed and the biotite is not noticeably foliated, suggesting that the felspar orientation is due to flow rather than deformation. Accessory small crystals of sphene, apatite and zircon tend to accompany biotite and magnetite. Some magnetite grains appear to be selectively altered to leucoxene.

The bulk composition indicates a granodiorite.

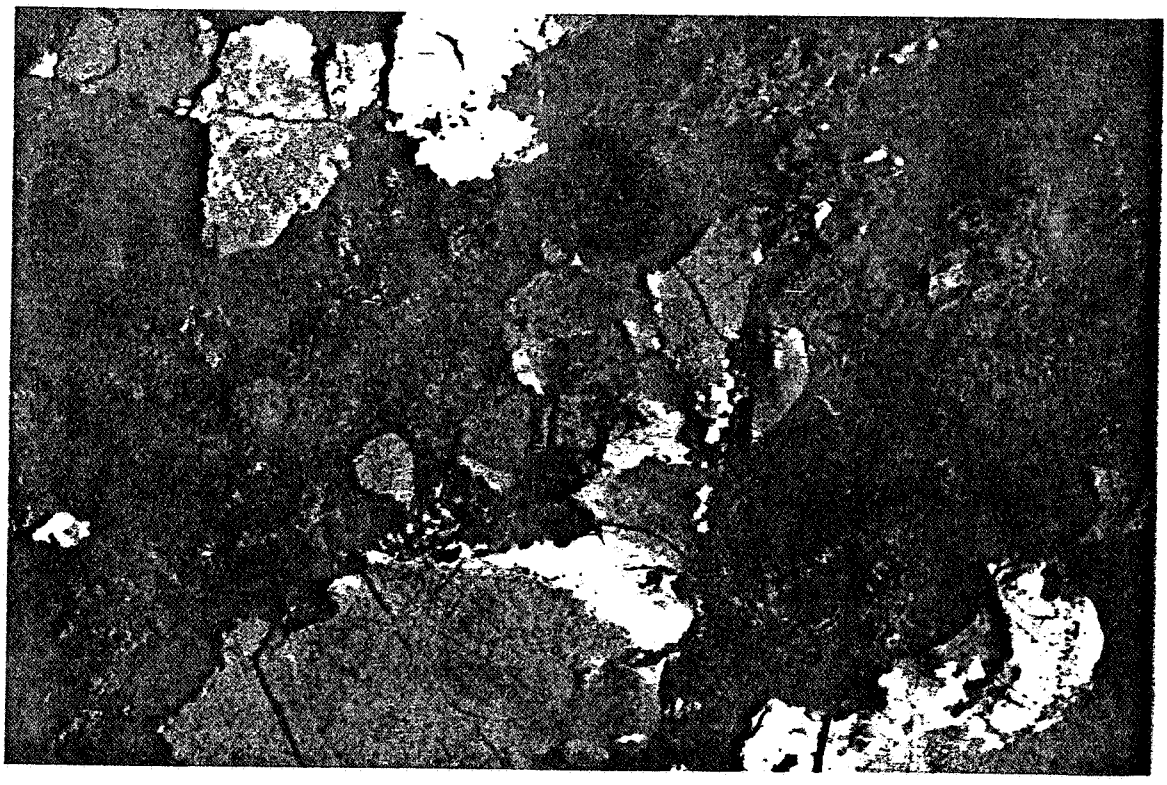


Fig 5 **164677** 0.32mm

TS. Xnic, flow layered biotite-granodiorite with quartz (yellowish, slightly thick); clouded, clay-sericite-altered felspar and scattered 'coloured' flakes of biotite.

164678	**BIF of medium grained, quartz-hematite (largely**
PK DDH-1, 40.1-40.2m	**microporous martite). Accessory fine clay-mica, and carbonate (cf. 164694).**

This sample consists of a laminated to thin layered sequence of a fairly fine crystalline mosaic of hematite (approx 50% of the whole rock) and quartz (also approx 50%).

Individual grains/crystals of hematite are about 0.3mm in size, but these form coarser composites, which form a fairly continuous (layered) network. At least one half of this hematite is seen as martite, weakly microporous, and with a relict crystal structure after magnetite, from which the hematite has apparently formed by metamorphic conversion (not supergene), with trace residual inclusions of magnetite. Other hematite is a 'primary' metamorphic mosaic of relatively more 'solid' hematite grains.

The intergranular quartz has individual grain size of 0.1 to 0.3mm and this quartz commonly carries minor minute inclusions of hematite.

Minor components include scattered 'spots' of clouded, indefinite fine clay-mica (3-5%), and of carbonate (2-3%) intergranular to the quartz-hematite, and there is a crosscutting veinlet of carbonate 1mm wide.

Fig 6 **164678** 0.11mm

PS. Basically a BIF, with two varieties of hematite grains, one 'solid-primary' metamorphic hematite, together with ex-magnetite which has converted to martite and is microporous possibly due to incipient (selective) oxidation. Trace relicts of magnetite remain in the martite.

164679 **Massive compact aggregate of coarse polygonal hematite.**
PK-DDH-1, 54 2-54.3 m **Accessory very fine quartz > carbonate > magnetite.**

At least 90% of this sample consists of massive, coarse crystalline hematite (0.3mm to 4mm individual size). The hematite crystals have a polygonal outline which collectively form a compact granuloblastic mosaic characteristic of high grade metamorphism.

Accessory components are :

*	subrounded quartz grains, 0.1 to 0.4mm, mostly interstitial to the hematite mosaic	3-4%
*	inclusions clustered in some hematite grains apparently as relicts of magnetite (as seen in 164692), but now selectively, oxidised	2-3%
*	carbonate grains, 0.3mm, also interstitial	1%

164680 **Broadly layered BIF, of coarse massive hematite + 15% quartz; with irregular contacts into a central band of finer quartz (65%) - hematite (35%). Minor carbonate and pyrite.**
PK-DDH-1, 82.4-82.5 m

The 50mm slice cut from this 100mm long piece of core has a central layer of irregular width (15mm to 30mm) of quartz hematite, with (partial) layers above and below dominated by more massive, concentrated hematite.

The central layer consists of a polygonal metamorphic mosaic of quartz (65%), with fairly evenly scattered polygonal hematite crystals (35%), all with a grain size range of 0.1mm to 1.5mm. Accessory, minor grains of carbonate <1mm, and of somewhat coarser, locally patchy pyrite occur in this layer, close to its contacts.

Hematite in the more iron-oxide-rich layers is coarser 1mm to 3mm, and forms a more compact aggregate, but with scattered quartz grains to 0.5mm also local larger intergranular patches of quartz mosaic, in total comprising about 15% of these domains.

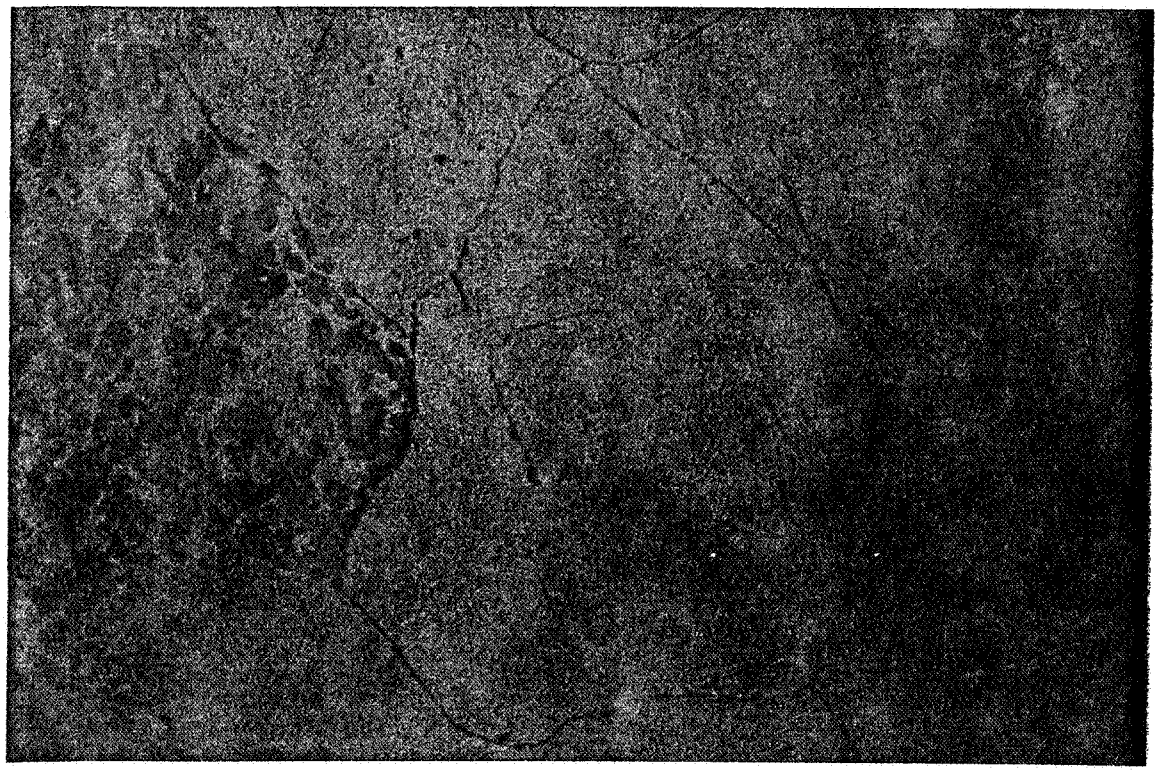


Fig 7 **134679** 0.21mm

PS. Coarse aggregate of polygonal metamorphic hematite. Mottled grain left side of photo in a hematite with clustered inclusions of ex-magnetite, now selectively oxidised to 'limonite'. [Cf. Fig sample where fresh magnetite in this exact same situation remain.]

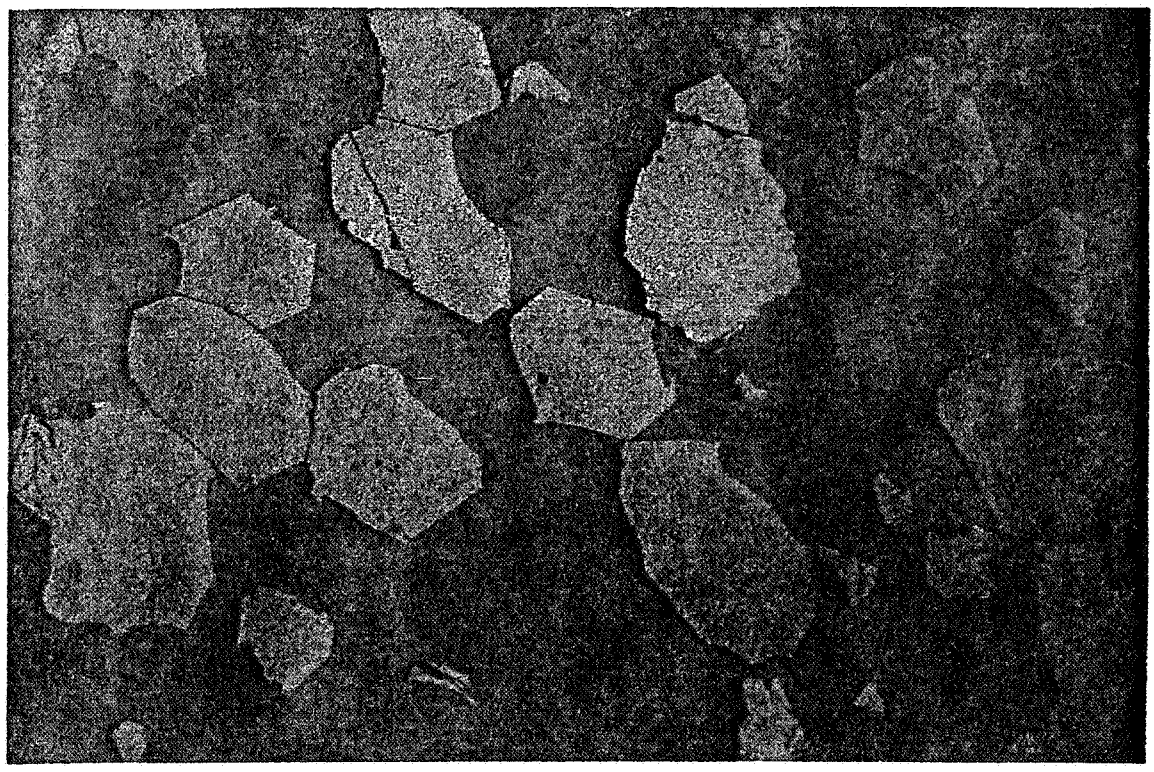


Fig 8 **164680**

PS. Typical solid polygonal crystals of hematite within quartz mosaic.

0.21mm

164681
PK-DDH-1, 98.2-98.3 m

Massive, coarse but inequigranular hematite-plagioclase-quartz aggregate. Minor late stage interstitial chloritic clays ± muscovite; accessory monazite and apatite. Genesis uncertain, possibly a pegmatoid.

This rock is a rather heterogeneous coarse (3 to 15mm) crystalline aggregate of:

*	sodic plagioclase	25-30%
*	quartz, recrystallised	25-30%
*	hematite, irregularly granular	30-35%
*	chloritic clays, interstitial	10%
*	muscovite, monazite, apatite	accessory

Compared with hematite in BIF described above, this hematite is more irregularly granular, generally more commonly twinned and many crystals contain "micron-size" exsolution needles of probable ilmenite parallel to (0001).

Quartz and coarse sodic plagioclase are equally inequigranular, randomly disposed between coarse hematite, also incorporating abundant inclusions of hematite. The quartz is partly recrystallised, the plagioclase has numerous internal microfissures.

Green to khaki "chloritic-clay", some oxidised brown, is quite widespread through interstices, partly separating quartz from plagioclase, also partly permeating microfissures in the plagioclase. These locally enclose muscovite, and appear to be a late stage hydrothermal.

Accessory small (to 0.5mm) crystals of monazite and apatite occur as inclusions in all major minerals, as well as in the late "chloritic clays". There are also crosscutting threads and stringers of carbonate.

164682
PK-DDH-1, 116.7-116.8 m

Quartz-microcline-sillimanite-hematite micro-gneiss (metasediment). Incorporating a lens (?clast) of possible pegmatite, rich in microcline with minor quartz and hematite, also with small lenses and veins of hematite + rarer pyrite.

There is an **irregular lens** in this sample, about 10 mm wide, and 30mm long, composed of a compact granulose mosaic of microcline grains to 5 mm grainsize, incorporating subordinate interstitial quartz, and several small lenses of granular recrystallised hematite, to 10 mm long, rarer pyrite. A vein of opaque oxide with minor chlorite cuts across the microcline-rich lens and contains rare pyrite. Some sericite occur as small patches apparently after plagioclase, but passing into areas of chlorite. This lens seems to be a clast of pegmatite or granitoid.

The **host rock** is a fine quartz-rich gneiss, with quartz grains to 1 mm long commonly elongated parallel to small lenses with foliae rich in fine prismatic sillimanite. Minor microcline is present with a weakly layered distribution and there is also some apparently retrograde muscovite and quite minor biotite. Small elongate hematite grains (7-10%) are parallel to the schistosity.

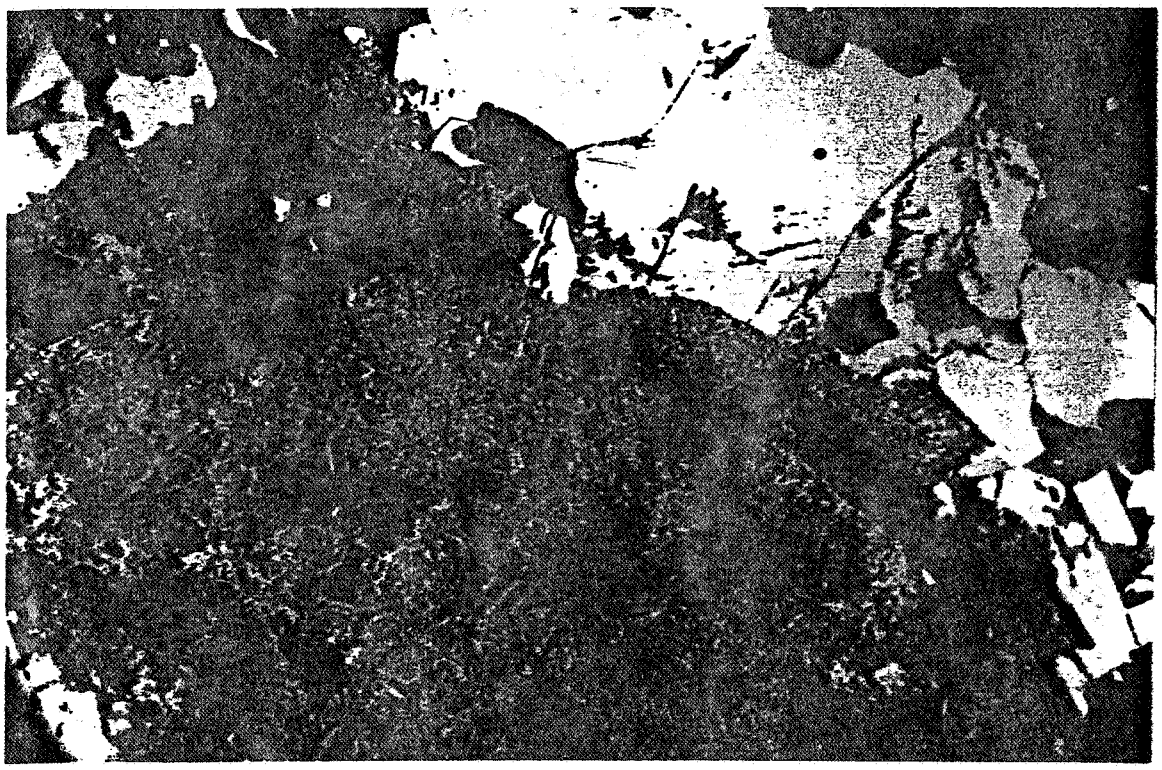
164683
PK-DDH-2, 33.9-34.0 m

Micro BIF, one layer of quartz > metamorphic hematite, and one of (coarser) metamorphic hematite > quartz plus minor carbonate. Patches of microporous limonite + (earthy) hematite appear to be selectively oxidised martite (or carbonate?).

This sample is very similar to 16478 and 16480 (in DDH-1). About one half of the core length consists of a rather weakly layered sequence of quartz (65%) and hematite (35%). The quartz is coarser (to 2mm) in some poorly defined layers than in others (0.3mm). At least one half of the hematite consists of 'solid' metamorphic amoeboidal grains connected and intergranular within the quartz mosaic. These are commonly in contact with a microporous 'earthy' hematite ± goethite as intergranular network and in some patches. By comparison with other samples, these appear to be selectively oxidised martite (as seen e.g. in 164691), or objectively they may be after carbonate?

This main macroband has a gradational contact over about 6mm into a band of relatively more hematite-rich lithology, with a weakly laminated distribution of fine quartz through a mosaic of coarser irregularly granular hematite, with minor sporadic microporous hematite-limonite composition.

There are also numerous 'pock-markings' as more or less poikilitic lenses of limonite ± earthy hematite to 10mm long, at a high angle to the layering. These may represent oxidised carbonate, consistent with several poorly defined patches of relatively fresh carbonate. Minor inclusions of quartz occur in these.



Figs 11 & 12 **164683** 0.11 mm

PS. BIF with 'solid' metamorphic hematite, together with pseudomorphs of predominantly microporous limonite, almost certainly after martite derived from magnetite; all forming an aggregate with quartz.

164684
PK, DDH-2, 41.4 to 41.5m

Massive aggregate of coarse polygonal hematite crystals; rare small quartz grains as the only 'impurity'.

This compares with 164679 in DDH-1. It consists of a very compact massive aggregate of coarse hematite crystals with a size of 0.5mm to 4mm, and most mutual contact in the aggregate have a polygonal (granuloblastic) configuration. These hematite crystals are commonly multiple-twinned.

Quartz grains, subrounded and invariably <0.3mm, are sparsely scattered (1%) as inclusions and some interstitial.

164685
PK-DDH-2, 55.1-55.2 m

Inequigranular possible granodiorite. Extensive khaki-greenish "chloritic-clay" alteration apparently after plagioclase, scattered slightly coarse grains of quartz ± decussate muscovite.

About 75% of this very altered sample consists of a fine grained (0.1mm to 0.5mm) massive mosaic, of apparent igneous origin. This has abundant micro-amoeboidal shaped quartz grains, randomly but fairly evenly disposed, through brownish to greenish (?"chloritic") clays apparently mostly after plagioclase of similar size to the quartz, (with some relict twinning), together with minor relatively fresh equally fine microcline.

The other approximate 25% consists of coarser (1 5 to 2mm) scattered 'grains', some as single crystal quartz grains, but many as composite quartz and clustered decussate muscovite. Sparse (<1%) minute grains and one larger ochreous patch of hematite are present.

The gross texture appears to be inequigranular (rather than porphyritic) and the interpreted composition suggest an original granodiorite.

Fig 13 **164685** 0.32mm

TS. Plane light' inequigranular granodiorite showing igneous micromosaic of quartz clear and felspars altered/clouded by limonitic clays.

164686
PK-DDH-2, 58.4-58.5 m

Sericitised/hematised microadamellite. Sparsely porphyritic in quartz, microcline, and altered ?plagioclase.

At least 80% of this rock consists of a massive, apparently igneous, microcrystalline mosaic-groundmass <0.4mm in size, composed of at least 50% quartz, together with plagioclase altered to limonitised sericite, and with subequal, generally fresh microcline.

Phenocrysts up to 5mm in size are sparsely scattered, and consist mostly of quartz, rarer microcline and clay-altered ?plagioclase. Some quartz phenocrysts are partly recrystallised. Accessory opaque oxide grains and muscovite are scattered.

This rock is interpreted as a minimum melt, sparsely porphyritic, microadamellite.

164687
PK-DDH-2, 62.6 m

Weakly porphyritic microgranitoid with felspar varying from antiperthitic plagioclase to perthitic microcline ('hypersolvus' granite). Minor muscovite, partly in veins.

This rock compares with 164685 and 164686, as inequigranular to porphyritic granitoid.. The grainsize varies from 0.1 to 4 mm with the larger grains having the appearance of phenocrysts, including quartz phenocrysts which are composed of two or more grains.

The felspar in this rock is seen as antiperthitic plagioclase passing into perthitic microcline, with various proportions of plagioclase to alkali felspar within complex exsolved grains. This suggests an originally hot 'hypersolvus' granite.

There is some muscovite in the rock however, some of which occurs in veins, but this mica may be of retrograde origin. Accessories include oxidised opaque oxides and rare zircon.

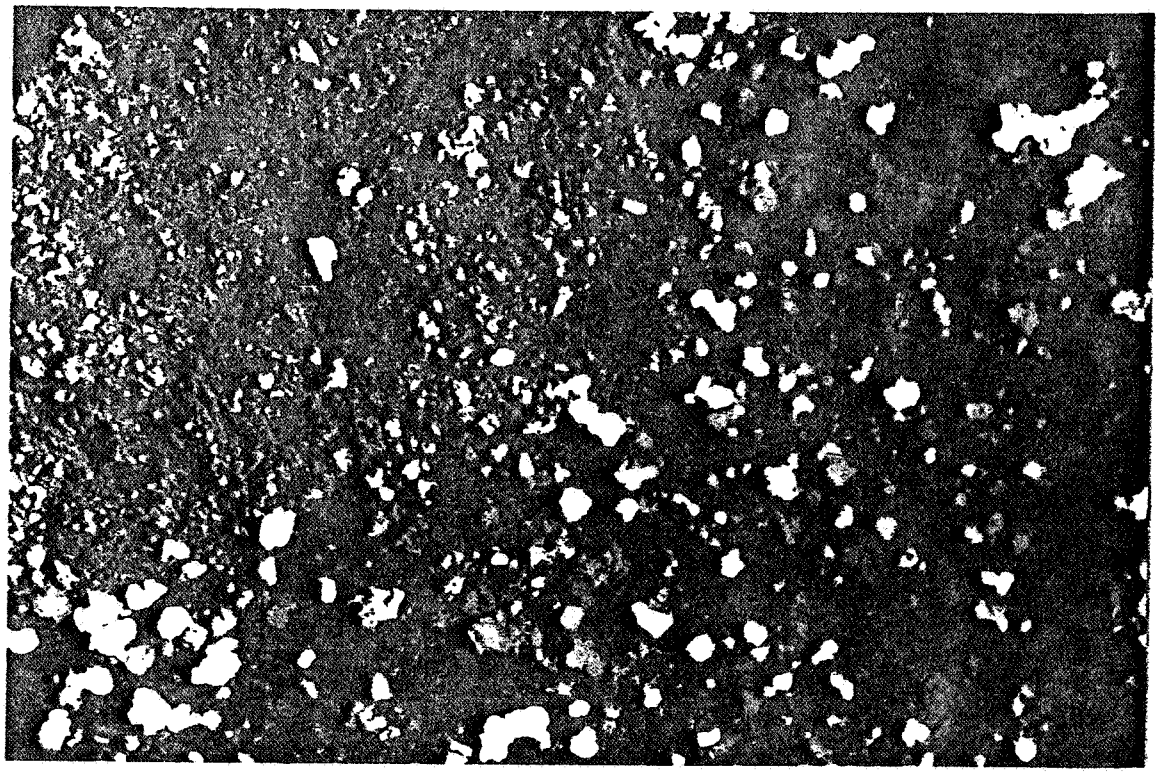


Fig 14 **164686** 0.32mm

TS. Xnic. Porphyritic microadamellite; large kspar phenocryst top left quadrant; in groundmass of altered felspar, quartz micromosaic.

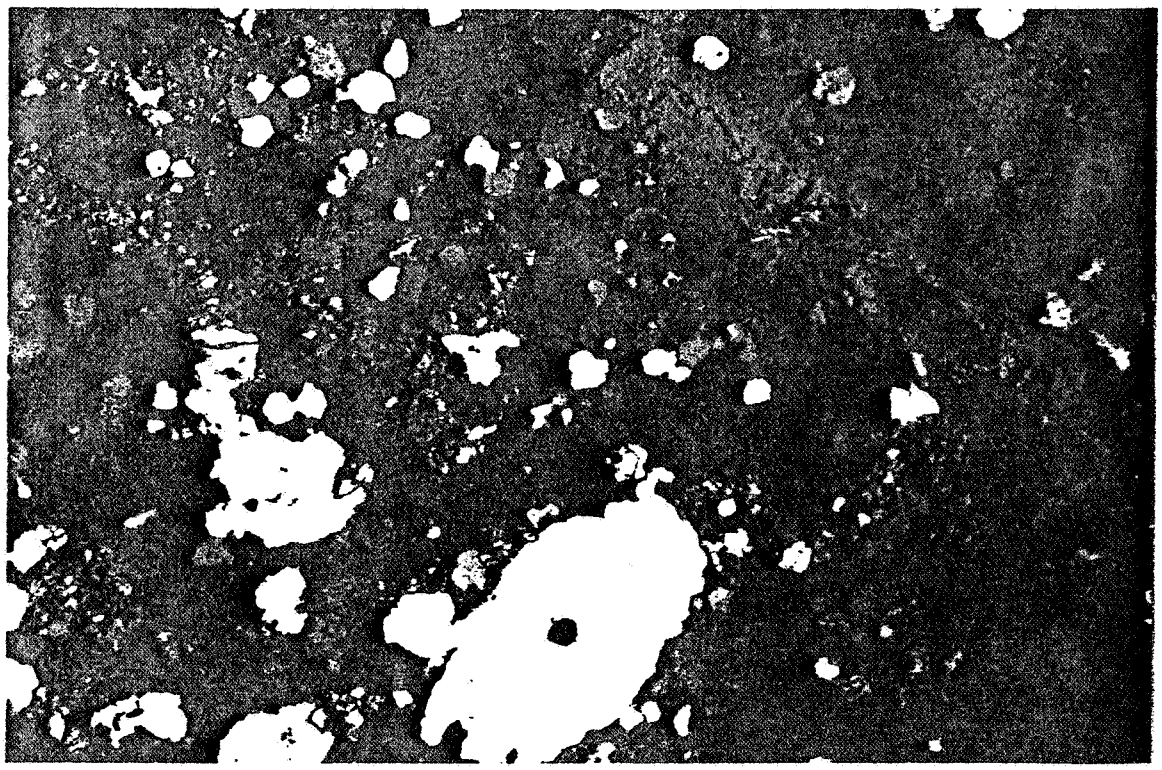


Fig 15 **164687** 0.32mm

TS. Xnic. Inequigranular/porphyritic granitoid, felspar clouded due to minor clay-sericite alteration; cut by vein of muscovite.

164688
PK-DDH-2, 70.6 m

Hematite-rich quartzite. Minor interstitial 'clays' (?after felspar or micas), less muscovite, carbonate.

At least 60% of this sample consists of an irregular metamorphic mosaic of quartz grains, 0.1 to 2mm in size, indicating some exaggerated grain growth. Hematite grains (30%) occur as very small inclusions (0.05mm) in quartz, through to larger (1mm) irregular grains with a weakly layered distribution, forming an integral part of the quartzitic mosaic texture.

Accessory minerals form a total of about 10% are scattered throughout as grains more or less interstitial to the quartz and hematite mosaic, also as films along intergranular contacts. These are predominantly 'clays', variably "sericitic" and/or 'chloritic'. In the case of the grains, these may be after felspar or muscovite, or where leucoxene is included, possibly after biotite or mafic silicate. There is in fact accessory scattered fresh muscovite, also fine carbonate, and trace very small crystals of ?monazite.

164689
PK-DDH-2, 96.5 m

Layered and disrupted hematite-sillimanite-orthoclase-quartz hornfels or gneiss, accessory biotite, apatite. High grade metapelite.

This thin section viewed macroscopically is seen to have pinkish to greyish microcrystalline poorly defined layers which are quite strongly distorted and disrupted. These layers, which are rather diffuse in thin section, consist of fine metamorphic quartz mosaic, with variably minor to abundant orthoclase k-spar, also minor to locally abundant fine prismatic/fibrous sillimanite which is poorly oriented to random.

Irregular patchy lenses or poorly defined layer-veins, possibly in disruption zones, all of these minerals are coarser, with random sillimanite prisms to 2mm long.

Very fine, 0.1 to 0.5mm hematite grains are disseminated, but generally not in the coarser patches, and there are accessory micropoikiloblastic flakes of biotite to 2mm. Very small (0.03mm) grains of probable apatite are scattered as an abundant-accessory mineral, and there are rare grains of sericite (?after plagioclase).

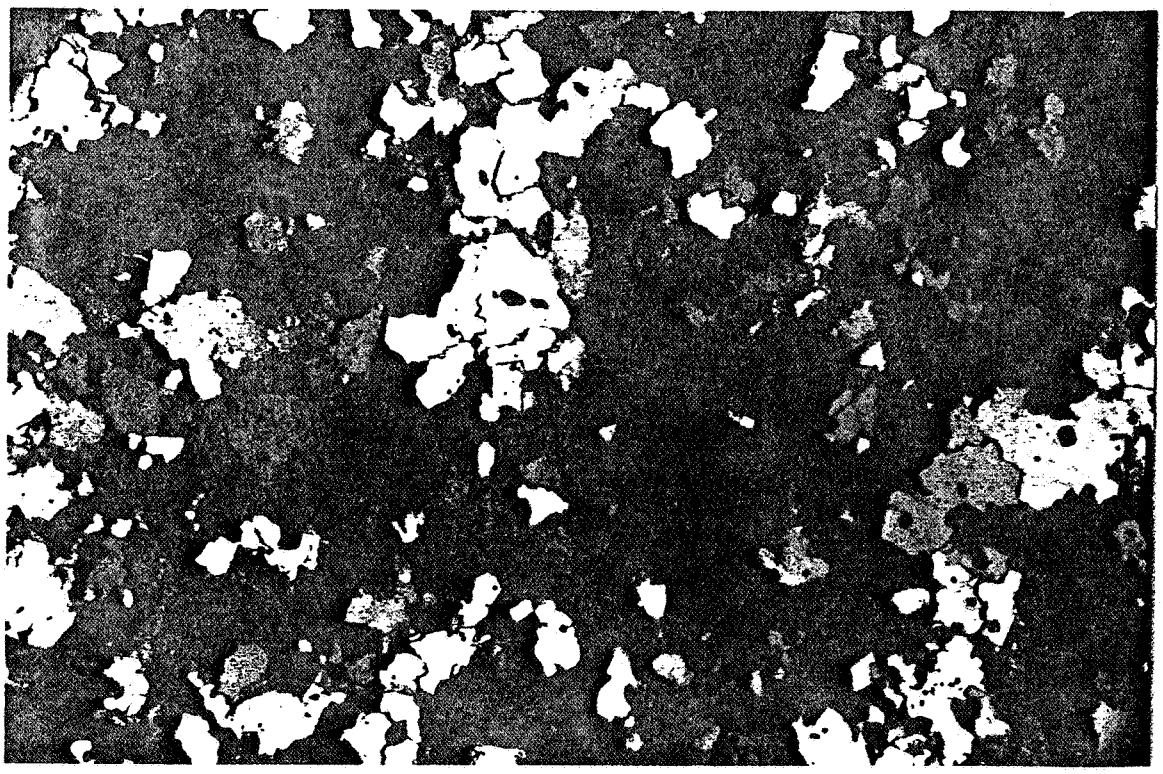


Fig 16 **164688** 0.32mm

TS. Xnic. BIF, 'quartzite' with scattered black-opaque haematite grains; shown to emphasise the presence of intergranular clays of uncertain origin.

Fig 17 **164689** 0.32 mm

TS. Massive sillimanite-quartzite, with abundant prisms of sillimanite randomly disposed through quartz micromosaic.

164690 PK-DDH-3, 27.35-27.40m	**Superficial coarse microcline-quartz sandstone, incorporating clasts of hematite derived from underlying basement. Extensive permeation by ochreous hematite/limonite and local areas of supergene gypsum and carbonate.**

About 60% of this sample consists of a weakly layered, loose-packed "detrital" aggregate of subangular to subrounded grains of quartz and co-dominant microcline, reasonably well sorted, with an average size of about 0.5mm.

This aggregate incorporates several somewhat exotic subrounded clasts of cherty-quartz-hematite (?martite) to 10mm in size. One prominent rounded clast to 20mm diameter consists of compact reddish ochreous hematite-limonite which contains several scattered coarse crystals of martite to 4mm size.

An intergranular matrix/porosity through most of the quartz-microcline aggregate is extensively permeated by reddish ochreous hematite/limonite, with minor closely associated fine carbonate. There are also several poorly defined lenticular layers within the sandstone, and party permeating it, which have a matrix of gypsum, with scattered euhedral rhombic crystals of carbonate about 0.5mm size. Some of these crystals are partly replaced by the gypsum.

This rock is interpreted to represent a superficial sediment, clearly younger than the crystalline "basement" samples forming the remainder of this suite. Indeed, at least the enclosed clasts of ironstone would be basement-derived; the extensive permeating secondary iron oxide, gypsum and carbonate are supergene.

164691	**Folded mesobanded BIF of quartz-metamorphic**
PK-DDH-3, 30.4-30.5 m	**hematite, and impure martite (partly oxidised ± inclusions). Minor biotite; stringers of limonite ± carbonate.**

Macroscopically this sample shows an apparent fold within a mesobanded BIF, with centimetre-scale mesolayers composed of quartz (total content about 50%) and hematite (also about 50%) but alternately with these minerals dominant. Texture within these layers is irregularly polygonal metamorphic mosaic with individual grains 0.3mm to 1mm, rarely to 2mm, commonly as composite aggregates and with some quartz grains representing exaggerated grain growth.

The opaque oxides include two varieties of hematite:

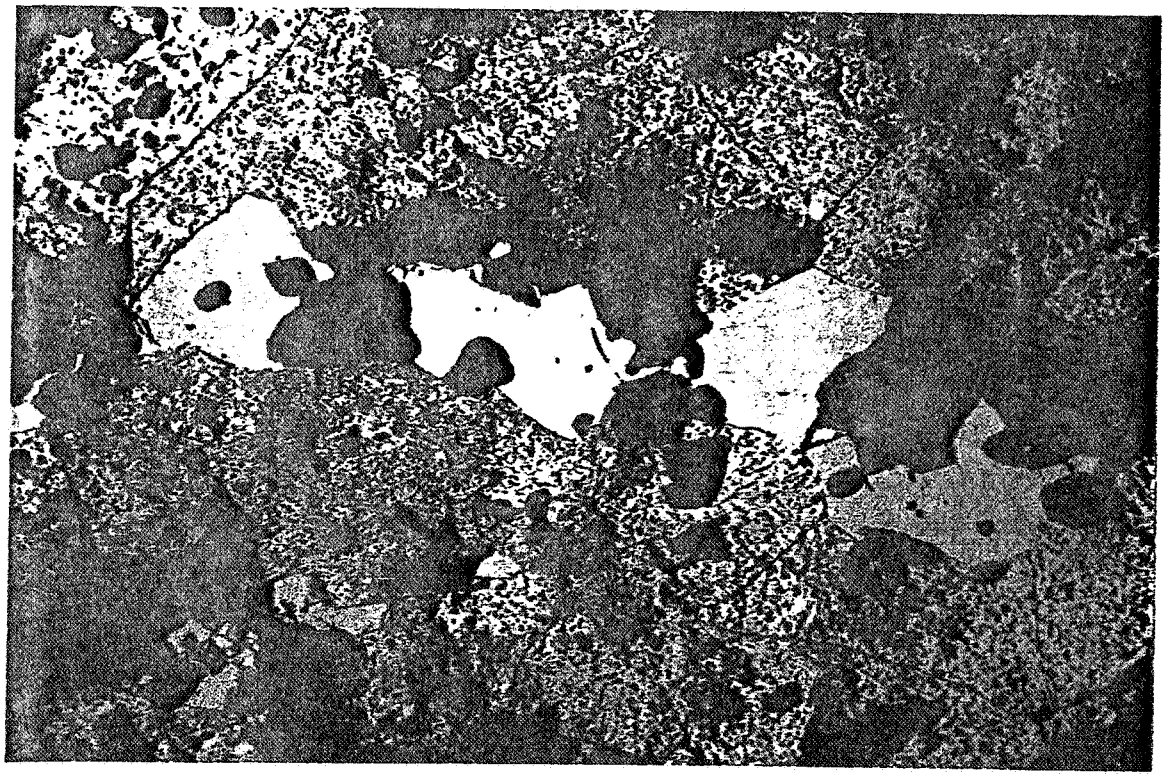
(1) about 45% oxide grains are 'solid', primary metamorphic hematite

(2) about 55% of the grains consist basically of martite, with partial pseudomorphous outlines after magnetite. These grains are "microporous", ± limonite probably due to (selective) oxidation and leaching. These grains enclose minute relict inclusions of silicate.

Numerous minute bleb-like inclusions of fresh magnetite occur in the quartz, bleb-like quartz inclusions of similar size, occur in oxidised martite.

There are minor very small grains, and patches of biotite/phlogopite and of clay, trace minute ?zircon or ?monazite.

Several stringers of supergene ochreous iron oxide ± carbonate (as in 164690) cut across the layering.



Figs 19 & 20 **164691** 0.11 mm

PS. BIF with 'solid' metamorphic hematite, together with pseudomorphs of microporous martite ± limonite derived from pre-existing magnetite; all forming an aggregate with quartz

164692
PK-DDH-3, 54.3-54.4 m

Massive polygonal (metamorphic) hematite with minor residuals of magnetite in selected hematite grains. Trace fine quartz.

At least 75% of this sample consists of a compact massive aggregate of coarse (commonly 2 to 5mm) polygonal shaped metamorphic hematite crystals, most of which show at least some multiple twinning (seen in reflected light).

Approximately 25% of this aggregate however consists of somewhat more irregularly shaped hematite grains, of similar size and composition to those the major hematite, but distinguished by the enclosure of small(<0.3mm) patchy inclusions of residual magnetite. This magnetite forms a total of 7-10% of the whole rock and it is partly replaced by martite.

Sparse (1-2%) very small (0.2mm) grains of quartz are randomly scattered.

The paragenesis is interpreted as :

(1) magnetite-aggregate
(2) metamorphic recrystallisation to massive polygonal hematite, with residuals of magnetite
(3) partial selective replacement of the relict magnetite by martite.

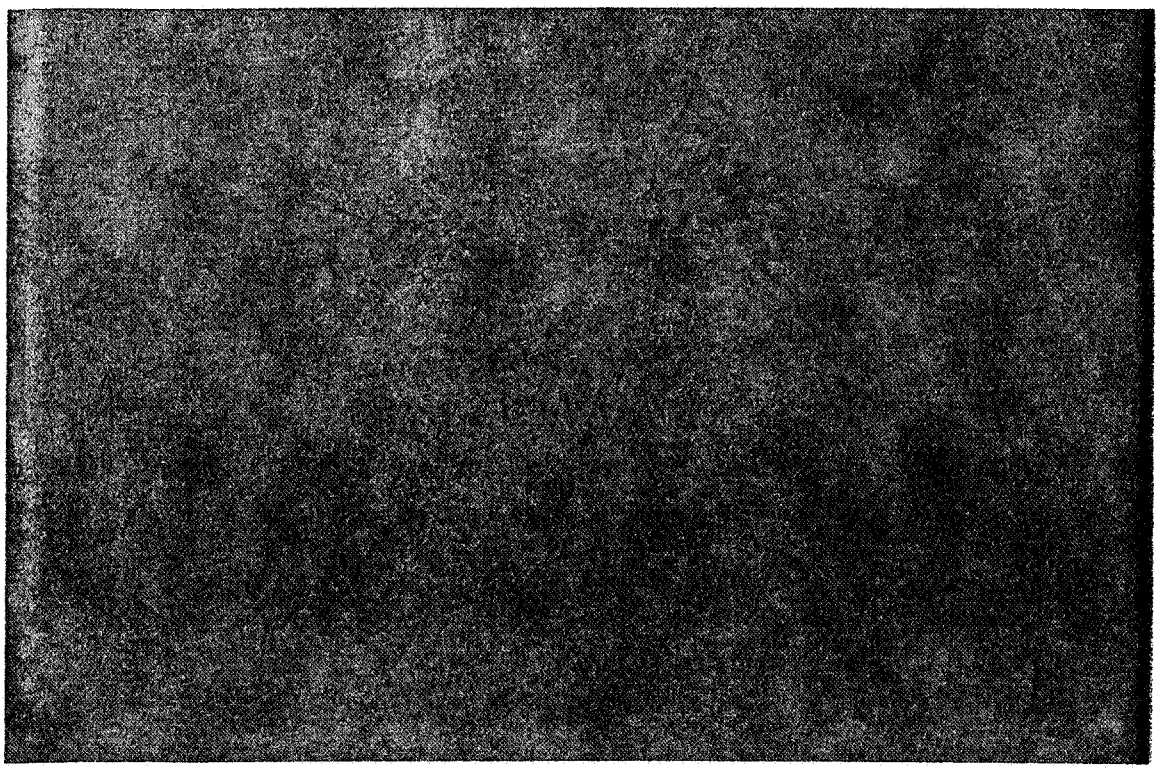


Fig 21 **164692** 0.21 mm

PS. Coarse polygonal aggregate of solid, metamorphic hematite, with occasional crystals of hematite incorporating very small patchy inclusions of magnetite (pinkish brown), and quartz (black).

164993
PK-DDH-3, 75.6-75.7 m

Lenticular-layered quartz hematite rock with accessory clays. Includes metamorphic hematite, martite, trace relict magnetite.

This ironstone is moderately well layered on a scale of 2mm to 12mm with the following gross mineralogy :

*	massive coarse crystalline metamorphic hematite	40%
*	coarse crystals and small clusters of (microporous) martite	25-30%
*	relict inclusions of magnetite, in martite	3%
*	quartz, poorly defined, lenticular layers, dominant in some	25-30%
*	yellowish-brownish "clays"	2-3%

As indicated above, this rock is dominated by poorly defined layers of coarse polygonal metamorphic hematite (as in 16492). Fine grains, and patchy mosaics of quartz are scattered, also form diffuse interlayers within the hematite.

Martite occurs as coarse (1 to 3mm) pseudomorphous grains after magnetite, which are microporous and contain minor very small residuals of magnetite. These pseudomorphs are aggregated in several conformable lenses up to 3mm thick and fairly continuous up to 25mm long.

Figs 22 & 23 **164693** 0.21 mm

PS. Further examples (particularly well shown in this DDH3), of two iron-oxide varieties; coarse, 'solid' metamorphic hematite, incorporating and aggregated with coarse original magnetite extensively altered to microporous martite, with minor relicts of magnetite remaining (pinkish-brown).

164694 **Microbanded quartz hematite rock (cf. 164678)**
PK-DDH-3, 81.8-81.9 m

This rock consists essentially of a subequal abundance of hematite and quartz. These minerals occur in a metamorphic mosaic, individual grain size about 0.15mm locally up to 1mm. The hematite is almost entirely "metamorphic", but up to 5% of the microporous martite reported in 164692, 693 is present.

Minor relative concentrations of these components form intercalated layers on a scale of 1mm to 5mm. Accessory (2-3%) khaki clays in interstices to 0.3mm are scattered, but the exact genesis of these is uncertain.

Minor stringers of carbonate cut across the layering.

This rock compares in texture and broad composition to 164678 in DDH-1, except that microporous martite is dominant over 'solid' metamorphic hematite in that rock.

Fig 24 **164694** 0.21 mm

PS. BIF with 'solid' hematite and microporous martite with a crudely layered distribution through quartzite.

164695 **PK-DDH-3, 142.2-142.25 m**	**Massive, coarse, heterogeneous, clinopyroxene, scapolite rock, with an extensive matrix of secondary microgranular fibrous albite, and clay-carbonate alteration..**

At least 35% of this rock consists of scattered greenish, irregular composite patches to 10mm across of clear clinopyroxene, which show minor to advanced alteration to extremely fine clays and/or carbonate. Coarser carbonate substitutes for some of the clinopyroxene, apparently representing complete replacement.

These patches occur in a largely reddish matrix of very fine granular to fibrous 'secondary' albite (30%). Minor (7%) small (1mm) clear patches in this albite appear to be residuals of plagioclase, locally accompanied by minor fine granular quartz. There are also several large areas (15%) of uniformly oriented clays, which appear to represent former large grains of scapolite.

APPENDIX 3

GEOLOGICAL DRILL LOGS AND ASSAYS

ABBREVIATIONS USED COMMONLY IN GEOLOGICAL LOGS

Colour

black	-	blk
blue	-	bl
brown	-	b, br, brn
cream	-	crm
green	-	gr, gn, grn
grey	-	g, gy
khaki	-	kh
maroon	-	mr
orange	-	o, oy
pink	-	pk
purple	-	pp, ppl
red	-	r, rd
white	-	w, wh
yellow	-	y, yl

Shade

light	-	l
pale	-	p, pl
medium	-	med
dark	-	d, dk

Descriptive

abundant	-	abnt
as above	-	A.A.
basement	-	bsmt
deeply	-	dply
highly weathered	-	H.W.
indurated	-	indur
laminated	-	lam
medium	-	med
moderately	-	mod
moderately fresh	-	MF
mottled	-	mttld
occasional	-	occ
possibly	-	poss
predominantly	-	pred
Poor sample returns	-	P.S.R.
relatively	-	rel
slight(ly)	-	sl
trace	-	tr
very	-	v
weakly	-	wkly
weathered	-	wthd(W)

Minerals/Rock Type

amphibole	-	amph
Banded Iron Formation	-	BIF
biotite	-	bi
calcareous	-	calc
carbonaceous	-	carb
Chalcopyrite	-	ch, Cpy
Chert	-	CHT, cht
Clay	-	cy
Claystone	-	c/s
Calcite	-	Ct
Chlorite	-	Chl
Dolerite	-	Dt
Epidote	-	Ep
Feldspar	-	Feld
ferruginous	-	ferrug
Goethite	-	goeth, goe, gt, g
Haematite	-	Hem, He, Ht, H
Ironstone	-	Fe-st
Iron oxide	-	FeO
Limonite	-	lim
Magnetite, magnetic	-	Mt
Pyrite	-	Py
Pyrrhotite	-	Pyr
Quartz	-	qtz
Silicified	-	sil, silic

Grainsize

very fine	-	vf
fine	-	f
medium	-	m
coarse	-	c
very coarse	-	vc

Grain Shape

well rounded	-	WR
rounded	-	RR
sub-rounded	-	SR
sub-angular	-	SA
angular	-	AA

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 1	**1:100 000 Map**	5938
Traverse	9800N	**UnitNo**	181
Station	10010E	**Max Depth (m)**	30.00
Completion Date	1/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	536930
Azimuth at Collar		**AMG Northing**	6726446
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	14

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.06		MUDSTONE	Pl brn mudstone
2.00	4.00	0.21		MUDSTONE	Pl brn mudstone
4.00	6.00	0.15		MUDSTONE	As above
6.00	8.00	0.10		MUDSTONE	As above
8.00	10.00	0.07		MUDSTONE	As above
10.00	12.00	0.07		MUDSTONE	As above
12.00	14.00	0.28		MUDSTONE	As above and He, minor Goethite
14.00	16.00	1.41		ORE	Blue grey He, coarsely crystalline, rare Mt
16.00	18.00	13.60		ORE	As above
18.00	20.00	9.14		ORE	As above
20.00	22.00	12.30		ORE	As above
22.00	24.00	26.90		ORE	As above very poor returns.
24.00	26.00	9.78		ORE	As above
26.00	28.00	6.44		ORE	As above
28.00	30.00			ORE	NO SAMPLE Probably as above

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 2	**1:100 000 Map**	5938
Traverse	9600N	**UnitNo**	182
Station	9992E	**Max Depth (m)**	56.00
Completion Date	1/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	536771
Azimuth at Collar		**AMG Northing**	6726352
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	16

Comments Hole abandoned. Shattered Piston in hammer.

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.12		MUDSTONE	Pl brn cy.
2.00	4.00	0.07		MUDSTONE	Pl brn mudstone
4.00	6.00	0.13		MUDSTONE	As above
6.00	8.00	0.06		MUDSTONE	As above
8.00	10.00	0.13		MUDSTONE	As above
10.00	12.00	0.10		MUDSTONE	As above
12.00	14.00	0.12		MUDSTONE	As above
14.00	16.00	0.23		MUDSTONE	As above Hard CHT at 15.8m
16.00	18.00	2.02	67.3	ORE	He. v poor sample
18.00	20.00	7.38	67.3	ORE	Bl-gr He. coarsely crystalline trace Goethite
20.00	22.00	10.80	68.3	ORE	Bl-gr He. coarsely crystalline trace Goethite
22.00	24.00	10.50	68.3	ORE	Bl-gr He. coarsely crystalline trace Goethite
24.00	26.00	9.09	68.1	ORE	Bl-gr He. coarsely crystalline trace Goethite
26.00	28.00	8.99	68.1	ORE	As above rare r c/s.
28.00	30.00	1.28	3.9	CHERT	CHT, pl r, pl y.
30.00	32.00	1.97	3.9	CHERT	As above
32.00	34.00	0.67	3.9	CHERT	As above and pink to pl g, qzite.
34.00	36.00	0.60	5.2	QUARTZITE	As above qzite, as aboveminor pl grn chloritic qzite.
36.00	38.00	1.38	5.2	QUARTZITE	Qzite, pl r and pl grn, chloritic qzite.
38.00	40.00	0.87	5.2	QUARTZITE	As above translucent qtz set in a red crypto - xtalline matrix.
40.00	42.00	0.79	2.2	QUARTZITE	As above pl r pl brn, rare He.
42.00	44.00	1.01	2.2	QUARTZITE	Pl r Qzite.
44.00	46.00	1.25	2.2	QUARTZITE	As above
46.00	48.00	0.81	2.4	QUARTZITE	As above
48.00	50.00	1.29	2.4	QUARTZITE	As above rare pl grn qzite
50.00	52.00	2.27	6.4	GNEISS	v pl, ppl He-qt gneiss.
52.00	54.00	4.08	6.4	GNEISS	As above "sugary" texture of He, qtz, rare Mt.
54.00	56.00	7.59	6.4	GNEISS	As above "sugary" texture of He, qtz, rare Mt.

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 3	**1:100 000 Map**	5938
Traverse	9803N	**UnitNo**	183
Station	10010E	**Max Depth (m)**	90.00
Completion Date	3/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	536930
Azimuth at Collar		**AMG Northing**	6726449
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	16

Comments 3 metres N of PK-1

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.63		MUDSTONE	Pl brn cy
2.00	4.00	0.68		MUDSTONE	Pl brn mudstone.
4.00	6.00	2.78		MUDSTONE	As above
6.00	8.00	0.32		MUDSTONE	As above
8.00	10.00	0.16		MUDSTONE	As above
10.00	12.00	0.17		MUDSTONE	As above
12.00	14.00	0.16		MUDSTONE	As above
14.00	16.00	0.24		MUDSTONE	As above minor Goethite, trace He and Gypsum.
16.00	18.00	5.83	66.9	ORE	He, bl-g, coarse X-talline, rare Mt.
18.00	20.00	15.70	66.9	ORE	As above trace Mt
20.00	22.00	5.61	66.9	ORE	As above
22.00	24.00	2.11	66.9	ORE	As above
24.00	26.00	1.58	66.9	ORE	As above
26.00	28.00	3.52	68.8	ORE	As above
28.00	30.00	1.32	68.8	ORE	As above
30.00	32.00	2.99	68.8	ORE	As above
32.00	34.00	6.26	68.8	ORE	As above
34.00	36.00	21.00	68.8	ORE	As above
36.00	38.00	54.70	68.2	ORE	As above
38.00	40.00	31.00	68.2	ORE	As above
40.00	42.00	8.36	68.2	ORE	As above
42.00	44.00	2.49	68.2	ORE	As above tr pl r qzite.
44.00	46.00	2.68	68.2	ORE	He as above.
46.00	48.00	2.48	67.2	ORE	As above.
48.00	50.00	1.41	67.2	ORE	As above.
50.00	52.00	31.20	67.2	ORE	He as above, minor Mt
52.00	54.00	170.00	67.2	ORE	He as above and lesser Mt.
54.00	56.00	17.40	67.2	ORE	He as above and minor Mt
56.00	58.00	113.00	64.5	ORE	He as above and lesser Mt.
58.00	60.00	1.88	64.5	ORE	He as above and minor Mt.
60.00	62.00	11.40	64.5	ORE	He as above and minor Mt.
62.00	64.00	54.70	64.5	ORE	He as above and minor Mt.
64.00	66.00	41.20	64.5	GNEISS	Pl grn chloritic ? CHERT and He as above
66.00	68.00	8.21	13.9	GNEISS	He qtz gneiss He as above but "sugary" minor Mt, pl r qzite.
68.00	70.00	36.10	13.9	GNEISS	He-qtz gneiss, "sugary" and He, coarsely x-talline.
70.00	72.00	42.10	13.9	GNEISS	As above
72.00	74.00	11.50	58.2	ORE	He coarsely x-talline, minor He-qtz gneiss as above
74.00	76.00	11.30	58.2	ORE	He as above
76.00	78.00	2.62	58.2	ORE	He as above, tr He-qtz-gneiss.

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
78.00	80.00	22.50	58.2	ORE	He, "sugary", minor "sugary", He-qtz-gneiss.
80.00	82.00	20.20	58.2	ORE	He as above and minor He qtz gneiss as above
82.00	84.00	39.70	10.9	GNEISS	He-qtz-gneiss, minor He as above
84.00	86.00	9.12	10.9	GNEISS	He-qtz-gneiss, "sugary" texture minor qzite. He as above
86.00	88.00	52.90	13.8	GNEISS	He coarse X-talline, minor He-qtz- gneiss as above and pl grn chloritic qtzite.
88.00	90.00	85.60	13.8	GNEISS	He as above, minor He-qtz gneiss as above and chloritic qzite as above.

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 4	**1:100 000 Map**	5938
Traverse	9503N	**UnitNo**	184
Station	9994E	**Max Depth (m)**	23.00
Completion Date	4/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	536695
Azimuth at Collar		**AMG Northing**	6726289
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	12

Comments Hole abandoned. Bit shanked off in hole.

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.88		MUDSTONE	Pl brn mudstone
2.00	4.00	0.30		MUDSTONE	Pl brn mudstone
4.00	6.00	0.29		MUDSTONE	As above
6.00	8.00	0.06		MUDSTONE	As above
8.00	10.00	0.08		MUDSTONE	As above
10.00	12.00	0.21		MUDSTONE	Pl brn mudstone, minor Goethite and He.
12.00	14.00	1.75		ORE	He, blue - g, coarsely X-talline.
14.00	16.00	1.44		ORE	He as above
16.00	18.00	5.03		ORE	He as above.
18.00	20.00	1.92		ORE	He as above.
20.00	22.00	6.03		ORE	He as above.
22.00	23.00	2.05		ORE	He as above.

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 5	**1:100 000 Map**	5938
Traverse	9505N	**UnitNo**	185
Station	9994E	**Max Depth (m)**	92.00
Completion Date	6/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	536695
Azimuth at Collar		**AMG Northing**	6726288
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	12

Comments 3m N of PK-4

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.47		MUDSTONE	Pl brn Mudstone
2.00	4.00	0.41		MUDSTONE	As above
4.00	6.00	1.17		MUDSTONE	As above
6.00	8.00	0.07		MUDSTONE	As above
8.00	10.00	0.07		MUDSTONE	As above
10.00	12.00	0.56		MUDSTONE	As above and He and yellow Goethite.
12.00	14.00	1.57	65.8	ORE	He bl-g, coarse X-talline, trace Mudstone contamination.
14.00	16.00	1.65	65.8	ORE	He as above.
16.00	18.00	7.41	65.8	ORE	As above
18.00	20.00	6.12	65.8	ORE	As above
20.00	22.00	11.90	65.8	ORE	As above wkly Magnetic.
22.00	24.00	3.21	66.0	ORE	He as above.
24.00	26.00	8.45	66.0	ORE	As above
26.00	28.00	9.99	66.0	ORE	He as above and He finer grained, reddish.
28.00	30.00	9.99	66.0	ORE	He, coarse and He, fine grained.
30.00	32.00	10.00	66.0	ORE	He, fine grained,red when crushed.
32.00	34.00	33.70	65.7	ORE	He, bl-g, coarse and "red", He, rare bl grn cy. Mod Mt.
34.00	36.00	89.80	65.7	ORE	He, bl-g as above mod magnetic.
36.00	38.00	2.72	65.7	ORE	He, bl-g coarse, X-talline
38.00	40.00	2.77	65.7	ORE	As above
40.00	42.00	6.21	65.7	ORE	As above
42.00	44.00	3.32	65.8	ORE	As above
44.00	46.00	23.50	65.8	ORE	As above and minor pl grn chloritic rock.
46.00	48.00	0.39	2.8	QUARTZITE	Pl grn v.f. qtz in a crypto-x-talline chloritic matrix. Possibly of igneous origin.
48.00	50.00	1.45	2.8	QUARTZITE	As above and pl matrix.
50.00	52.00	1.51	2.8	QUARTZITE	As above
52.00	54.00	1.63	2.8	QUARTZITE	Qzite, coarse, milky qtz, with flecks ofChl, He Minor He rich qzite.
54.00	56.00	1.71	2.8	QUARTZITE	As above with grn, chl flecks, r He flecks and rare Mt.
56.00	58.00	0.63	2.0	QUARTZITE	Qzt set iin a pl r cypto-X-talline matrix.
58.00	60.00	0.42	2.0	QUARTZITE	As above pl grn qtz.
60.00	62.00	0.91	2.0	QUARTZITE	As above, tr, qtzite with flecks of He.
62.00	64.00	2.91	4.6	GNEISS	Qtz-He, "sugary" rock Qtz is transulent.
64.00	66.00	2.74	4.6	GNEISS	As above trace He-qtz rock.
66.00	68.00	1.43	4.6	QUARTZITE	Qtzite, minor He flecks.
68.00	70.00	2.47	4.6	QUARTZITE	As above
70.00	72.00	0.96	4.6	QUARTZITE	As above.
72.00	74.00	2.49	6.5	QUARTZITE	As above.
74.00	76.00	2.29	6.5	GNEISS	Qzite as above, minor He-qtz rock.

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
76.00	78.00	1.57	6.5	GNEISS	As above.
78.00	80.00	1.79	6.5	GNEISS	As above, slightly more He-qtz rock.
80.00	82.00	1.70	6.5	GNEISS	Qzite as above and He-qtz rock.
82.00	84.00	2.01	7.2	GNEISS	Qzite as above and He-qtz rock.
84.00	86.00	2.01	7.2	GNEISS	Qzite as above and He-qtz rock.
86.00	88.00	2.71	7.2	GNEISS	He-qtz rock
88.00	90.00	2.61	7.2	GNEISS	As above
90.00	92.00	2.49	7.2	GNEISS	Qtzite, minor He-qtz rock.

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 6	**1:100 000 Map**	5938
Traverse	10200N	**UnitNo**	186
Station	10000E	**Max Depth (m)**	86.00
Completion Date	7/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	537243
Azimuth at Collar		**AMG Northing**	6726698
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	22

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.72		SOIL	R-brn cy. pebbles of c/s.
2.00	4.00	1.06		MUDSTONE	Brn Mudstone
4.00	6.00	0.40		MUDSTONE	As above trace gypsum.
6.00	8.00	0.07		MUDSTONE	As above
8.00	10.00	0.06		MUDSTONE	As above
10.00	12.00	0.07		MUDSTONE	As above
12.00	14.00	0.08		MUDSTONE	As above
14.00	16.00	0.07		MUDSTONE	As above
16.00	18.00	0.08		MUDSTONE	As above
18.00	20.00	0.07		MUDSTONE	As above.
20.00	22.00	0.09		MUDSTONE	As above.
22.00	24.00	1.52	61.2	ORE	Hematite, coarsely x-talline
24.00	26.00	2.75	61.2	ORE	As above
26.00	28.00	2.06	61.2	ORE	As above
28.00	30.00	22.30	61.2	ORE	As above
30.00	32.00	23.40	61.2	ORE	He as above rare chloritic rock.
32.00	34.00	77.30	65.7	ORE	He as above and rare He with "sugary" qtz, translucent.
34.00	36.00	22.50	65.7	ORE	He as above and trace He with "sugary qtz"
36.00	38.00	4.07	65.7	ORE	He as above, minor He with "sugary qtz".
38.00	40.00	2.69	65.7	ORE	As above
40.00	42.00	10.20	65.7	ORE	He, coarsely x-talline lesser He with "sugary" qtz.
42.00	44.00	38.00	63.4	ORE	He as above, trace with "sugary" qtz.
44.00	46.00	22.80	63.4	ORE	As above
46.00	48.00	3.40	63.4	ORE	He as above, minor He with "sugary" qtz.
48.00	50.00	16.10	63.4	ORE	He as above trace He with "sugary" qtz.
50.00	52.00	57.00	63.4	ORE	He as above
52.00	54.00	115.00	65.9	ORE	He as above and He, finer grained , red.
54.00	56.00	28.30	65.9	ORE	He, coarse X-talline
56.00	58.00	7.58	65.9	ORE	He as above.
58.00	60.00	15.90	65.9	ORE	As above.
60.00	62.00	3.34	65.9	ORE	He as above and He-qtz sugary.
62.00	64.00	3.98	6.2	GNEISS	Qtz - He rock.
64.00	66.00	3.89	6.2	QUARTZITE	Qtzite, v fine with vf He disseminated minor "sugary" qtz He
66.00	68.00	4.35	6.2	QUARTZITE	Qtz - He v fine
68.00	70.00	17.20	6.2	QUARTZITE	Qtz - He as above
70.00	72.00	11.90	6.2	QUARTZITE	He-qtz rock and Qtzite with minor flecks of He.
72.00	74.00	13.80	4.6	QUARTZITE	Qtzite with v fine pin pricks of He disseminated

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
74.00	76.00	8.31	4.6	QUARTZITE	Qtzite lesser He, "sugary" texture.
76.00	78.00	8.69	4.6	QUARTZITE	Qtzite v f with pin prick He disseminated.
78.00	80.00	5.54	4.6	QUARTZITE	Qtzite as above
80.00	82.00	11.00	4.6	GNEISS	Qtz - He rock "sugary", minor pl r. Qtzite with crypto-Xtalline matrix.
82.00	84.00	4.16	4.8	GNEISS	Pl r Qtzite with cryptocrystalline matrix, trace He flecks.
84.00	86.00	2.50	4.8	GNEISS	As above.

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 7	**1:100 000 Map**	5938
Traverse	10400N	**UnitNo**	187
Station	9962E	**Max Depth (m)**	102.00
Completion Date	8/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	537377
Azimuth at Collar		**AMG Northing**	6726851
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	22

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	1.40		MUDSTONE	Pl brn Mudstone tr gypsum.
2.00	4.00	0.07		MUDSTONE	As above
4.00	6.00	0.17		MUDSTONE	As above.
6.00	8.00	0.20		MUDSTONE	As above
8.00	10.00	0.10		MUDSTONE	As above
10.00	12.00	0.06		MUDSTONE	As above
12.00	14.00	0.01		MUDSTONE	As above
14.00	16.00	0.02		MUDSTONE	As above
16.00	18.00	0.00		MUDSTONE	As above
18.00	20.00	0.02		MUDSTONE	As above
20.00	22.00	0.13		MUDSTONE	Pl gray Mudstone
22.00	24.00	3.53	62.0	ORE	He pl-g coarse X-tralline
24.00	26.00	3.23	62.0	ORE	He as above
26.00	28.00	1.68	62.0	ORE	He as above
28.00	30.00	4.81	62.0	ORE	He as above minor qtz-Felds granite, chloritic weathered.
30.00	32.00	2.46	5.0	GNEISS	Qtz-felds rock, chloritic, flecks of the med, grained.
32.00	34.00	3.80	46.8	ORE	He, "sugary" and He-qtz rock "sugary"
34.00	36.00	3.83	46.8	ORE	As above
36.00	38.00	2.15	46.8	ORE	He-qtz "sugary" with He dominant.
38.00	40.00	3.15	46.8	ORE	As above tr He coarse X-talline
40.00	42.00	1.36	11.1	GNEISS	Qtz - He "sugary" & He -qtz "sugary"
42.00	44.00	2.28	11.1	GNEISS	Qtz - He "sugary", minor He-qtz tr pl r qzite.
44.00	46.00	2.25	11.1	GNEISS	Qtz - He as above minor He-qtz
46.00	48.00	2.08	66.3	ORE	He, coarse X-talline
48.00	50.00	2.48	66.3	ORE	He as above
50.00	52.00	2.33	66.3	ORE	He as above
52.00	54.00	2.00	66.3	ORE	He as above
54.00	56.00	1.86	66.3	ORE	He as above
56.00	58.00	3.09	66.3	ORE	He as above
58.00	60.00	2.36	66.3	ORE	He as above
60.00	62.00	4.72	66.3	ORE	He as above
62.00	64.00	2.22	66.3	ORE	He as above
64.00	66.00	9.94	66.3	ORE	He as above
66.00	68.00	4.16	62.2	ORE	He as above
68.00	70.00	2.15	62.2	ORE	He as above
70.00	72.00	2.32	62.2	ORE	He as above rare Qtz.
72.00	74.00	2.89	62.2	ORE	He as above rare Qtz.

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
74.00	76.00	2.46	62.2	ORE	As above
76.00	78.00	1.96	62.2	ORE	As above
78.00	80.00	3.29	62.2	ORE	He as above trace qtz.
80.00	82.00	2.40	62.2	ORE	As above
82.00	84.00	2.06	62.2	ORE	He as above trace qtz-He.
84.00	86.00	2.15	62.2	ORE	As above
86.00	88.00	2.07	15.3	IRONSTONE	He as above & tr, He qtz as above
88.00	90.00	2.23	15.3	IRONSTONE	As above
90.00	92.00	2.28	15.3	IRONSTONE	He as above tr He-qtz rare Py.
92.00	94.00	1.85	15.3	IRONSTONE	As above
94.00	96.00	2.60	15.3	IRONSTONE	As above, Water table at 96m. Samples contam. low salinity.
96.00	98.00	2.02	15.3	IRONSTONE	He as above.
98.00	100.00	2.78	15.3	IRONSTONE	As above.
100.00	102.00	2.71	15.3	IRONSTONE	As above.

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 8	**1:100 000 Map**	5938
Traverse	9810mE	**UnitNo**	188
Station	10500E	**Max Depth (m)**	86.00
Completion Date	9/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	537384
Azimuth at Collar		**AMG Northing**	6727042
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	32

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.59		MUDSTONE	Pl g Mudstone
2.00	4.00	0.11		MUDSTONE	As above
4.00	6.00	0.11		MUDSTONE	As above
6.00	8.00	0.04		MUDSTONE	Pl brn Mudstone
8.00	10.00	0.02		MUDSTONE	As above
10.00	12.00	0.14		MUDSTONE	As above
12.00	14.00	0.03		MUDSTONE	As above
14.00	16.00	0.00		MUDSTONE	As above
16.00	18.00	0.03		MUDSTONE	As above
18.00	20.00	0.00		MUDSTONE	As above
20.00	22.00	0.38		MUDSTONE	As above
22.00	24.00	0.10		MUDSTONE	As above
24.00	26.00	0.05		MUDSTONE	As above
26.00	28.00	0.08		MUDSTONE	As above
28.00	30.00	0.00		MUDSTONE	As above
30.00	32.00	0.20		MUDSTONE	As above minor Qtz, He pebbles
32.00	34.00	0.97		GNEISS	He, red, CHT and mudstone
34.00	36.00	5.36	13.4	GNEISS	Qtz-He "sugary" and qzite pl r, grn. vf.
36.00	38.00	11.80	13.4	GNEISS	Chl - qtz- He gneiss.
38.00	40.00	14.30	13.4	GNEISS	Chl - qtz - He gneiss.
40.00	42.00	2.60	13.4	GNEISS	Chl - qtz - He gneiss.
42.00	44.00	15.50	17.1	GNEISS	He-qtz, Chl - qtz - He gneiss. He coarse
44.00	46.00	3.61	17.1	GNEISS	He coarse, minor Chl-qtz-He gneiss.
46.00	48.00	0.86	41.9	GNEISS	Chl - qtz gneiss, minor He-qtz.
48.00	50.00	2.42	41.9	IRONSTONE	He, 'sugary' on He-qtz and Chl-qtz-He.
50.00	52.00	2.87	41.9	IRONSTONE	He, coarse, lesser -qtz - He.
52.00	54.00	2.41	41.9	IRONSTONE	He, 'sugary' and qtz-He
54.00	56.00	2.54	41.9	IRONSTONE	He 'sugary' lesser qtz-He
56.00	58.00	1.53	39.6	IRONSTONE	As above
58.00	60.00	1.68	39.6	IRONSTONE	He as above trace qtz-felds gneiss rare granite.
60.00	62.00	4.14	39.6	GNEISS	Qtz-He 'sugary' v.f.
62.00	64.00	30.30	39.6	IRONSTONE	He 'sugary' He-qtz, minor Chl - He-qtz gneiss.
64.00	66.00	5.24	39.6	GNEISS	Ch-qtz-He gneiss lesser He qtz.
66.00	68.00	2.74	36.5	IRONSTONE	He 'sugary' and Chl -qtz gneiss tr He.
68.00	70.00	19.60	36.5	IRONSTONE	As above
70.00	72.00	17.80	36.5	IRONSTONE	He 'sugary'
72.00	74.00	20.50	11.5	GNEISS	Chl-qtz rock coarse grained, minor He.

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
74.00	76.00	14.90	11.5	GNEISS	As above
76.00	78.00	8.92	3.5	GNEISS	Qtz-felds, gneiss, red, trace He.
78.00	80.00	1.83	3.5	GNEISS	As above
80.00	82.00	3.30	3.5	GNEISS	As above
82.00	84.00	7.20	3.5	GNEISS	As above
84.00	86.00	2.45	3.5	GNEISS	As above

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 9	**1:100 000 Map**	5938
Traverse	9945E	**UnitNo**	189
Station	10500N	**Max Depth (m)**	96.00
Completion Date	9/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	537463
Azimuth at Collar		**AMG Northing**	6726932
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	34

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.95		MUDSTONE	Mudstone pl brn.
2.00	4.00	0.47		MUDSTONE	As above
4.00	6.00	0.36		MUDSTONE	As above
6.00	8.00	0.13		MUDSTONE	As above
8.00	10.00	0.05		MUDSTONE	As above
10.00	12.00	0.03		MUDSTONE	As above
12.00	14.00	0.09		MUDSTONE	As above and yellow mudstone
14.00	16.00	0.11		MUDSTONE	Dk grey Mudstone
16.00	18.00	0.00		MUDSTONE	As above
18.00	20.00	0.28		MUDSTONE	As above
20.00	22.00	0.01		MUDSTONE	As above
22.00	24.00	0.04		MUDSTONE	As above
24.00	26.00	0.12		MUDSTONE	As above
26.00	28.00	0.07		MUDSTONE	As above
28.00	30.00	0.14		MUDSTONE	As above
30.00	32.00	2.25		MUDSTONE	As above
32.00	34.00	0.13		MUDSTONE	As above
34.00	36.00	0.43		CLAY	Pl grn fine sandy clay.
36.00	38.00	0.14		CLAY	Clay as above trace Granite and gneiss pebbles.
38.00	40.00	0.22		CLAY	Clay as above
40.00	42.00	0.15		CLAY	As above
42.00	44.00	0.30		CLAY	As above
44.00	46.00	0.04		CLAY	As above
46.00	48.00	0.31		CLAY	Pl grey to pl grn fine sandy clay.
48.00	50.00	0.35		CLAY	As above
50.00	52.00	2.39		CLAY	As above
52.00	54.00	1.10		CLAY	Clay as above and He -qtz rock.
54.00	56.00	1.74	9.3	IRONSTONE	He 'sugary' minor He-qtz & pl grn cy.
56.00	58.00	0.50	9.3	GNEISS	Qtz-chl-He gneiss.
58.00	60.00	0.20	9.3	GNEISS	Qtz-chl-gneiss minor He
60.00	62.00	0.17	9.3	GNEISS	Qtz-chl-gneiss minor He
62.00	64.00	1.03	9.3	GNEISS	Dk grn chlorite rock.
64.00	66.00	2.69	11.6	GNEISS	As above and He-qtz 'sugary'
66.00	68.00	2.25	11.6	GNEISS	He-qtz 'sugary' trace qtz-He
68.00	70.00	1.85	8.8	GNEISS	Qtz-chl- He gneiss.
70.00	72.00	1.60	8.8	GNEISS	Qtz-He lesser Qtz-chl-He gneiss, dk grn.
72.00	74.00	1.45	8.8	GNEISS	Chl-qtz-He gneiss, dk grn.

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
74.00	76.00	0.28	8.8	GNEISS	As above v f to 'sugary'
76.00	78.00	1.06	8.8	GNEISS	As above
78.00	80.00	0.51	45.6	ORE	He'sugary' minor He-chl-qtz gneiss
80.00	82.00	1.39	45.6	ORE	He 'sugary' minor He-Ch qtz and He-qtz
82.00	84.00	1.41	45.6	ORE	As above
84.00	86.00	0.61	45.6	ORE	He coarse, X-talline, He 'sugary'
86.00	88.00	1.98	45.6	ORE	As above
88.00	90.00	1.82	59.2	ORE	He 'sugary' minor He, coarse.
90.00	92.00	1.54	59.2	ORE	He 'sugary' & He 'coarse'
92.00	94.00	1.63	59.2	ORE	He coarse and lesser He 'sugary'
94.00	96.00	1.80	59.2	ORE	As above

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 10	**1:100 000 Map**	5938
Traverse	9400N	**UnitNo**	190
Station	10000E	**Max Depth (m)**	68.00
Completion Date	10/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	536616
Azimuth at Collar		**AMG Northing**	6726221
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	20

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	2.07		MUDSTONE	Mudstone, brn. tr Gypsum
2.00	4.00	0.29		MUDSTONE	As above
4.00	6.00	2.87		MUDSTONE	As above
6.00	8.00	0.06		MUDSTONE	As above
8.00	10.00	0.00		MUDSTONE	As above
10.00	12.00	0.00		MUDSTONE	As above
12.00	14.00	0.00		MUDSTONE	As above
14.00	16.00	0.00		MUDSTONE	As above
16.00	18.00	0.01		MUDSTONE	As above
18.00	20.00	0.55		MUDSTONE	Qtz, tr He, red, and Mudstone as above
20.00	22.00	1.01		CLAY	Clay, vf, sandy (wthd basement?)
22.00	24.00	0.05		CLAY	As above
24.00	26.00	0.00		CLAY	As above
26.00	28.00	0.11		CLAY	As above
28.00	30.00	0.09		CLAY	As above
30.00	32.00	0.23		CLAY	As above tr Chl-qtz-He gneiss
32.00	34.00	0.33		GRANITE	Qtz-Felds gneiss/granite tr He f to coarse
34.00	36.00	1.19		GRANITE	As above tr biotite
36.00	38.00	3.01		GRANITE	As above
38.00	40.00	10.50		GRANITE	Granite/gneiss as above minor -qtz-He gneiss
40.00	42.00	6.77		GRANITE	Granite/gneiss as above trace disseminated He and Chl
42.00	44.00	3.18		GRANITE	As above
44.00	46.00	3.86		GRANITE	As above
46.00	48.00	1.91		GRANITE	As above rare milky qtz.
48.00	50.00	4.39		GRANITE	As above
50.00	52.00	2.91		GRANITE	As above
52.00	54.00	4.54		GRANITE	As above
54.00	56.00	1.59		GRANITE	As above and chloritized
56.00	58.00	0.98		GRANITE	Qtz-felds gneiss/granite fine grained ple red.
58.00	60.00	0.51		GRANITE	As above
60.00	62.00	0.11		GRANITE	As above
62.00	64.00	0.60		GRANITE	Qtz-felds gneiss/granite
64.00	66.00	0.62		GRANITE	As above
66.00	68.00	0.58		GRANITE	As above

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 11	**1:100 000 Map**	5938
Traverse	9240N	**UnitNo**	191
Station	9870E	**Max Depth (m)**	68.00
Completion Date	11/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	536404
Azimuth at Collar		**AMG Northing**	6726221
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	12

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.38		MUDSTONE	Pl g, pl brn Mudstone
2.00	4.00	0.07		MUDSTONE	As above
4.00	6.00	0.00		MUDSTONE	As above
6.00	8.00	0.00		MUDSTONE	As above
8.00	10.00	0.08		MUDSTONE	As above
10.00	12.00	0.01		MUDSTONE	As above
12.00	14.00	3.79	10.7	QUARTZITE	Hematitic Qtzite 'sugary'
14.00	16.00	7.36	10.7	QUARTZITE	As above
16.00	18.00	4.95	10.7	QUARTZITE	As above
18.00	20.00	16.80	10.7	QUARTZITE	Hem Qtzite as above less hem.
20.00	22.00	15.20	10.7	QUARTZITE	As above
22.00	24.00	15.60	11.1	QUARTZITE	As above
24.00	26.00	6.19	11.1	QUARTZITE	Qzite, trace He Translucent qtz.
26.00	28.00	31.60	11.1	QUARTZITE	Qzite, rare Mt.
28.00	30.00	30.50	11.1	QUARTZITE	As above
30.00	32.00	192.00	11.1	GNEISS	Qtz-Chl Mt gneiss dk g.
32.00	34.00	50.90	13.1	GNEISS	As above
34.00	36.00	164.00	13.1	GNEISS	Qtz - Mt gneiss. Translucent qtz.
36.00	38.00	59.40	13.1	GNEISS	Qtz-Feld gneiss/granite and qtz- Mt gneiss.
38.00	40.00	119.00	13.1	GNEISS	Qtz - lesser Mt gneiss.
40.00	42.00	195.00	13.1	GNEISS	As above
42.00	44.00	106.00	10.6	GNEISS	As above
44.00	46.00	121.00	10.6	GNEISS	Qtz - as above trace Qtz-Feld gneiss.
46.00	48.00	93.90	10.6	GNEISS	Qtz - minor Mt gneiss.
48.00	50.00	4.97	10.6	GNEISS	Qtz - minor Mt and chl-qtz-Mt gneiss.
50.00	52.00	2.34	10.6	GNEISS	Qtz - minor Mt, minor qtz-chl-Mt/He gneiss.
52.00	54.00	3.56	5.8	GNEISS	Dk g chl-qtz-tr Mt gneiss.
54.00	56.00	1.24	5.8	GNEISS	Chl - qtz gneiss.
56.00	58.00	8.88	5.8	GNEISS	Chl - qtz gneiss and qtz-He/Mt gneiss.
58.00	60.00	31.50	5.8	GNEISS	Qtzite - tr/Mt gneiss.
60.00	62.00	23.70	5.8	GNEISS	Chl - qtz lesser Mt gneiss & qtz - Mt gneiss.
62.00	64.00	0.69	5.8	GNEISS	Chl - qtz lesser Mt gneiss.
64.00	66.00	0.84	5.8	GNEISS	Chl - qtz gneiss
66.00	68.00	0.60	5.8	GNEISS	Qtz - chl gneiss.

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 12	**1:100 000 Map**	5938
Traverse	10200N	**UnitNo**	192
Station	9935E	**Max Depth (m)**	45.00
Completion Date	11/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	536770
Azimuth at Collar		**AMG Northing**	6726577
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	22

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	1.86		MUDSTONE	Mudstone
2.00	4.00	0.62		MUDSTONE	As above
4.00	6.00	0.16		MUDSTONE	As above
6.00	8.00	0.03		MUDSTONE	As above
8.00	10.00	0.03		MUDSTONE	As above
10.00	12.00	0.05		MUDSTONE	As above
12.00	14.00	0.08		MUDSTONE	As above
14.00	16.00	0.09		MUDSTONE	As above
16.00	18.00	0.07		MUDSTONE	As above
18.00	20.00	0.23		MUDSTONE	As above
20.00	22.00	0.13		MUDSTONE	Qtz. (gravel?)
22.00	24.00	1.31	5.1	QUARTZITE	Qtzite, trace flakes of He
24.00	26.00	8.71	5.1	QUARTZITE	As above
26.00	28.00	12.20	5.1	QUARTZITE	Qtzite as above and Qtz-Felds gneiss/Granite
28.00	30.00	1.44	5.1	QUARTZITE	Qtzite minor Qz-He gneiss
30.00	32.00	3.16	5.1	QUARTZITE	Hematitic Qzite
32.00	34.00	3.59	1.7	GRANITE	Qtz-Felds gneiss minor Hem Qtzite
34.00	36.00	0.60	1.7	GRANITE	Qtz-Feld Granite, rare He flecks pl red.
36.00	38.00	1.16	1.7	GRANITE	Pl red Qtz-Feld Granite
38.00	40.00	1.41	1.7	GRANITE	As above
40.00	42.00	5.83	1.7	GRANITE	As above
42.00	44.00	4.85	1.7	GRANITE	As above
44.00	45.00	2.65	1.7	GRANITE	As above

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 13	**1:100 000 Map**	5938
Traverse	9935E	**UnitNo**	193
Station	10200N	**Max Depth (m)**	78.00
Completion Date	11/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	537206
Azimuth at Collar		**AMG Northing**	6726748
Logged By	M DAVIES	**Zone**	53
		Depth to Bsmt	22

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	0.60		MUDSTONE	Mudstone
2.00	4.00	35.00		MUDSTONE	As above
4.00	6.00	1.11		MUDSTONE	As above
6.00	8.00	0.10		MUDSTONE	As above
8.00	10.00	0.07		MUDSTONE	As above
10.00	12.00	0.00		MUDSTONE	As above
12.00	14.00	0.00		MUDSTONE	As above
14.00	16.00	0.05		MUDSTONE	As above
16.00	18.00	0.00		MUDSTONE	As above
18.00	20.00	0.00		MUDSTONE	As above
20.00	22.00	0.38		MUDSTONE	As above tr He 'sugary' with minor qtz.
22.00	24.00	1.40	61.7	ORE	He, trace qtz 'sugary' minor He, coarse X-talline
24.00	26.00	1.84	61.7	ORE	He as above
26.00	28.00	2.67	61.7	ORE	He as above
28.00	30.00	3.23	61.7	ORE	He, coarse, tr yellow CHT.
30.00	32.00	3.10	61.7	ORE	He, coarse
32.00	34.00	2.57	56.7	ORE	He as above, tr Granite and Chl qtz He gneiss.
34.00	36.00	2.04	56.7	ORE	As above
36.00	38.00	2.02	56.7	ORE	He, 'sugary' texture and He-qtz gneiss 'sugary'
38.00	40.00	1.60	56.7	ORE	As above
40.00	42.00	1.69	56.7	ORE	As above
42.00	44.00	1.43	29.5	ORE	He 'sugary' minor qtzite with tr He.
44.00	46.00	1.37	29.5	GNEISS	He-qtz gneiss 'sugary' v fine grained.
46.00	48.00	1.54	29.5	GNEISS	As above
48.00	50.00	1.39	29.5	GNEISS	As above
50.00	52.00	1.83	29.5	QUARTZITE	Qzite with tr He flecks rare Chl, minor He-qtz gneiss.
52.00	54.00	1.63	8.9	QUARTZITE	Qzite as above, minor He-qtz gneiss.
54.00	56.00	2.18	8.9	QUARTZITE	Qzite as above minor He-qtz gneiss.
56.00	58.00	2.06	8.9	QUARTZITE	Qzite as above, minor He -qtz gneiss.
58.00	60.00	1.06	4.3	QUARTZITE	Qzite as above, fine grained.
60.00	62.00	2.99	4.3	QUARTZITE	Qzite as above.
62.00	64.00	1.23	5.7	QUARTZITE	Qtz-He gneiss, f g minor qtzite as above
64.00	66.00	1.34	4.6	QUARTZITE	Qtzite as above, minor Qtz-He gneiss.
66.00	68.00	0.97	4.6	QUARTZITE	Qtzite as above
68.00	70.00	1.42	4.6	QUARTZITE	Qtzite as above with rare pl grn Chl.
70.00	72.00	1.43	4.6	QUARTZITE	Qtzite as above
72.00	74.00	1.39	4.6	QUARTZITE	Qtzite as above

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
74.00	76.00	0.50	1.6	GNEISS	Qtz-Feld, Gneiss, qtzite,chloritic
76.00	78.00	0.27	1.6	GNEISS	As above

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 14	**1:100 000 Map**	5938
Traverse		**UnitNo**	194
Station		**Max Depth (m)**	50.00
Completion Date	11/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	536780
Azimuth at Collar		**AMG Northing**	6627530
Logged By	JOANNE HOUGH	**Zone**	53
		Depth to Bsmt	2

Comments

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	2.00	1.17		SILTSTONE	Grey siltstone
2.00	4.00	1.45		GRANITE	Red brown variably weathered granite
4.00	6.00	16.40		GRANITE	As above
6.00	8.00	20.10		GRANITE	As above
8.00	10.00	15.80		GRANITE	As above
10.00	12.00	29.30		GRANITE	As above
12.00	14.00	22.10		GRANITE	As above
14.00	16.00	20.70		GRANITE	As above
16.00	18.00	18.40		GRANITE	As above
18.00	20.00	19.00		GRANITE	As above
20.00	22.00	34.80		GRANITE	As above
22.00	24.00	14.90		GRANITE	As above
24.00	26.00	22.30		GRANITE	As above
26.00	28.00	21.60		GRANITE	As above
28.00	30.00	26.50		GRANITE	As above
30.00	32.00	27.10		GRANITE	As above
32.00	34.00	15.80		GRANITE	As above
34.00	36.00	15.60		GRANITE	As above
36.00	38.00	19.50		GRANITE	As above
38.00	40.00	23.90		GRANITE	As above
40.00	42.00	34.70		GRANITE	As above
42.00	44.00	39.80		GRANITE	As above
44.00	46.00	23.80		GRANITE	As above
46.00	48.00	23.10		GRANITE	As above
48.00	50.00	24.20		GRANITE	As above

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PK 23	**1:100 000 Map**	5938
Traverse		**UnitNo**	394
Station		**Max Depth (m)**	51.00
Completion Date	15/09/95	**Drilling Method**	RCP
Dip at Collar	-90.00	**AMG Easting**	
Azimuth at Collar		**AMG Northing**	
Logged By	JOANNE HOUGH	**Zone**	53
		Depth to Bsmt	

Comments

From	To	Mag Susc SIUnits *1000	Major Rock	Lithology Description
0.00	2.00		SILTSTONE	Green grey siltstone with occ frags of gypsum
2.00	4.00		SILTSTONE	As above
4.00	6.00		SILTSTONE	As above
6.00	8.00		SILTSTONE	As above
8.00	10.00		SILTSTONE	As above
10.00	12.00		SILTSTONE	As above
12.00	14.00		SILTSTONE	As above
14.00	16.00		SILTSTONE	As above
16.00	18.00		SILTSTONE	As above - decoming darker
18.00	20.00		SILTSTONE	As above
20.00	22.00		SILTSTONE	As above
22.00	24.00		GNEISS	Red powdery wthrd hematitic gneiss
24.00	26.00		GNEISS	Red powdery wthrd hematitic gneiss
26.00	28.00		GNEISS	Red powdery wthrd hematitic gneiss
28.00	30.00		GNEISS	Red powdery wthrd hematitic gneiss
30.00	32.00		GNEISS	Red stained gneiss , chloritic.
32.00	34.00		GNEISS	Altered & weathered Ht gneiss with chlorite and epidote alteration
34.00	36.00		GNEISS	As above
36.00	38.00		GNEISS	As above
38.00	40.00		GNEISS	As above
40.00	42.00		GNEISS	As above
42.00	44.00		GNEISS	As above
44.00	46.00		GNEISS	As above
46.00	48.00		GNEISS	As above
48.00	50.00		GNEISS	As above
50.00	51.00		GNEISS	As above

PECULIAR KNOB PK 2

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL2O3 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
137324	16-20	67.34	96.20	2.94	0.16	-0.01	0.03	0.21	0.08	0.51	-0.01	0.01	0.07	0.00	-1.00	0.00	0.00
137325	20-24	68.32	97.60	2.34	0.09	-0.01	0.01	0.07	0.08	-0.01	-0.01	-0.01	0.06	0.00	-1.00	0.00	0.00
137326	24-28	68.11	97.30	1.72	0.24	-0.01	0.01	0.05	0.10	0.73	-0.01	0.03	0.05	0.00	-1.00	0.00	0.00

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137327	28-34	3.90	4	7	6	26	8	10	4	220	0	0	-4	22	0	0	0.00	0.00
137328	34-40	5.20	-1	4	10	23	6	47	5	260	0	0	-4	11	0	0	0.00	0.00
137329	40-46	2.19	3	12	4	13	6	7	1	80	0	0	-4	53	0	0	0.00	0.00
137330	46-50	2.37	-1	7	4	4	5	10	2	110	0	0	-4	43	0	0	0.00	0.00
137331	50-56	6.40	1	7	10	9	4	13	-1	70	0	0	5	15	0	0	0.00	0.00

PECULIAR KNOB PK 3

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL2O3 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
137332	16-26	66.92	95.60	2.22	0.20	0.09	0.04	0.18	0.08	0.39	0.01	-0.01	0.07	0.00	-1.00	0.00	0.00
137333	26-36	68.81	98.30	0.79	0.16	0.07	0.03	0.04	0.06	0.18	-0.01	-0.01	0.06	0.00	-1.00	0.00	0.00
137334	36-46	68.18	97.40	0.49	0.15	0.07	0.03	0.04	0.05	0.11	-0.01	-0.01	0.08	0.00	-1.00	0.00	0.00
137335	46-56	67.20	96.00	1.88	0.17	0.07	0.03	0.03	0.06	-0.01	-0.01	-0.01	0.25	0.00	-1.00	0.00	0.00
137336	56-66	64.54	92.20	4.45	1.21	0.15	0.03	0.06	0.23	0.44	0.03	-0.01	0.22	0.00	-1.00	0.00	0.00
137338	72-82	58.24	83.20	14.20	0.29	0.07	0.03	0.07	0.10	0.89	0.02	-0.01	0.37	0.00	-1.00	0.00	0.00

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137337	66-72	13.90	-1	3	8	6	11	36	4	75	0	0	10	4	0	0	0.00	0.00
137339	82-86	10.90	1	3	6	4	7	11	2	80	0	0	9	14	0	0	0.00	0.00
137340	86-90	13.80	-1	3	6	4	8	6	3	85	0	0	4	-4	0	0	0.00	0.00

PECULIAR KNOB PK 5

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL2O3 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
137341	12-22	65.80	94.00	3.37	0.22	0.08	0.04	0.07	0.08	0.26	-0.01	-0.01	0.14	0.00	1.00	0.00	0.00
137342	22-32	66.01	94.30	2.66	0.42	0.11	0.06	0.09	0.09	0.84	0.05	0.03	0.08	0.00	-1.00	0.00	0.00
137343	32-42	65.73	93.90	2.73	0.38	0.09	0.04	0.06	0.09	1.19	0.01	0.03	0.09	0.00	1.00	0.00	0.00
137344	42-46	65.80	94.00	2.51	0.68	0.18	0.04	0.05	0.08	0.61	0.01	-0.01	0.11	0.00	1.00	0.00	0.00

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137345	46-56	2.81	1	4	-3	4	5	9	1	40	0	0	-4	11	0	0	0.00	0.00
137346	56-62	1.95	-1	12	8	4	3	4	-1	35	0	0	-4	13	0	0	0.00	0.00
137347	62-72	4.61	1	5	8	6	3	16	-1	55	0	0	-4	-4	0	0	0.00	0.00
137348	72-82	6.47	-1	3	6	2	2	25	-1	50	0	0	-4	7	0	0	0.00	0.00
137349	82-92	7.24	1	5	6	7	4	59	2	60	0	0	-4	9	0	0	0.00	0.00

PECULIAR KNOB PK 6

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL2O3 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
137350	22-32	61.18	87.40	8.30	0.60	0.14	0.09	0.32	0.18	1.13	0.04	0.07	0.11	0.00	-1.00	0.00	0.00
137351	32-42	65.66	93.80	4.65	0.32	0.09	0.05	0.03	0.07	0.50	-0.01	-0.01	0.07	0.00	-1.00	0.00	0.00
137352	42-52	63.35	90.50	7.90	0.26	0.07	0.05	-0.01	0.07	0.27	-0.01	-0.01	0.09	0.00	-1.00	0.00	0.00
137353	52-62	65.94	94.20	3.14	0.35	0.08	0.05	0.01	0.08	0.36	-0.01	-0.01	0.13	0.00	-1.00	0.00	0.00

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137354	62-72	6.15	-1	3	4	4	2	13	2	60	0	0	-4	7	0	0	0.00	0.00
137355	72-82	4.60	1	3	6	5	4	14	-1	40	0	0	-4	-4	0	0	0.00	0.00
137356	82-86	4.78	1	7	10	14	2	8	-1	135	0	0	8	48	0	0	0.00	0.00

PECULIAR KNOB PK 7

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL2O3 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
137357	22-30	61.95	88.50	6.71	0.82	0.19	0.07	0.15	0.23	1.42	0.01	-0.01	0.16	0.00	-1.00	0.00	0.00
137359	32-40	46.76	66.80	28.80	0.54	0.11	0.06	0.07	0.13	0.98	-0.01	-0.01	0.24	0.00	-1.00	0.00	0.00
137361	46-66	66.29	94.70	3.17	0.29	0.07	0.04	-0.01	0.08	0.35	-0.01	-0.01	0.06	0.00	-1.00	0.00	0.00
137362	66-86	62.23	88.90	8.36	0.23	0.06	0.04	0.03	0.06	0.44	-0.01	-0.01	0.09	0.00	-1.00	0.00	0.00

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137358	30-32	4.99	-1	7	6	30	4	4	4	140	0	0	-4	39	0	0	0.00	0.00
137360	40-46	11.10	-1	2	4	-1	-1	6	-1	45	0	0	-4	-4	0	0	0.00	0.00
137363	86-102	15.30	-1	3	4	4	-1	7	-1	25	0	0	-4	-4	0	0	0.00	0.00

PECULIAR KNOB PK 8

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL203 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
137366	46-56	41.93	59.90	33.10	2.60	1.06	0.09	0.28	0.26	0.97	0.16	-0.01	0.39	0.00	-1.00	0.00	0.00
137367	56-66	39.62	56.60	37.50	2.67	0.88	0.08	0.22	0.33	0.93	0.15	-0.01	0.37	0.00	-1.00	0.00	0.00
137368	66-72	36.47	52.10	42.80	2.20	0.86	0.08	0.15	0.23	1.04	0.06	-0.01	0.35	0.00	-1.00	0.00	0.00

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137364	34-42	13.40	-1	10	8	9	2	8	-1	280	0	0	-4	31	0	0	0.00	0.00
137365	42-46	17.10	-1	6	12	8	2	8	-1	195	0	0	-4	13	0	0	0.00	0.00
137369	72-76	11.50	-1	4	12	11	5	8	2	150	0	0	-4	9	0	0	0.00	0.00
137370	76-86	3.45	1	4	-3	5	6	23	1	75	0	0	-4	17	0	0	0.00	0.00

PECULIAR KNOB PK 9

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL203 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
137374	78-88	45.64	65.20	23.00	3.37	0.80	0.09	0.94	0.76	4.29	0.10	0.01	0.45	0.00	7.00	0.00	0.00
137375	88-96	59.22	84.60	11.10	0.80	0.17	0.06	0.47	0.24	1.77	-0.01	-0.01	0.07	0.00	3.00	0.00	0.00

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137371	54-64	9.25	2	10	12	28	11	10	9	280	0	0	-4	16	0	0	0.00	0.00
137372	64-68	11.60	-1	3	4	3	1	7	-1	150	0	0	7	8	0	0	0.00	0.00
137373	68-78	8.83	2	18	12	20	6	6	7	260	0	0	-4	13	0	0	0.00	0.00

PECULIAR KNOB PK 11

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL203 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
137376	12-22	10.71	15.30	78.80	1.46	0.09	0.12	0.52	0.36	2.90	0.11	0.12	0.34	0.00	-1.00	0.00	0.00

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137377	22-32	11.10	-1	45	14	31	30	33	13	360	0	0	-4	20	0	0	0.00	0.00
137378	32-42	13.10	-1	26	8	17	32	35	11	260	0	0	-4	9	0	0	0.00	0.00
137379	42-52	10.60	-1	53	10	17	31	39	10	460	0	0	-4	-4	0	0	0.00	0.00
137380	52-68	5.77	-1	46	8	51	17	37	9	860	0	0	13	49	0	0	0.00	0.00

PECULIAR KNOB PK 12

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137381	22-32	5.08	-1	6	4	12	17	33	5	240	0	0	-4	-4	0	0	0.00	0.00
137382	32-45	1.71	-1	6	6	7	6	27	2	100	0	0	-4	-4	0	0	0.00	0.00

PECULIAR KNOB PK 13

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL2O3 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
137383	22-32	61.74	88.20	8.51	0.51	0.10	0.07	0.18	0.15	0.99	-0.01	-0.01	0.11	0.00	-1.00	0.00	0.00
137384	32-42	56.70	81.00	14.80	0.66	0.13	0.05	0.10	0.14	1.24	-0.01	-0.01	0.34	0.00	-1.00	0.00	0.00
137385	42-52	29.47	42.10	53.90	0.63	0.11	0.07	0.08	0.11	2.05	0.02	-0.01	0.38	0.00	5.00	0.00	0.00

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137386	52-58	8.85	-1	4	8	13	6	13	2	60	0	0	-4	6	0	0	0.00	0.00
137387	58-62	4.34	-1	3	8	4	2	9	-1	35	0	0	-4	5	0	0	0.00	0.00
137388	62-64	5.71	-1	3	6	3	2	13	-1	40	0	0	-4	9	0	0	0.00	0.00
137389	64-74	4.58	-1	3	4	3	2	13	-1	45	0	0	-4	-4	0	0	0.00	0.00
137393	74-78	1.64	-1	3	4	6	3	16	-1	30	0	0	-4	8	0	0	0.00	0.00

PECULIAR KNOB PK 14

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137394	3-16	3.71	-1	23	4	22	10	6	7	170	0	0	-4	11	0	0	0.00	0.00
137395	16-30	3.46	-1	16	8	18	7	8	5	150	0	0	6	12	0	0	0.00	0.00
137396	30-50	4.26	-1	18	6	22	10	10	6	220	0	0	-4	11	0	0	0.00	0.00

PECULIAR KNOB PK 23

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
137397	32-44	3.58	-1	8	6	14	13	38	3	240	0	0	-4	28	0	0	0.00	0.00
137398	44-51	4.47	-1	12	4	23	18	51	6	300	0	0	-4	23	0	0	0.00	0.00

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PKDDH 1	**1:100 000 Map**	5938
Traverse		**UnitNo**	395
Station	1040N/9924E	**Max Depth (m)**	152.30
Completion Date	17/09/95	**Drilling Method**	ROT
Dip at Collar	-60.00	**AMG Easting**	537635
Azimuth at Collar	137.00	**AMG Northing**	6726886
Logged By	JOANNE HOUGH	**Zone**	53
		Depth to Bsmt	

Comments Pet. Rpt.No.7053 - 9 samples

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	28.19			SILTSTONE	Pale brown to grey siltstone with occ. yellow lenses and gypsum.
28.19	28.32			SILTSTONE	Red purple brown siltstone stained wi hematite . Veined and fractured, anastamose in parts.
28.32	28.70		27.7	GNEISS	Hematitic quartz gneiss. 1mm qtz vein at 28.4m. Fe rich fractures and staining common.
28.70	29.00		27.7	BRECCIA (UNDIFF. ORI	Hematitic breccia with well rounded gneissic clasts 2-6cm in a hematitic matrix. Low angle foliation at 10 degrees to core axis. Fractured.
29.00	33.60		6.1	QUARTZITE	Massive quartz quartzite with opaque oxides. Fractured and healed with oxides of hematite at 45 degrees. Appears bleached.
33.60	36.20		5.2	GNEISS	Pink and white gneissic granitoid or possibly a metamorphosed quartzofeldspathic sediment sericitised in parts.
36.20	39.80		5.2	GRANODIORITE	Biotite granodiorite with magnetite, apatite, dusty hematite and limonite. 10cm Feoxide rich band at 37.3m. Highly altered zone at 37.8-38.3m.
39.80	51.20		26.6	BIF	Qtz-Hm BIF with occ CaCO3 and gneissic bands. Gneissic band at 40.8m, myrmekitic texture with hematite & limonite reaction rims. Layering very fine (5mm). Occ. Ht bands & veinlets. Acid rich vein at 49-50m.
51.20	97.50		61.0	BIF	Massive hematite wi occ. qtz and gneissic bands . The crystals have a polygonal outline forming a granoblastic mosaic. Sulfide and drusy qtz lined vugh at 61.5m. Occ. CaCO3 & pyrite present. Bands granular in parts.
97.50	103.67		54.3	GNEISS	Qtz -plag-Ht gneiss (= proportionate). Hematite irregularly granular and twinned . Vughs healed with sulfide at 101.2m. Fractures healed with sulfide.
103.67	119.00		27.5	GNEISS	Qtz-feld-Ht gneiss, chloritic. Fractured and healed with sulfide. Hematite occurs as stringers and veinlets. Foliation at 45 degrees to core axis. Gneissic band at 109.6-112.2m. Occ. acid veinlets.
119.00	152.30		4.2	GNEISS	Qtz -feld-biotite- gneiss . Occ.fractures & healed chlorite alteration rims. Red Fe oxide and acid veinlets. Becomes foliated and wispy at 126.2m. Sulfides on some fracture surfaces. Tight Z folds at 126.7m. Becomes fresh at 127.6m.

PECULIAR KNOB PK DD 1

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL2O3 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
160248	33.5-39.8	6.66	9.51	66.00	12.00	6.26	0.56	0.25	0.72	2.57	0.14	0.08	0.55	0.00	3.30	0.40	0.40
160332	40.8-50.6	21.35	30.50	54.60	6.35	4.20	0.24	0.37	0.54	1.27	0.19	0.04	0.46	0.00	0.00	0.00	0.00
160252	50.6-52	62.02	88.60	9.83	0.10	0.06	-0.01	0.05	0.05	0.07	-0.01	0.02	0.20	0.00	0.10	-0.20	-0.20
160253	52.6-54	67.20	96.00	2.56	0.07	0.12	-0.01	0.12	0.03	0.13	-0.01	0.02	0.07	0.00	0.20	-0.20	-0.20
160254	54.6-56.1	66.43	94.90	3.01	0.05	0.13	-0.01	0.10	0.04	0.19	-0.01	0.02	0.06	0.00	0.40	-0.20	-0.20
160255	56.1-58	62.79	89.70	7.59	0.07	0.15	-0.01	0.09	0.05	0.31	0.02	0.02	0.16	0.00	1.30	-0.20	-0.20
160256	58-60	66.71	95.30	3.42	0.07	0.15	-0.01	0.11	0.04	0.11	0.04	0.02	0.07	0.00	-0.10	-0.20	-0.20
160257	60-62	49.35	70.50	28.20	0.12	0.16	-0.01	0.26	0.05	0.05	0.07	0.03	0.26	0.00	1.50	0.40	0.60
160258	62-64	48.09	68.70	29.70	0.12	0.16	-0.01	0.17	0.04	0.29	0.05	0.02	0.28	0.00	0.50	-0.20	-0.20
160259	64-66	47.32	67.60	31.10	0.10	0.15	-0.01	0.08	0.04	0.51	-0.01	0.02	0.28	0.00	0.50	0.20	-0.20
160260	66-68	66.92	95.60	2.11	0.09	0.15	-0.01	0.17	0.06	0.21	-0.01	0.03	0.09	0.00	0.50	-0.20	-0.20
160261	68-70	66.36	94.80	2.37	0.14	0.17	-0.01	0.17	0.07	0.28	0.02	0.03	0.07	0.00	0.90	0.40	-0.20
160262	70-72	66.71	95.30	2.56	0.07	0.17	-0.01	0.11	0.02	0.20	0.01	0.02	0.06	0.00	0.30	-0.20	-0.20
160263	72-74	66.43	94.90	2.34	0.07	0.18	-0.01	0.14	0.09	0.18	-0.01	0.02	0.05	0.00	0.40	-0.20	-0.20
160264	74-76	65.10	93.00	4.98	0.10	0.20	0.01	0.08	0.06	0.42	0.02	0.03	0.08	0.00	0.50	-0.20	-0.20
160265	76-78	61.81	88.30	9.95	0.08	0.19	-0.01	0.15	0.10	0.16	0.02	0.02	0.14	0.00	0.60	-0.20	-0.20
160266	78-80	64.26	91.80	7.10	0.09	0.18	-0.01	0.22	0.12	0.36	0.01	0.02	0.13	0.00	0.60	-0.20	-0.20
160267	80-82	65.45	93.50	3.94	0.08	0.18	-0.01	0.14	0.10	0.24	0.02	0.02	0.08	0.00	0.70	-0.20	-0.20
160268	82-84	64.82	92.60	6.87	0.07	0.19	0.01	0.08	0.10	0.13	0.02	0.02	0.12	0.00	0.50	-0.20	-0.20
160269	84-86	62.72	89.60	9.19	0.08	0.20	0.01	0.08	0.05	0.06	0.02	0.03	0.14	0.00	0.40	-0.20	-0.20
160270	86-88	63.28	90.40	9.28	0.10	0.22	0.02	0.08	0.12	0.23	0.03	0.03	0.13	0.00	0.50	-0.20	-0.20
160271	88-90	58.45	83.50	16.00	0.16	0.20	0.01	0.11	0.12	0.26	0.04	0.02	0.18	0.00	0.50	-0.20	-0.20
160272	90-92	62.09	88.70	10.30	0.15	0.19	0.01	0.09	0.10	0.01	0.03	0.02	0.15	0.00	0.30	-0.20	-0.20
160273	92-94	60.34	86.20	10.40	0.21	0.19	0.02	0.21	0.12	0.36	0.03	0.02	0.12	0.00	1.00	-0.20	-0.20
160274	94-96	64.47	92.10	4.82	0.09	0.21	-0.01	0.09	0.08	0.32	0.02	0.03	0.08	0.00	0.10	-0.20	-0.20
160275	96-98	55.02	78.60	19.80	0.24	0.24	0.01	0.13	0.14	0.18	0.08	0.03	0.19	0.00	0.30	-0.20	-0.20
160276	98-100	49.28	70.40	28.50	0.43	0.31	0.02	0.17	0.23	0.24	0.11	0.03	0.25	0.00	0.90	0.40	0.20
160277	100-102.2	52.15	74.50	23.90	0.16	0.27	0.01	0.13	0.19	0.15	0.06	0.04	0.16	0.00	0.20	-0.20	-0.20
160278	102.2-104.7	61.32	87.60	11.70	0.13	0.25	0.01	0.11	0.19	0.15	0.06	0.04	0.12	0.00	0.30	0.40	-0.20
160279	104.7-106.2	21.84	31.20	55.70	6.24	3.49	0.24	0.20	0.48	1.42	0.18	0.04	0.29	0.00	2.10	43.00	0.40
160285	139.2-152.3	2.69	3.85	71.40	11.80	5.68	2.25	0.56	1.01	1.10	0.08	0.05	0.23	0.00	12.00	0.40	0.40

PECULIAR KNOB PK DD 1

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
160246	28.27-28	27.70	-0	4	-5	72	14	12	0	1200	2900	0	2	6	0	0	1.40	-0.20
160247	28.9-33.5	6.09	3	8	-5	10	12	26	0	340	-500	0	2	19	0	0	1.60	1.00
160248	33.5-39.8	5.17	3	14	5	28	6	11	0	480	-500	0	8	21	0	0	0.40	0.40
160249	39.8-40.8	42.20	1	2	5	6	-2	21	0	580	-500	0	2	8	0	0	0.20	-0.20
160250	40.8-43.6	7.21	2	4	-5	13	-2	8	0	95	-500	0	4	8	0	0	0.40	-0.20
160251	43.6-50.6	30.30	1	2	-5	3	-2	20	0	180	-500	0	2	6	0	0	0.40	-0.20
160280	106.2-10	35.90	0	-2	-5	-2	-2	7	0	40	-500	0	1	5	0	0	-0.20	0.20
160281	108.2-11	14.70	2	7	-5	3	-2	29	0	70	-500	0	4	32	0	0	48.00	0.40
160282	111.2-11	4.03	1	18	-5	6	3	54	0	55	600	0	1	6	0	0	0.20	-0.20
160283	119.1-12	3.85	3	15	-5	20	8	47	0	135	-500	0	4	18	0	0	0.40	0.20
160284	129.2-13	6.50	5	14	-5	32	7	56	0	260	700	0	3	20	0	0	0.40	0.40
160285	139.2-15	2.37	12	14	10	24	4	23	0	280	-500	0	18	57	0	0	0.40	0.40
160333	50.6-60	44.90	0	3	-5	-2	-2	7	0	60	-500	0	0	0	0	0	0.00	0.00
160334	60-70	45.20	0	2	-5	-2	-2	7	0	60	-500	0	0	0	0	0	0.00	0.00
160335	70-80	56.30	0	-2	-5	-2	-2	13	0	110	900	0	0	0	0	0	0.00	0.00
160336	80-90	58.80	0	9	-5	20	-2	7	0	55	1000	0	0	0	0	0	0.00	0.00
160337	90-100	44.00	0	4	-5	7	-2	5	0	35	600	0	0	0	0	0	0.00	0.00

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name PKDDH 2
Traverse
Station 9505N/9964E
Completion Date 21/09/95
Dip at Collar -60.00
Azimuth at Collar 137.00
Logged By JOANNE HOUGH

1:100 000 Map 5938
UnitNo 396
Max Depth (m) 140.00
Drilling Method ROT
AMG Easting 536679
AMG Northing 6726311
Zone 53
Depth to Bsmt

Comments Pet. Rpt. No. 7053 - 7 samples

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	15.60			MUDSTONE	Tan fine grained unconsolidated mudstone
15.60	22.15		1.8	QUARTZITE	Pale white grey qtzite. Vughs in parts filled with ? hematite. Feoxide stained . Commonly healed with Feox. Appears as if Fe rich fluids have percolated thru leaving vughs. Occ. Ht blebs. Anhedral grain boundaries.
22.15	33.62		8.7	GNEISS	Gneiss/granite. Red purple pink gneiss with matrix replaced by hematitic fluids. A remnant granitic texture may be visible. Stringers and veinlets of blue grey hematite , qtz and Fe oxides common.
33.62	35.60		25.4	GNEISS	Qtz-feld-Ht gneiss. Sub ore grade. Ht is blue grey red and purple. BIF layers occur in bands. Foliation at 45 degrees.
35.60	54.67		62.0	ORE	BIF and Ht gneiss into massive Ht. Quartz rare, commonly microfractured . Foliation 50-60 degrees.
54.67	55.90		3.3	GNEISS	Qtz - feld-Ht gneiss. Possible granodiorite in parts. Extensive chlorite , clay alteration ?after feldspar.
55.90	58.40		6.4	GNEISS	Qtz-feld-Ht gneiss less chloritic. Qtztite bands common. Chlorite rich band at 57.7m.
58.40	65.10		1.5	MICROADAMELLITE	Sericitised and hematised microadamellite porphryritic in parts grading to porphryrtic microgranitoid. Very pale pink bleached appearance.
65.10	100.30		9.5	QUARTZITE	Hematite rich quartzite layers grading to Ht- orthoclase -qtz gneiss. Accessory sericite chlorite and biotite & apatite occur respectively. The sequence is layered and disrupted. Chlorite content is variable.

PECULIAR KNOB PK DD 2

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL2O3 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
160287	22.1-32.6	11.06	15.80	80.60	1.22	0.40	0.04	0.27	0.26	0.89	0.05	0.04	0.24	0.00	0.70	0.40	1.00
160291	41.9-44.6	67.41	96.30	2.50	0.07	0.23	-0.01	0.13	0.18	1.06	0.04	0.04	0.09	0.00	0.40	-0.20	-0.20
160292	44.6-46.1	66.36	94.80	3.05	0.06	0.21	0.02	0.16	0.20	1.02	0.05	0.04	0.09	0.00	3.30	-0.20	0.20
160293	46.1-48	67.97	97.10	1.61	0.09	0.22	0.01	0.16	0.23	0.98	0.06	0.05	0.08	0.00	0.20	-0.20	-0.20
160294	48-50.6	66.78	95.40	2.48	0.55	0.30	0.01	0.11	0.20	0.72	0.04	0.03	0.11	0.00	4.30	0.20	0.40
160295	50.6-52.6	65.94	94.20	4.30	0.07	0.17	-0.01	0.11	0.15	0.82	0.03	0.03	0.10	0.00	1.10	-0.20	-0.20
160296	52.6-54.6	68.74	98.20	0.45	0.15	0.21	-0.01	0.12	0.17	1.09	0.04	0.03	0.15	0.00	0.20	-0.20	0.20
160297	54.6-55.9	3.30	4.72	69.60	14.90	5.10	2.10	0.16	0.57	3.15	0.04	0.03	0.06	0.00	0.60	-0.20	0.40
160298	55.9-57.65	7.84	11.20	85.70	0.87	0.37	0.06	0.07	0.18	1.16	0.07	0.03	0.74	0.00	1.40	-0.20	0.40
160340	57.65-62.3	25.97	37.10	51.30	5.59	1.92	0.70	0.11	0.33	1.28	0.05	0.03	0.23	0.00	0.00	0.00	0.00
160301	62.3-65.2	1.93	2.76	74.70	13.50	3.32	2.89	0.38	0.48	2.34	0.05	0.04	0.06	0.00	0.30	-0.20	-0.20
160341	74.9-95.6	10.99	15.70	68.00	9.49	2.95	0.36	0.16	0.52	1.79	0.17	0.04	0.60	0.00	0.00	0.00	0.00

PECULIAR KNOB PK DD 2

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
160286	15.6-22.1	1.79	-0	3	-5	16	9	20	0	460	-500	0	1	2	0	0	-0.20	0.20
160287	22.1-32.6	8.72	1	-2	-5	6	16	11	0	125	-500	0	2	5	0	0	0.40	1.00
160288	32.6-35.6	25.40	1	2	-5	4	4	16	0	200	-500	0	1	2	0	0	-0.20	0.60
160289	35.6-40.9	44.80	0	-2	-5	-2	-2	19	0	90	-500	0	1	1	0	0	-0.20	0.20
160290	40.9-41.9	48.10	1	2	10	2	-2	6	0	55	-500	0	0	0	0	0	-0.20	-0.20
160299	57.65-58	3.22	3	9	-5	16	2	3	0	35	-500	0	3	8	0	0	0.20	-0.20
160300	58.3-62	6.43	1	6	-5	21	7	14	0	90	-500	0	2	21	0	0	-0.20	0.20
160301	62.3-65.2	1.48	0	6	5	14	3	3	0	45	-500	0	3	4	0	0	-0.20	-0.20
160302	65.2-70.6	9.86	1	5	-5	7	3	29	0	90	-500	0	1	8	0	0	-0.20	0.20
160303	70.6-74.9	14.40	1	4	-5	4	-2	65	0	80	-500	0	1	16	0	0	-0.20	-0.20
160304	74.9-84.1	11.60	2	7	-5	13	2	53	0	110	1900	0	2	18	0	0	0.40	0.20
160305	84.1-95.6	7.03	4	6	-5	11	4	59	0	85	-500	0	3	20	0	0	-0.20	0.20
160306	95.6-100	4.46	0	25	-5	12	5	58	0	120	-500	0	4	18	0	0	-0.20	-0.20
160339	41.9-50.6	58.40	0	-2	-5	7	-2	4	0	115	-500	0	0	0	0	0	0.00	0.00

MESA - South Australian Steel and Energy Project
Drillhole Summary

Drillhole Name	PKDDH 3	**1:100 000 Map**	5938
Traverse		**UnitNo**	397
Station	10200N/9935E	**Max Depth (m)**	140.00
Completion Date	26/10/95	**Drilling Method**	ROT
Dip at Collar	-60.00	**AMG Easting**	537222
Azimuth at Collar	137.00	**AMG Northing**	6726730
Logged By	JOANNE HOUGH	**Zone**	53
		Depth to Bsmt	

Comments Pet. Rpt. No. 7053 - 6 samples

From	To	Mag Susc SIUnits *1000	Fe %	Major Rock	Lithology Description
0.00	26.90			MUDSTONE	Green grey mudstone
26.90	27.80		41.4	SILTSTONE	Surfical coarse feldspar qtz siltstone with Ht clasts to 7cm. The matrix consists of Hematite limonite and minor carbonate and gypsum.(P)
27.80	47.23		25.7	BIF	BIF of qtz -Ht and martite with stringers of limonite and carbonate. Hematite occurs as disseminations and bands up to 1cm. Feoxide healed fractures common. Fresh Mt occurs as blebs and veinlets. Qtz appears chert like in parts.(P)
47.23	75.70		64.8	ORE	Massive blue grey Ht with residual Mt. Foliation at 45 degrees to core axis. Chlorite band at 55.10m. Commonly fractures and healed with sulfides and rare carbonate.(P)
75.70	88.70		23.9	BIF	Microbanded Qtz-Ht rock. Foliation at 45-60 degrees to core axis. Minor fracture fill sulfides at 77.3m. Fractures healed with chlorite in parts. Qtz rich band at 84.80m.(P)
88.70	100.10		10.7	GNEISS	Chloritic Qtz-Ht gneiss . Hematite occurs as disseminations and veinlets. Feoxide alteration haloes around veins.
100.10	140.90		2.4	GNEISS	Chlorite Qtz-gneiss. Minor hematite occurs as blebs and veinlets and becomes reddish in colur with depth . Fractured from 109-111m healed with sulfides.
140.90	141.20		3.0		Core loss.
141.20	144.00		3.0	GNEISS	Altered gneiss. Massive coarse heterogeneous clinopyroxene scapolite rock with carbonate in parts and local fine granular.(P)

PECULIAR KNOB PK DD 3

Sample No	Interval	Fe %	FE2O3 %	SiO2 %	AL2O3 %	K2O %	Na2O %	CaO %	MgO %	LOI %	P2O5 %	MnO %	TiO2 %	SO3 %	Au ppb	Pt ppb	Pd ppb
160312	49.5-51.5	68.32	97.60	2.44	0.05	0.17	-0.01	0.08	0.14	0.01	0.03	0.02	0.06	0.00	0.20	-0.20	-0.20
160313	51.5-54.3	62.93	89.90	10.00	0.05	0.15	-0.01	0.07	0.11	0.05	0.02	0.02	0.11	0.00	0.50	-0.20	-0.20
160314	54.3-56.3	64.82	92.60	5.21	0.43	0.17	-0.01	0.26	0.17	0.31	0.12	0.03	0.07	0.00	0.30	-0.20	-0.20
160315	56.3-58.3	63.84	91.20	8.11	0.06	0.11	-0.01	0.06	0.07	0.03	-0.01	0.01	0.07	0.00	-0.10	-0.20	-0.20
160316	58.3-60.3	62.72	89.60	10.10	0.09	0.14	-0.01	0.22	0.11	0.11	0.03	0.02	0.11	0.00	0.10	-0.20	-0.20
160317	60.3-63.3	64.68	92.40	5.66	0.04	0.17	-0.01	0.12	0.12	0.05	0.04	0.02	0.06	0.00	0.50	-0.20	-0.20
160318	63.3-66.3	64.89	92.70	5.83	0.07	0.16	-0.01	0.11	0.11	0.06	0.04	0.03	0.07	0.00	0.20	-0.20	-0.20
160319	66.3-69.3	68.81	98.30	0.58	0.08	0.23	-0.01	0.16	0.16	0.01	0.06	0.04	0.10	0.00	0.20	-0.20	-0.20
160320	69.3-72.3	68.25	97.50	0.42	0.08	0.20	-0.01	0.10	0.14	0.05	0.03	0.02	0.10	0.00	0.10	-0.20	-0.20
160321	72.3-75.3	67.20	96.00	1.47	0.09	0.17	-0.01	0.10	0.15	0.05	0.05	0.02	0.25	0.00	0.30	-0.20	-0.20
160322	75.7-78.3	31.85	45.50	52.20	0.12	0.21	-0.01	0.14	0.22	0.04	0.08	0.02	0.68	0.00	0.30	-0.20	-0.20
160323	78.3-84.2	25.20	36.00	62.10	0.25	0.28	0.01	0.20	0.25	0.10	0.08	0.03	0.57	0.00	1.00	0.40	0.20
160342	46.6-49.5	49.91	71.30	23.20	1.29	0.31	0.02	0.14	0.32	1.30	0.09	0.04	0.28	0.00	0.00	0.00	0.00
160346	100.1-12	2.49	3.56	72.70	11.90	5.78	2.60	1.05	0.89	1.13	0.10	0.06	0.14	0.00	0.00	0.00	0.00
160347	129.3-14	3.04	4.35	62.40	10.00	3.07	2.68	8.25	6.26	1.98	0.07	0.10	0.12	0.00	0.00	0.00	0.00

PECULIAR KNOB PK DD 3

Sample No	Interval	Fe %	Au ppb	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Cr ppm	Co ppm	Mn ppm	S ppm	Mo ppm	U ppm	Th ppm	Sn ppm	W ppm	Pt ppb	Pd ppb
160307	26.9-27.8	41.40	0	2	5	41	17	10	0	2000	2300	0	1	7	0	0	0.20	-0.20
160308	27.8-39.2	16.40	19	4	5	25	2	19	0	85	-500	0	1	10	0	0	0.40	2.60
160309	39.2-46.6	21.90	2	2	-5	-2	-2	21	0	90	-500	0	1	6	0	0	0.20	-0.20
160310	46.6-48.3	39.00	0	3	-5	28	-2	13	0	160	-500	0	2	4	0	0	-0.20	-0.20
160311	48.3-49.5	56.40	0	-2	-5	3	-2	4	0	50	-500	0	0	1	0	0	0.20	-0.20
160324	84.2-93.1	14.70	2	-2	-5	4	-2	16	0	45	-500	0	1	5	0	0	0.40	0.40
160325	93.1-100	10.70	1	4	-5	7	-2	30	0	185	-500	0	3	11	0	0	-0.20	-0.20
160326	100.1-11	3.25	1	11	-5	23	-2	4	0	170	-500	0	12	67	0	0	0.40	-0.20
160327	110.3-12	1.92	2	46	10	29	-2	-2	0	320	600	0	13	87	0	0	-0.20	-0.20
160328	120.3-12	1.15	2	28	10	27	-2	-2	0	220	-500	0	10	60	0	0	-0.20	-0.20
160329	129.3-13	3.92	1	37	-5	34	-2	-2	0	980	700	0	9	91	0	0	-0.20	-0.20
160330	135.3-13	1.80	1	65	15	28	-2	4	0	340	1000	0	13	86	0	0	-0.20	-0.20
160331	139.2-14	2.96	4	200	20	24	9	7	0	540	4100	0	30	48	0	0	0.60	1.00
160343	49.5-58.3	47.30	0	-2	-5	-2	-2	3	0	40	-500	0	0	0	0	0	0.00	0.00
160344	58.3-69.3	54.00	0	-2	-5	3	-2	5	0	55	-500	0	0	0	0	0	0.00	0.00
160345	69.3-84.2	39.90	0	-2	-5	3	-2	7	0	35	-500	0	0	0	0	0	0.00	0.00

APPENDIX 4

RARE EARTH ANALYSIS

MINERAL CHEMISTRY

Amdel Laboratories Ltd
PO Box 338
Torrensville Plaza SA 5031
ACN 009 076 555

Telephone (08) 416 5300
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B J Morris
Mines & Energy South Australia
PO Box 151
EASTWOOD SA 5063

FINAL ANALYSIS REPORT

Your Order No: C8GR2/AO6/9K1

Our Job Number : 6AD0769

Sample rec'd : 12/02/96
No. of samples : 8
Report comprises a cover sheet and pages 1 to 2

Results reported : 11/03/96

This report relates specifically to the samples tested in so far that the samples as supplied are truly representative of the sample source.

Approved Signature:

for
Alan Ciplys
Manager - Mineral Chemistry
AMDEL LABORATORIES ADELAIDE

Report Codes:
N.A. - Not Available.
L.N.R. - Listed But Not Received.
I.S. - Insufficient Sample.

Distribution Codes:
CC - Carbon Copy
EM - Electronic Media
MM - Magnetic Media

amdel

Analytical Chemistry

Final
Job Number:6AD0769
O/N :C8GR2/AO6/9K1

ANALYTICAL REPORT

Element	Unit	5938 RS160326	5938 RS160327	5938 RS160328	5938 RS160329		
Li	ppm	6	6	5	11	IC3E	2 DL
Ba	ppm	440	360	580	150	IC3E	5 DL
Be	ppm	4	3	<2	4	IC4E	2 DL
Sc	ppm	<5	<5	<5	<5	IC4E	5 DL
Zr	ppm	280	280	260	120	IC4E	20 DL
Y	ppm	95	105	65	75	IC4E	10 DL
Ce	ppm	260	260	160	4200	IC3R	0.05 DL
Dy	ppm	15.5	18.0	11.5	13.5	IC3R	0.02 DL
Er	ppm	6.5	7.0	4.4	5.0	IC3R	0.05 DL
Eu	ppm	1.20	1.05	1.05	5.5	IC3R	0.02 DL
Gd	ppm	16.0	17.5	13.0	34.0	IC3R	0.05 DL
Ho	ppm	3.3	3.6	2.1	2.00	IC3R	0.02 DL
La	ppm	160	160	120	3700	IC3R	0.05 DL
Lu	ppm	1.75	1.75	0.94	0.79	IC3R	0.02 DL
Nd	ppm	110	120	77	800	IC3R	0.02 DL
Pr	ppm	29.0	30.5	19.5	280	IC3R	0.05 DL
Sm	ppm	18.5	20.0	14.0	64	IC3R	0.02 DL
Tb	ppm	2.5	2.8	1.65	3.2	IC3R	0.02 DL
Tm	ppm	1.70	1.70	0.95	0.70	IC3R	0.05 DL
Yb	ppm	8.5	9.5	5.5	4.3	IC3R	0.05 DL
Ga	ppm	25.0	26.0	20.5	17.5	IC3M	0.1 DL
Hf	ppm	9	5	5	3	IC3M	1 DL
Nb	ppm	36.5	25.5	21.0	3.5	IC3M	0.5 DL
Rb	ppm	115	91	105	38.5	IC3M	0.1 DL
Ta	ppm	2.5	2.0	1.5	<0.5	IC3M	0.5 DL
PKDD43		100.1	110.3	120.3	129.3		
		1	1	1	1		
		110.3m	120.3m	129.3m	135.3m		

amdel

Analytical Chemistry

Final
Job Number:6AD0769
O/N :C8GR2/AO6/9K1

ANALYTICAL REPORT

Element	Unit	5938 RS160330	5938 RS160331	5938 RS160279	5938 RS160285		
Li	ppm	6	11	5	7	IC3E	2 DL
Ba	ppm	320	300	9600	360	IC3E	5 DL
Be	ppm	2	7	<2	<2	IC4E	2 DL
Sc	ppm	<5	5	<5	<5	IC4E	5 DL
Zr	ppm	200	300	140	300	IC4E	20 DL
Y	ppm	90	40	15	80	IC4E	10 DL
Ce	ppm	240	130	260	300	IC3R	0.05 DL
Dy	ppm	15.5	5.5	3.2	12.0	IC3R	0.02 DL
Er	ppm	5.5	2.8	0.85	4.5	IC3R	0.05 DL
Eu	ppm	0.85	0.71	3.1	0.77	IC3R	0.02 DL
Gd	ppm	16.5	5.5	4.4	12.5	IC3R	0.05 DL
Ho	ppm	2.9	1.05	0.55	2.0	IC3R	0.02 DL
La	ppm	160	105	190	220	IC3R	0.05 DL
Lu	ppm	1.05	0.49	0.22	0.88	IC3R	0.02 DL
Nd	ppm	110	42.0	77	105	IC3R	0.02 DL
Pr	ppm	26.0	11.5	24.5	28.0	IC3R	0.05 DL
Sm	ppm	18.5	6.5	2.9	14.5	IC3R	0.02 DL
Tb	ppm	2.2	0.74	0.55	1.60	IC3R	0.02 DL
Tm	ppm	1.25	0.50	0.25	0.95	IC3R	0.05 DL
Yb	ppm	7.5	3.1	1.20	6.5	IC3R	0.05 DL
Ga	ppm	25.5	18.0	9.5	22.5	IC3M	0.1 DL
Hf	ppm	3	7	<1	4	IC3M	1 DL
Nb	ppm	16.0	17.0	9.5	26.5	IC3M	0.5 DL
Rb	ppm	80	75	70	105	IC3M	0.1 DL
Ta	ppm	1.0	2.0	<0.5	2.0	IC3M	0.5 DL
		135.3	139.2	104.7	139.2		
		|	|	|	|		
		139.2m	144m	106.2m	152.3m		

PKDDH 1