CONTENTS ENVELOPE 3839

TENEMENT: E.L.'s 621 & 1009 - Wirrida - N. Of Tarcoola.

TENEMENT HOLDER: AFMECO Pty. Ltd.

PLANS: Gravity Profile Line 5. Drg. No. SH53-6.136.4072. 3839-10
Plate 8.
Gravity Profile Line 6. Drg. No. SH53-6.136.4073. 3839-11
Plate 9.
Gravity Profile Line 7. Plate 10. MISSING
Contour Map Of Bouguer Gravity Anomaly. Sheets 3839-12 To
1 To 6. Drg. Nos. SH53-6.136.4101 To 3839-17
SH53-6.136.4106.

AFMECO PTY. LTD.

11-13 Lucknow Place, West Perth, Western Australia
P.O. Box 526, West Perth, Western Australia, 6005
Telephone: (09) 321 9618, 321 9681
Telex: AFMECO 92077 Perth

0003

PPA/ds 80-2352

12th August, 1980

Director-General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD SA 5063

Dear Sir,

EXPLORATION LICENCE 621 - WIRRIDA
QUARTERLY REPORT 21.4.80 to 20.7.80

Field work which was delayed by a delay in getting clearances for obtaining aerial photography was just in progress at the end of the quarter. No results will be available until the crew completes this work.

Expenditure for the quarter was $880.83 as per the attached statement.

Yours faithfully,
AFMECO PTY LTD.

J.-P. POGGI,
Managing Director.

Enc.1

STATEMENT OF EXPENSES RELATING TO EXPLORATION
PROGRAMME E.L. 621, QUARTER 21.4.80 to 20.7.80

PERSONNEL (FIELD WORK, EVALUATION, OFFICE WORK)	496.84
MATERIAL (DIRECT)	3.26
TRAVEL, ACCOMMODATION (DIRECT)	58.80
CONTRACTS, SUPPLIES	200.00
DRAFTING SERVICE, PREPARATION OF REPORTS & MISCELLANEOUS	79.99
MANAGEMENT/OVERHEADS	41.94
	$880.83

AFMECO PTY. LTD.

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Telephone: (09) 321 9618, 321 9681
Telex: AFMECO 92077 Perth

0005

TL/ds 80-3443

18th November, 1980

Director-General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD SA 5063

Dear Sir,

Exploration Licence 621 - Wirrida
Quarterly Report 20.7.80 to 19.10.80

A reconnaissance of available outcrop was completed together with radiometric monitoring and rock and water sampling. No anomalies were located, although some fresh granites yielded high radiometric counts.

Plans are under way for an aerial geophysical survey in the coming quarter.

Expenditure for the quarter was $6,856.22 as per the attached Schedule.

Yours faithfully,
AFMECO PTY LTD.

J.-P. POGGI,
Managing Director

Enc.1

STATEMENT OF EXPENSES RELATING TO EXPLORATION PROGRAMME QUARTER ENDING 20.7.80 to 19.10.80

PERSONNEL (FIELD WORK, EVALUATION, OFFICE WORK)	$3,073.41
MATERIAL (DIRECT)	494.10
TRAVEL, ACCOMMODATION (DIRECT)	1,612.23
CONTRACTS, SUPPLIES	371.00
DRAFTING SERVICE, PREPARATION OF REPORTS & MISCELLANEOUS	1,032.99
MANAGEMENT/OVERHEADS	326.49
	$6,856.22

7

AFMECO PTY. LTD.

11-13 Lucknow Place, West Perth, Western Australia
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Telephone: (09) 321 9618, 321 9681
Telex: AFMECO 92077 Perth

JPP:kt 81-657 23rd February, 1981

Env 3839

The Director General,
Department of Mines & Energy,
P.O. Box 151,
EASTWOOD, S.A. 5067

Dear Sir,

EXPLORATION LICENCE No. 621 & 620
QUARTERLY REPORT 20.10.80 - 20.1.81

During December approximately 1200 km and 1500 km respectively of low level high resolution aerial magnetic surveys were flown by Aerodata Services Pty. Ltd.

Processing is now well under way and presentation is expected in the coming period. It is anticipated that from the information obtained an air core drilling programme will follow mid year.

Details of this exercise will be advised in due course.

Expenditure for the quarter is shown as per attached schedule.

Yours faithfully,
AFMECO PTY LTD.

J.-P. Poggi,
Managing Director

ENCL: 1

8

AFMECO PTY. LTD.

11-13 Lucknow Place, West Perth, Western Australia
P.O. Box 526, West Perth, Western Australia, 6005
Telephone: (09) 321 9618, 321 9681
Telex: AFMECO 92077 Perth

TL/tb 81-4602

4th September, 1981,

The Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD, S.A. 5063

Dear Sir,

Exploration Licence 621

Progress Report 21.1.81 - 20.7.81

An airborne magnetic survey was completed by Aerodata Pty. Ltd., and the data interpreted by the consulting geophysist.

During April, Geoex Pty. Ltd., of Adelaide completed a survey of gravity profiles with 118 km of readings (600 stations) and the results in a preliminary form were made available in June.

A limited "air core" drilling programme was carried out with a total of 967m (25 holes). All work was carried out on or adjacent to existing tracks, therefore no declared equipment was used.

An annual report will be prepared and forwarded upon completion.

Yours faithfully,
AFMECO PTY. LTD.

J.-P. POGGI
Managing Director

STATEMENT OF EXPENSES RELATING TO EXPLORATION

PROGRAMME E.L. 621, 21.4.81 to 20.7.81

Personnel (Field Work, Evaluation, Office Work)		6993.56
Material (Direct)		687.13
Travel, Accommodation (Direct)		3314.85
Contracts, Supplies		53,731.29
Drafting Service, Prep. of Reports		3385.11
Miscellaneous		
Management/Overheads		3405.60
	$	71,517.54

STATEMENT OF EXPENSES RELATING TO EXPLORATION
PROGRAMME E.L. 621, QUARTER 21.1.81 to 20.4.81

Personnel (Field Work, Evaluation, Office Work)		(136.01)
Material (Direct)		6.19
Travel, Accommodation (Direct)		174.15
Contracts, Supplies		10,277.61
Drafting Service		645.51
Prep. of Reports		
Miscellaneous		
Management/Overheads		548.37
	$	11,515.82

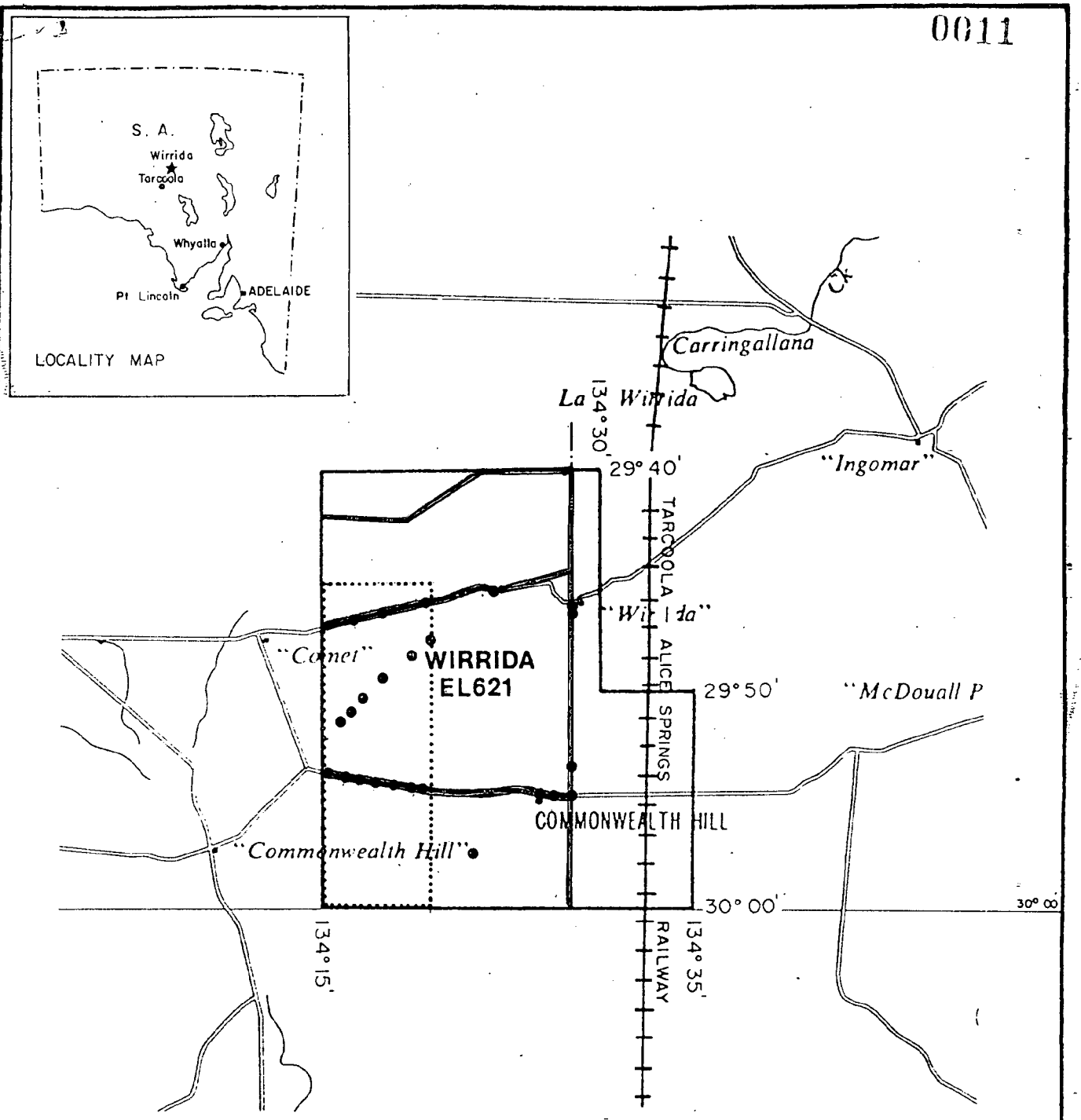


Figure 3

TN

..... Aeromagnetic Survey

● Air Core Drilling

Gravity Survey

DRAWN	SADME
DATE	21-4-80
GEOLOGY	G.R.Ryan
APPROVED	
DWG NO	SH 53-6.T. 1998
REV	

AFMECO PTY. LTD.

SCALE 1:500000 4 0 4 8 12 16 20 km

GAWLER BLOCK

EXPLORATION LICENCE

621

0012

AFMECO PTY. LTD.

11-13 Lucknow Place, West Perth, Western Australia
P.O. Box 526, West Perth, Western Australia, 6005
Telephone: (09) 321 9618, 321 9681
Telex: AFMECO 92077 Perth

MQ/pz 81-5639

December 17, 1981

The Director General
Department of Mines and Energy
PO Box 151
EASTWOOD SA 5063

Dear Sir,

Mining Act 1971 to 1978
Exploration Licence No. 621
2nd Quarter, Year 2
Period 21.7.81 to 20.10.81

During the period covered by this report, the work programme carried out by Afmeco Pty Ltd has concentrated on collation and compilation of the data collected by the 25 drillhole programme undertaken in the previous quarter.

Results from this programme are in the final process of being assessed and summarized for inclusion in a report to be forwarded to your office when completed.

Please find attached a statement of expenditure covering the period of this report.

Yours faithfully,
AFMECO PTY LTD

J.-P. Poggi
Managing Director

Enc.

STATEMENT OF EXPENSES RELATING TO EXPLORATION PROGRAMME
EL 621 QUARTER 21.7.81 to 20.10.81

Personnel (Field Work, Evaluation, Office Work)	1,312.62
Material (Direct)	10.98
Travel, Accommodation (Direct)	44.91
Contracts, Supplies	1,203.46
Drafting Service, Preparation of Reports and Miscellaneous	nil
Management/Overheads	128.60
	$2,700.57

Commitment:	$35,000.00
Permit Year Ends	20.4.82

AFMECO PTY LTD

WHYALLA BASE

Report No. WY 81.4

E.L. 621

WIRRIDA BASEMENT STUDY

by

G.R. STYLES

WHYALLA

SEPTEMBER 1981

CONTENTS

FIGURES

PLATES

APPENDICES

1. INTRODUCTION

1.1 AIM

E.L.621 was originally chosen for exploration work by AFMECO after a preliminary assessment revealed the coincidence of a gravity high and positive magnetic features with outcropping or shallow basement. As a first step towards understanding the geology of this area and the Gawler Craton as a whole, a magnetic interpretation with drilling to obtain fresh basement samples would be undertaken.

1.2 LOCATION AND ACCESS

The E.L. is 620 km by road from Whyalla via the Stuart Highway and the railway road beyond Kingoonya. (Fig. 1). The area is flat and covered by light mulga scrub with a good density of station tracks. Food, Fuel and post office facilities are available at the railway town of Tarcoola, 120 km from the E.L.

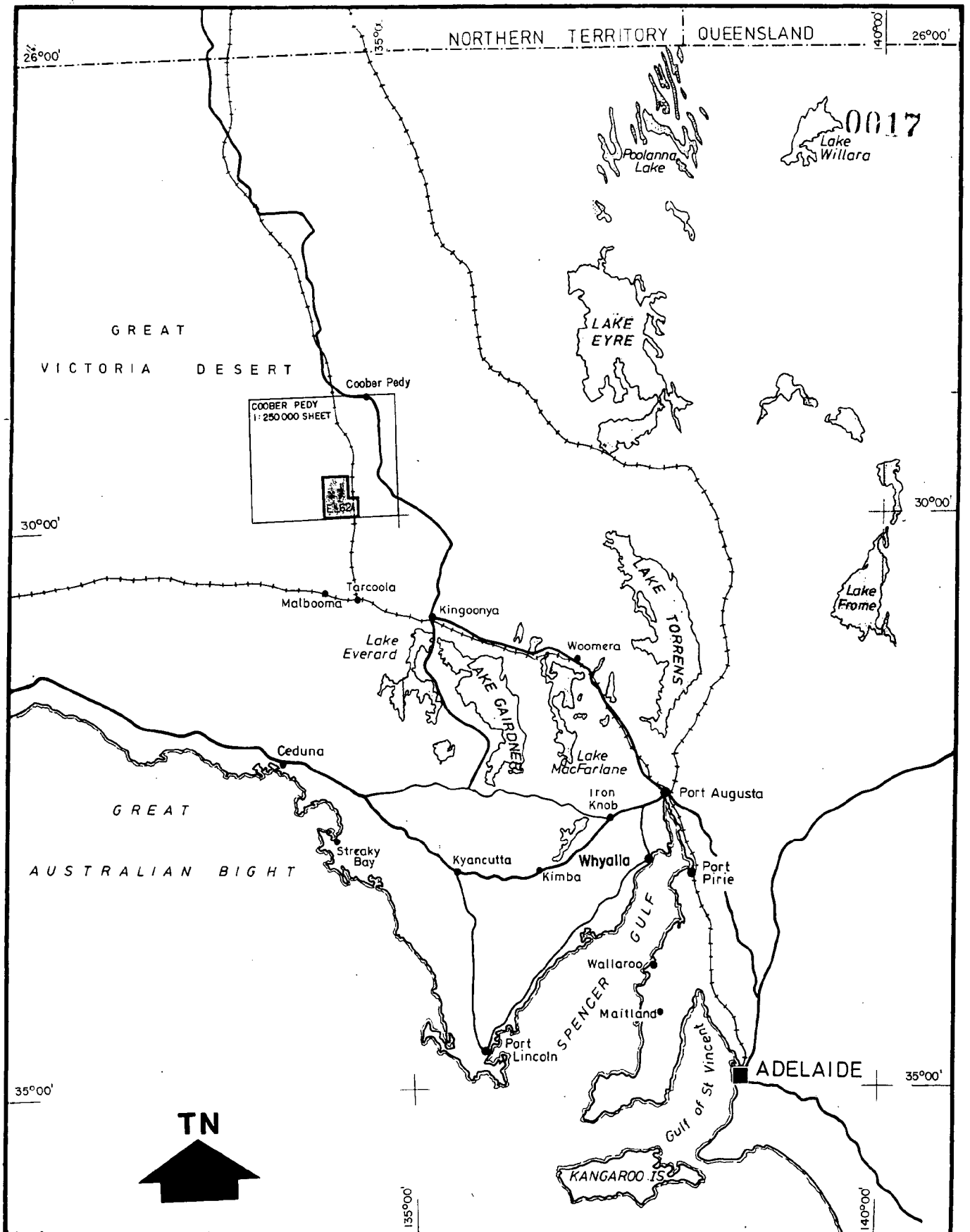
1.3 PREVIOUS WORK

The E.L. falls within the COOBER PEDY 1:250,000 sheet and is covered by magnetic, gravity and a preliminary geological map published by the South Australian Department of Mines and Energy. Benbow (1979) has reported on the basement rocks and made a magnetic interpretation of the COOBER PEDY sheet. B.H.P. (1980) has conducted ground magnetic and gravity surveys followed by three drill holes on the large magnetic body in the central eastern part of the E.L. Mafic diorite with 3-5% magnetite was intersected in the holes.

1.4 GEOLOGICAL SETTING

Interpretation of the regional magnetics and the sparse outcrop information suggests that the crystalline basement of the COOBER PEDY sheet lies in the northern part of the Gawler Craton and is comprised of gneisses and amphibolites and granitoids of the Mulgathing Complex.

The Mulgathing Province is the northern equivalent of the better exposed and better known Sleaford Complex on ~~the~~ Eyre Peninsula in the south. Metamorphism of these former sediments, which included arkosic sandstone



To Accompany Report No. WY 81.4

DRAWN	R.P.S.
DATE	October, 1980
GEOLOGY	G. Styles
APPROVED	
DWG. NO	AFMAP 2923
REV NO	0

AFMECO PTY. LTD.

SCALE 1:5 000 000 — 0 50 100 150 200 250 Kms

WIRRIDA PROJECT

LOCATION AND TENURE MAP

Figure 1

and BIF together with some basic-ultrabasic rocks, occurred at about 2400 MA and reached granulite facies grade and was accompanied by syntectonic granites.

After uplift and erosion the younger sediments of the Hutchison Group were deposited and subsequently metamorphosed (reaching amphibolite facies in places) between 1600 & 1800 MA during the Kimban Orogeny. This orogeny also saw the formation of the granitic gneisses and granulites of the Lincoln Complex. On present knowledge the Hutchison Group is thickest on the Eyre Peninsula and thins northward whilst the Lincoln Complex is apparently restricted to the southern part of the Craton, mainly the Eyre Peninsula. The Kimban Orogeny also caused retrograde metamorphism of the Archaean rocks and produced syn and post tectonic granites.

The Archaean to early Proterozoic crystalline basement is unconformably overlain by the Tarcoola Beds (or equivalents), a thick middle proterozoic sedimentary sequence which is in part contemporaneous with extrusion of the acid Gawler Range Volcanics. The final phase of igneous activity at about 1480 MA resulted in the intrusion of granitic stocks and marked the consolidation of the Gawler Craton.

2. WORK COMPLETED

2.1 GROUNDWORK

A preliminary reconnaissance of the area was carried out in June 1980. After examination of airphotos, outcrops were checked and water samples from windmills were taken.

2.2 GEOPHYSICS

An airborne magnetometer survey was carried out on the 9th and 10th January 1981 on the S.W. corner of the E.L. and the results were interpreted by a consultant (appendix 5). A ground magnetic survey of 98 line km was undertaken to supplement the location of magnetic features from the 1 : 250,000 map. A Geometrics G-816 proton magnetometer was used and readings were taken every 25m.

2.3 DRILLING

A total of 1007.2m was drilled by the contractor Wallis Geochemical Drilling Co Pty Ltd, between 18.3.81 and 31.3.81. Twenty-five holes used the aircore system followed by 1-3m of diamond drilling to obtain samples of fresh basement rock.

2.4 SAMPLING AND ANALYSIS

Aircore samples were taken every metre and then resampled into clear plastic vials for retention as a permanent record. The basement core is stored in core trays with a representative sample being sent for petrography and analysis.

3. RESULTS OF FIELD WORK

3.1 RECONNAISSANCE

Throughout the district outcrop is extremely poor. Apart from several small outcrops of BIF, poorly exposed intensely weathered basement rocks below low silcrete capped scarps provide the only outcrop within the E.L. The weathered rocks are dominantly gneissic (often with a sheared or brecciated fabric) but a rhyolite, schist and a metaquartzite were also found. The spoil from wells and three areas of outcrop provided fresher rock samples. Gneisses and mylonite/brecciated rocks were again dominant but hornfels, schist, metanorite, rhyolite and a thorium rich biotite-orthoclase rock were found (appendices 2, 3a & 4a, Pl. 1).

3.2 DRILL PROGRAMME

Acid gneisses composed of quartz-plagioclase-biotite $\pm$ garnet $\pm$ K feldspar dominate the collection. Other rock types encountered are basic gneiss, amphibolite, basic schist, gabbro, basalt and rhyolite. Except for the last four rocks, the rocks have all undergone granulite or amphibolite facies grade metamorphism. Retrogressive metamorphic effects are common and include the development of biotite and shearing producing an ultramylonite in one case. The basic schist differs from all other rocks in the suite as it has reached greenschist facies grade metamorphism whilst the basalt, gabbro and rhyolite have not undergone regional metamorphism (appendices 3b & 4b, Pl. 1).

4. DISCUSSION

Due to scheduling problems the drilling programme was carried out prior to:

1) assessment of similiar investigative programmes elsewhere in the region;
11) receival of the consultant's interpretation of the magnetic survey.
111) a roadworks programme to provide access to all the magnetic rock units.

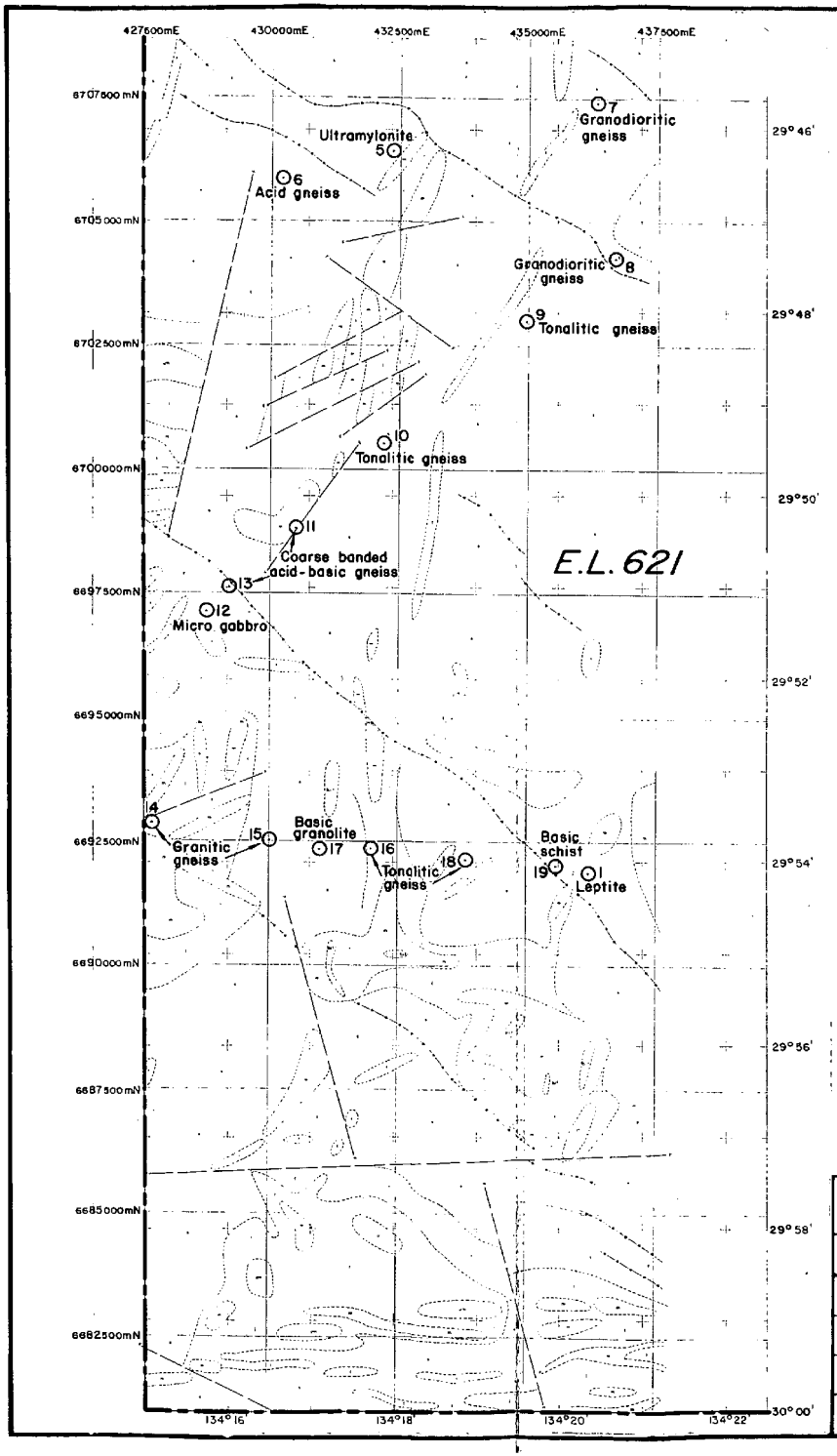
As a consequence the drilling programme utilized the existing road network to provide a series of holes across the airborne magnetic survey area plus a number of holes on positive magnetic features identified from the 1:250,000 magnetic sheet.

Most of the holes were sited on magnetically flat areas so not surprisingly the bulk of the rocks returned are essentially similiar metasedimentary acid gneisses. The basic gneiss (COM 17) also fits the magnetic interpretation being sited near a zone considered to be a BIF unit. The gneisses encountered in COM 2, 4, 24 do not fit the interpretation as they are felsic and low in magnetite but located on strong positive anomalies. On the other hand COM 3, located on a similiar discreet positive magnetic feature returned an amphibolite. (Fig. 2 & 3).

The bulk of the rocks produced by the preliminary reconnaissance are kaolinized, probably felsic gneisses and fit the pattern described above.

All these rocks are considered to be part of the Mulgathing Complex.

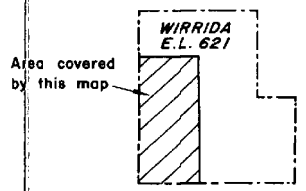
The rhyolites (Stn. 8, 21: COM 22) and the flow basalt (COM 23) are interpreted as members of the Gawler Range Volcanics. Station 21 is a large, known outcrop but the other two samples extend the known range of the group. Station 8 and COM 22 & 23 are situated on either side of the large magnetic feature which was drilled by B.H.P. and found to be diorite (Pl. 2). This diorite, the metanorite (Stn. 19), the gabbro (COM 12), the diorite of MUL 1 (WY 81.3) and the unnamed diorite on the TARCOOLA sheet (Daly 1981) are similiar, likely to be related to each other and may be related to the Gawler Range Volcanics.



LEGEND

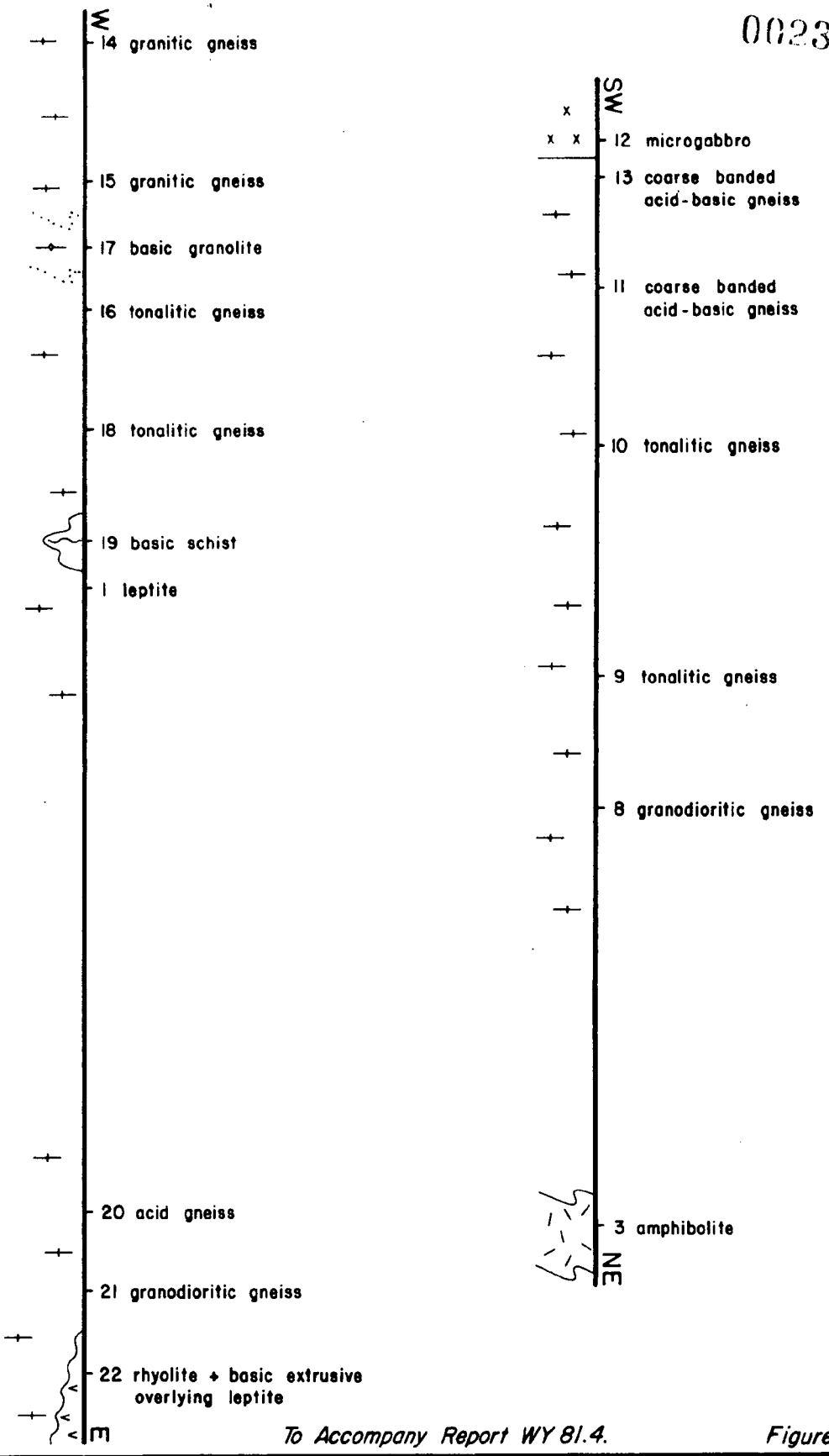
- BANDED IRON FORMATION
- ULTRAMAFIC ROCK UNIT
- MAFIC ROCK UNIT
- INTERMEDIATE ROCK UNIT
- FELSIC ROCK UNIT
- SILICIC ROCK UNIT
- GEOLOGICAL BOUNDARY
- FAULT
- DOLERITE DYKE
- E.L. BOUNDARY
- 17 DRILL HOLE LOCATION & NUMBER

NOTE: This map is a reduction of Woorong 5738-II-NW and SW sheets at 1:25 000.



To Accompany Report WY81.4 *Figure 2*

	AFMECO PTY. LTD.
DWG No. SH53-6.136.3960	SCALE 1:100 000 (2 0 2 4 km)
DRAWN A.E.M.	S. AUST. - WIRRIDA PROJECT
DATE Nov. '81	GEOLOGICAL ROCK UNITS INTERPRETED FROM MAGNETICS SHOWING DRILL HOLE LOCATIONS
COMPILED B.D. & G.R.S.	
APPROVED	



To Accompany Report WY 81.4. *Figure 3*

DRAWN A.E.M.	AFMECO PTY. LTD.
DATE Nov '81	SCALE 1 : 100 000 — 1 0 1 2 3 4 km
COMPILED G.R.S.	
APPROVED	S. AUST. - WIRRIDA PROJECT
DWG. No SH 53-6.136. 3961.	CROSS SECTIONS SHOWING ROCK TYPES INTERSECTED DURING DRILLING
REV.	

DISCUSSION Cont..

The thorium rich biotite-orthoclase rock containing monazite (Stn. 32) is similiar to the metamorphic pegmatites which occur at Mt. Christie and West Well (WY 80.4, WY 81.3). These rocks appear to be conformable with the surrounding gneisses and probably represent original thorium rich sedimentary horizons.

The most significant finding of this report is the schists (Stn. 10, 22, 23, 24: COM 19) which are of greenschist facies metamorphic grade. These rocks are unique within the "Mulgathing Complex Province" as no similiar rocks have been encountered either by AFMECO (Inila, Tallacootra, Childara, Tarcoola, Mulgathing) or anyone else. These schists may be members of a Hutchison Group equivalent metasedimentary group which up till now has consisted only of the Wilgena Hill Jaspilite, a mildly deformed low grade BIF occurring in several isolated outcrops in the Tarcoola area.

Apart from this correlation, it is difficult to fit these schists into the overall geological picture at Wirrida as their character on the magnetic map is not consistent and their relationship to other rock units is not clear.

i) Stn. 10 - an outcrop of decomposed mica schist and gneiss sited on a major magnetic feature composed of diorite with extrusives on the margin.

ii) COM 19 - fresh sample from a small magnetic high (interpreted as a mafic rock unit) which interrupts one of the N.W. trending regional dolerite dykes.

iii) Stn. 22 & 23 - cuttings of green mica schist (hand specimen description only) from water bores sited on a small discreet magnetic feature. (Located outside the E.L.)

iv) Stn. 24 - an exposure of weathered mica schist (hand specimen description only) in a dam in a magnetically flat area, (located outside the E.L.)

It seems likely that these schists, if they are indeed members of a low metamorphic grade metasedimentary sequence, are now only tiny remnants or pockets scattered throughout the region. They are therefore important in the regional context as they suggest that the Hutchison Group, which lies on the craton edge on the Eyre Peninsula, continues northward around the rim of the craton and underlies the Carpentarian and Adelaidean cover rocks.

DISCUSSION Cont..

Benbow (1979) compares the sheared granitoids at Station 6 to the Balta Granite and Engenina Adamellite in the Mt. Woods Inlier and their dates suggest that they are syntectonic Kimban granites. All these granites fit most of the chemical and mineralogical criteria for S-type granites and have a range of U value which are higher than world average but also have a high Th/U ratio.

Notwithstanding the lack of dates and the paucity of information on these schists and granitoids, their mere presence is important for U exploration in the N.-N.W. Gawler Craton as they may be analogous to the Hutchison Group and Lincoln Complex on the Eyre Peninsula and, in turn, to the metasediments and granitoids of the Pine Creek Geosyncline. Here the Archaean Basement rocks are the provenance to the L. Proterozoic metasediments where, in some cases, uranium is selectively enriched resulting in a syngenetic protore. Several options are open for origin of the syntectonic granitoids but they are also enriched in uranium providing a protore which is available for late processes and modification to form orebodies. The fluorite veins in samples 1008-1009 (Stn. 6) may be pointers to the presence of one of these processes in the Wirrida area.

5. REFERENCES

BENBOW M.C., 1979: The precambrian geology and geophysics of the COOBER PEDY 1:250,000 sheet. SADME R/B 79/73, AFMECO R3087

B.H.P., 1980: E.L. 400 Muckanippie, S.A. Final Report, SADME Env. 3334.

APPENDIX 1

DRILLING RECORD

APPENDIX 1

DRILLING RECORD

HOLE	COORDS	TD	AC	DD
COM 1	358 918	46.5	45	1.5
2	494 7075	54.5	54	0.5
3	422 7083	41.5	40	1.5
4	433 180	25	24	1
5	329 7063	46	43	3
6	306 7059	38.5	36.5	2
7	369 7072	35	33.5	1.5
8	372 7042	35	33.5	1.5
9	355 029	38.5	37.5	1
10	327 005	25.5	24.5	1
11	309 988	39.5	37	2.5
12	292 971	50	48.5	1.5
13	296 976	37	35.5	1.5
14	280 928	16.6	14.5	2.1
15	302 924	43.5	41.5	2
16	323 922	34.9	33.5	1.4
17	313 923	24	22	2
18	341 920	37.4	36	1.4
19	358 918	43.8	42.5	1.3
20	465 911	37	35.5	1.5
21	477 912	35.5	33	2.5
22	491 919	51.5	41.5 42-50.5	41.5-42 50.5-51.5
23	492 946	61	59.5	1.5
24	495 069	66	65	1

APPENDIX 1 CONT..

DRILLING RECORD

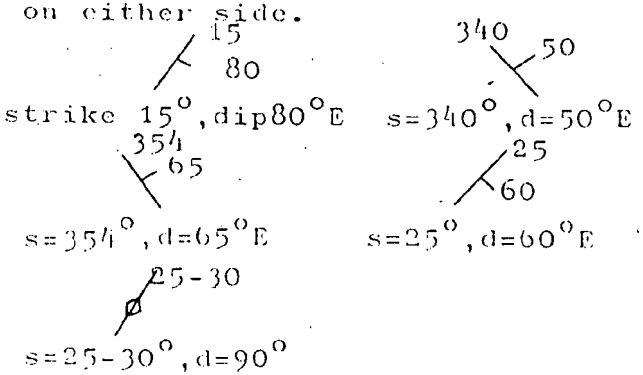
HOLE	COORDS	TD	AC	DD
COM 25	409 856	43.5	42	1.5
		1007.2	967.5	39.7

APPENDIX 2

STATION RECORD

Station No.	Description	SPP2 c/s	Sample No. a=analysis t=thin section w.s.=water sample	Grid Reference 0031
1	recently dug dam, fragments of fresh rock and green clay in spoil: Qtz-fs gneiss = qtz-plag hornfels, qtz-fs-ep-hb gneiss = qtz-fs-hb gneiss	40	1001 -1004 a,t	4 22 E 080 N
2	weak, sporadic outcrop of weathered basement below silcrete: (?) granite	40	1044, 1045 t	4 11 E 077 N
3	old drill hole at head of creek on track: gypsum and white clay in spoil	50		4 26 E 1 04 N
4	dark spot on photo: patch of black ferruginous silcrete gravel	25		4 60 E 1 20 N
5	cuttings from Surprise Bore (abandoned): qtz-fs-mica gneiss	40	1048 t	4 07 E 1 81 N
6	exposure of fresh basement rocks in a window in acolian sand:			3 82 E 2 49 N
	sheared pegmatoid	200	1005	
	qtz-fs breccia/mylonite	250	1006	
	sheared hornfels	120	1007	
	knotted schist	180	1008	
	qtz-fs breccia	300	1009	
			a,t	
	1008 and 1009 are in contact			
7	low silcrete capped ridge	30-40		3 94 E 028 N
7-8	abundant white milky qtz float, few qtz blows	20		

8	silcrete capped ridge, weakly exposed highly weathered basement rocks in gully: sheared qtz-fs gniess, qtz-k rock, kaolinised rhyolitic lava, qtz-k breccia.	40	1049 -1052 t	4 19 E 024 N 0032
9	area of low silcrete ridges and sub o/c of silcrete amongst aeolian sand and clay pans. Scattered concentrations of milky qtz float.	30-40		4 32 E 051 N
10	weakly exposed weathered basement below silcrete ridge, foliated 30-40: k-schist, k-gneiss	30-40	1053 -1054 t	4 14 E 009 N
10-11	low silcrete capped scarp with minor exposures of ppl. clayey cg-gritty sst and thin laminar calcrete below	40-50		
11	poorly exposed weathered basement below silcrete: qtz-k rock → ? pegmatite	30-40	1055 -1056 t	3 90 E 9 61 N
11-12	low silcrete capped scarp with minor poorly exposed sst (white, kaolinitic cg-gravel) 50c/s, < 2m thick; occasionally overlying weathered basement, generally a white massive kaolinitic rock	25-40		
12	well exposed weathered basement: k-gneiss	25-40	1057 -1058 t	4 40 E 9 27 N
13	claypan, floor littered with white milky qtz fragments with 2 small areas throwing black iron stone material	25-30	1046 -1047 a, t	4 43 E 9 42 N

14	well exposed weathered basement, k-gneiss ⌀ 15°, k-fs metaquartzite	40-50	1059 -1060 t	4 43 E 9 27 N 0033
15	small silcrete capped mesa with thin flat bedded kaolinitic sst (40-50c/s) overlying poorly exposed weathered basement-k-qtz rock	60		4 56 E 9 19 N
16	Commonwealth Hill, small hill of BIF, alturnating layers (~/cm) of qtz and hematite-both c-veg. Small isoclinal folds with axes parallel to layers are common. Strike length =500m, thickness= ?~10m. Weak sub o/c of weathered basement (k and k-qtz rock) and thin laminar calcrete on either side. 	25-30		4 65 E 9 09 N
17	three shallow trenches on a quartz blow, spoil consists of milky qtz and minor k-gneiss	30	1061 t	4 58 E 9 09 N
18	poorly exposed BIF, o/c appears to be 2 distinct BIF units (.3-.5m thick) separated by a 2m band of white k-qtz rock. A small patch of fairly fresh metanorite with onion skin weathering is present ~10m away	25-30 60	1010 a, t	4 60 E 8 88 N

19	low rubbly o/c: metanorite	25	1010 a, t	4 80 E 8 89 N
20	spoil from Jacobs Well: altered hornfels	75	1011 t w.s.1018	7 98 E 8 87 N
21	large ($\sim$ 1km^2) outcrop of porphyritic rhyolite	150	1012 a, t	7 19 E 1 05 N
22	cuttings of green mica schist + clear qtz from water bore. Another drill hole, 200mE gave partly decomposed green mica schist (80c/s)	40	w.s.1028 1029	072 E 3 13 N
23	green mica schist in cuttings of water bore	60	w.s.1030	095 E 3 16 N
24	large dam with decomposed mica-chl-k-qtz schist in spoil	140-180	1062 -1063 a	1 89 E 2 90 N
25	low BIF ridge. BIF stops in the south along a sharp line trending 110° - currently defined by a small creek. A few fractured and brecciated boulders of vein qtz suggest the presence of a fault. BIF strike length=1km, thickness = ?200m. Several spots on flanks of ridge gave 75c/s on the ground and 200c/s in calcreted scree rubble at 20-30cm depth. GAD 6 scree b.g. 40c/s T.C K U Th 10sec 27.8 3.4 1.5 1.8 scree 75c/s 10sec 51.7 4.4 3.2 3.7 pit 200c/s 10sec 123.7 8.2 7.6 9.3 100sec 130.3 9.9 8.1 11.1	30-50 75-200	1064 -1065 a	3 11 E 9 32 N

0034

26	sub o/c of weathered basement below silcrete ridge, foliated-non foliated 350 s=350°, d=90° : k-gneiss	25	1066 t	3 07 E 9 19 N 0035
27	several o/c along scarp with silcrete overlying ~/m thin, flat bedded cg k-sst (50c/s) overlying weathered basement - white k-qtz rock (25-30 c/s). One small area of very Fe-rich silcrete present (25c/s)	25-50		3 10 E 9 11 N
28	low ridge of weakly o/c BIF S=80°, d=60°N, S=95°, 100°, 105° d=?	25-30		3 26 E 9 01 N
29	3m high silcrete capped scarp with small area of well exposed basement rocks underlying ~/m of scree or regolith: k-gneiss k-gneiss k-gneiss qtz-k rock k-gneiss k-gneiss	 75 75 50 40 40-50 40-50	 1067 1068 1069 1070 1071 1072 t	3 18 E 8 76 N
30	as for 29 except that a thin (1-2cm) limonite-hematite zone about 20cm below and parallel to the upper contact of the basement is present - 80 c/s. 180-200c/s in small pit GAD 6 basement b.g. 30-50c/s 10sec 31.2 1.9 1.6 2.7 pit 200c/s 10sec 96.2 7.3 7.3 9.0	 200	 1073	3 18 E 8 76 N

31	small anomaly in red soil overlying calcreted rubble ground 75-80c/s 10cm 90-100c/s 30cm 90-100c/s - not increasing with depth	100		2 80 E 8 75 N 0036
32	spoil of middle well at Comet outstation, 400-500c/s:Bt-orth. rock. GAD 6 b.g. 30c/s 10sec 23 3.3 1.5 1.2 500c/s 10sec 229.0 21.4 13.2 16.9 100sec234.5 22.3 12.4 19.9	500	1074 a,t	2 21 E 048 N
33	spoil of No.45 east well:qtz-fs bt gneiss	100	1075 t w.s.1034	1 75 E 040 N
34	spoil of house well:qtz-fs gneiss	40	1076 t w.s.1040	1 84 E 8 77 N
35	poorly exposed weather basement below silcrete: qtz-k rock, k-microgneiss	25	1077 -1078 t	3 07 E 8 47 N
36	good exposure of weathered basement rocks in scree, foliated + massive types. Foliation is strong in places, S=80°:k-gneiss	25	1079 -1080 t	3 29 E 8 17 N
37	~2m sst, cg-gritty, poorly sorted, ab k., dominantly flat bedded and flaggy but a few shallow trough cross-sets are present; overlies poorly exposed weathered basement.	75-100		3 29 E 8 17 N
38	small silcrete capped spur with ~1m boulder conglomerate (70c/s) overlying weathered foliated basement: k-rock	75	1081 t	3 34 E 8 25 N

	up to 125 c/s at contact. GAD 6 conglomerate 70c/s 10sec 42.3 3.5 3.2 3.9 contact 125c/s 10sec 74.7 6.8 3.6 8.6 basement 75c/s 10sec 40.2 2.7 2.7 4.0			
39	flat bedded and planar cross bedded sediments, white k-mudstone, cg sst, gritty sst with ab. k grains + matrix	50-90		3 23 E 8 15 N
40	3m cliff of weathered basement capped by silcrete: k-gneiss, k-breccia	40-60	1082 -1083	3 21 E 8 11 N

APPENDIX 3a

PETROGRAPHIC REPORT ON RECONNAISSANCE SAMPLES

REPORT CMS 80/8/13

Rock Samples 1001 - 1012

Twelve hand specimens were received for thin-section preparation and petrological examination; the offcuts were potash-stained and studied in conjunction with the thin-sections. Brief descriptions are recorded in the accompanying tables.

Summary

This suite consists of metamorphic rocks (meta-igneous, metasedimentary) and one intrusive porphyritic rhyolite (1012).

Some of the rocks are readily recognisable in terms of origin, but many are difficult to interpret, mainly because of polymetamorphism. Even the sequence of metamorphic events is not completely clear; it would seem that an early phase of contact-metamorphism was succeeded by a regional phase of equal or higher grade, accompanied by partial recrystallization. One of the problems is that equilibrium was clearly not achieved, and thus there was an overprinting of effects, with relict ("palimpset") and new features/minerals. However, other rocks were produced by regional metamorphism and affected by later tectonism; it could be inferred that 1008 is younger than 1002/1003. Perhaps the quartz-feldspar breccias (1005, 1006, 1009) were younger (post-regional metamorphism) pegmatites affected only by tectonism, and thus comparable with 1008, and that the hornfelses 1004/1007 also belong to this younger suite (contact-metamorphosed by intrusives, then affected by tectonism).

The metanorite (1010) is anomalous in that it is contact-metamorphosed (hornblende-hornfels facies), but not affected by either regional or dynamic metamorphism.

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Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Comments
1001 (T.S. 33170) Station 1	Quartz-Feldspar Gneiss. Mainly poikiloblastic patches of poorly twinned albite with granulated, recrystallized margins; lenses of strongly stressed quartz.	All components strongly stressed. Good preferred orientation.	Brown, smoky apatite. Muscovite shreds. Rounded zircon. Degraded biotite.	Apparently a gneiss of sedimentary origin, stressed and partly recrystallized at a later stage.
1002 Stn. 1	Quartz-Feldspar-Epidote-Hornblende Gneiss. Bands of granular epidote, mottled plagioclase patches, minor granular quartz, random hornblende needles.	Banded, fine gneissic fabric with evidence of stress, recrystallization.	Magnetite crystals, with sphene rims. Apatite grains.	Polymetamorphic; possibly a banded hornfels, subjected to regional metamorphism with partial recrystallization.
1003 Stn. 1	Quartz-Feldspar-Hornblende Gneiss. Small Na-plagioclase patches, minor quartz; acicular hornblende, mostly lineated, microgranular epidote.	Gneissic/microgneissic fabric, but many recrystallization textures.	Granular sphene, traces of apatite.	Rock shows two distinct metamorphic events (thermal, regional), but may both be part of same phase. Similar to 1002.
1004 Stn. 1	Quartz-Plagioclase Hornfels. Dominantly interlocking patches of Na-plagioclase with mottled twinning; small stressed quartz mosaics and myrmekitic intergrowths.	Fairly homogeneous granular fabric, stressed, but no preferred orientation.	Small muscovite and biotite clusters.	Composition featureless, possibly igneous or anatectic; later stress, recrystallization in part.
1005 Stn. 6	Sheared pegmatoid. Large masses of very coarsely-crystalline orthoclase, smaller albite crystals and quartz patches, all strongly stressed, fractured, sheared.	Coarse, crudely-banded, gneissic fabric, mainly tectonic.	Wispy chlorite throughout. Traces of epidote, fluorite, ?metamict allanite.	Not known if original rock was orthodox igneous pegmatite or of metamorphic formation.
1006 Stn. 6	Quartz-Feldspar Breccia/Mylonite. Large and small splinters, fragments, of highly stressed quartz, orthoclase, minor albite; rock flour.	Strong, intensive crushing throughout, with mylonitisation in shear zones.	Fine chlorite shreds throughout. Possible ?allanite. Leucoxene films.	Could well be a more intensely sheared equivalent of 1005, partly mylonitised. Chlorite is post-shearing.
1007 Stn. 6	Sheared Hornfels. Irregular large and small lenses/fragments of quartz-K-feldspar-albite rock set in fine fibrous quartz with biotite, with schistose fabric.	Fabric of original rock was granular, now strongly sheared, gneissic.	Traces of apatite, granular sphene, sericite. Rounded zircon in feldspar.	Could be strongly sheared version of 1004; originally a sediment, first hornfelsed, then sheared.
1008 Stn. 6	Knotted Schist. Large and small euhedral but fractured porphyroblasts of orthoclase, albite, in a fine streaky quartz-biotite-sericite matrix.	Fine compositional banding. Schistosity envelops porphyroblasts	Fluorite-quartz veinlets in fractures in feldspars. Granular sphene.	Evidently porphyroblasts formed early, were affected by tectonism; fluorite is confined to feldspar crystals.
1009 Stn. 6	Quartz-Feldspar Breccia. Small and large fragments of mainly very coarse orthoclase, albite; minor mosaic quartz; a few fine muscovite patches, streaks.	All minerals strongly stressed, fractured; quartz recrystallized. Crudely banded.	Fluorite patches conspicuous. Wispy biotite-chlorite. Manganepidote or allanite.	Broadly similar to 1005 and 1006. Fluorite apparently post-tectonic, in quartz veinlets.

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Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Comments
1010 Stn. 18	Metanorite. Random laths of clear, fresh labradorite, interstitial hypersthene and granular pseudomorphous augite/hornblende intergrowths after hypersthene.	Medium- to coarse-grained, typically gabbroic fabric.	Uralitic alteration along parallel micro-fractures. Scattered oxide opaques.	Orthodox basic igneous rock, thermally metamorphosed, with specific re-crystallization of pyroxene. Not regionally metamorphosed.
1011 Stn. 20	Altered ?Hornfels. Mostly granular K-feldspar and albite, extensively argillised; quartz patches, many chlorite aggregates, chloritised garnet patches.	Medium-granular fabric, no preferred orientation.	Hematite-goethite patches. Leucoxene films in chlorite. Rounded zircon.	Could be related to 1004, but probably higher grade; fresh rock was garnet-biotite-quartz-feldspar assemblage.
1012 (T.S. 33181) Stn 21	Porphyritic Rhyolite. Well-formed phenocrysts of quartz, orthoclase and occasional oligoclase, in microgranular quartz-K-feldspar groundmass with fine chlorite.	Random distribution/ orientation of phenocrysts; no flow-features.	Scattered chloritised hornblende crystals. Oxide opaques. Apatite.	Minor or shallow intrusive rock. Compatible with Gawler Range Volcanics. Not metamorphosed.

REPORT CMS 80/8/29

Samples 1044 - 1083

0042

Thirty-four rocks were received for thin-section preparation and petrological description; because of their highly altered nature, and an overload situation at CMS (necessitating preparation by another laboratory), delays were experienced in completing this investigation, for which we apologise.

Summary

Because of the very widespread and intense kaolinisation, particular care was taken in examination and interpretation. Inevitably, interpretations are more tentative, less confident and conclusive, than if fresh rocks were involved. A more serious aspect is that comparisons and correlations are less meaningful, because rocks tend to be rather similar; it is difficult to judge whether such similarities are real or apparent.

The fabric and textures lay an important part in interpretation, and rocks can be subdivided into coarse/medium/fine, gneissic/non-gneissic ("granitic") and other types; it is quite possible that some gneissic rocks are sheared or metamorphosed versions of the non-gneissic types.

Some rocks contain rounded, detrital zircon grains, and these can be interpreted with some confidence as metasediments. In a few, fabrics are completely diagnostic (e.g. 1051, a kaolinised rhyolitic lava).

There is good cumulative evidence to indicate that kaolinisation was a low-grade hydrothermal event rather than simple weathering, but field data may contradict this observation.

It is suggested that the results be reviewed in the context of field evidence; it may then be advantageous to re-evaluate the petrology.

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Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Comments
1044 (T.S. 33297) Station 2	Kaolinised "Granite". Mostly shapeless aggregates of kaolinite flakes, with scattered, irregular, stressed quartz grains and fragments.	Coarse fabric; no relict textures, no preferred orientation.	Fine leucoxene-rutile possibly from ?biotite.	Fabric suggests an igneous intrusive, and present mineral assemblage could be derived from granite in broadest sense.
1045 Stn. 2	Kaolinised "Granite". Coarse, fragmented, irregular masses of stressed quartz, interstitial kaolinite patches; large lenses/wedges of compact kaolinite.	Fairly uniform coarse fabric, brecciated in places.	Traces of MnO_2. Limonite staining of clay in places.	Similar to 1044, but more quartz, less kaolinite (i.e. feldspar). Broadly granite in aspect, but origin uncertain.
1046 Stn. 13	Ironstone. Compact and earthy, extremely fine-grained goethite intergrown with fine clay; scattered quartz fragments.	Structureless, featureless; no relict textures or boxworks.	None detected.	Not a true gossan, because no evidence of sulphides. Origin unknown, possibly sedimentary.
1048 Stn. 5	Quartz-Feldspar-Mica Gneiss. Shapeless grains of K-feldspar, sodic plagioclase, small quartz mosaics, interstitial fine phlogopite, sericite.	Variable gneissic fabric, weakly sheared; medium- to coarse-grained.	Leucoxenic chlorite (oxidised) after biotite.	Four fragments sectioned are variable in fabric and composition. Possible igneous origin.
1049 Stn. 8	Sheared Quartzofeldspathic Gneiss. Thin, elongate lenses of strongly stressed quartz, bands of kaolinite with embedded muscovite flakes.	Gneissic fabric modified by later shearing; minor folding, fracturing.	Sporadic fine hematite in places.	Featureless rock; origin uncertain, as to whether igneous or sedimentary.
1050 Stn. 8	Quartz-Kaolinite Rock. Angular/splintery fragments of fine to coarse stressed quartz haphazardly embedded in fine featureless kaolinite.	Extensively brecciated, but little or no preferred orientation.	Isolated patches of earthy goethite.	Rock is featureless and origin unknown; possibly a kaolinised granite-breccia or fault-zone material.
1051 Stn. 8	Kaolinised Rhyolitic Lava. Conspicuously flow-banded, vesicular material, now fine quartz; extensive network of kaolinite veins.	Outstanding fine flow-features are diagnostic.	Portions of rock contain fine hematite (later).	Originally a glassy extrusive rock of rhyolitic composition. Kaolinite veins are apparently replacive, hydrothermal.
1052 Stn. 8	Quartz-Kaolinite Breccia. Kaolinised "granite" and coarse, massive, stressed and brecciated quartz-vein material; many hematite veinlets.	"Granite" fabric similar to 1044, 1045. Coarse-grained; abundant fracturing.	None detected.	Rock may have been a granite similar to 1044, 1045, with thick, coarse quartz veins, strongly brecciated.
1053 Stn. 10	Kaolinised Schist. Mainly kaolinised, ferruginised, matted mica flakes; interspersed parallel stringers of stressed, tabular quartz.	Schistose fabric clearly preserved, but textures altered by kaolinisation.	Isolated rounded detrital zircon.	This was a mica-rich schist, possibly originally biotitic; low-grade metamorphism of argillic sediment.

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Sample No.	Rock Type & Composition	Fabric	Minor Minerals	Comments
1054 Stn.10	Kaolinised Gneiss. Subparallel, elongate masses of stressed quartz set in compact kaolinite mostly pseudomorphous after feldspar.	Fairly coarse, gneissic fabric, with relict feldspar textures.	Fine goethite throughout. Scattered muscovite flakes.	Fresh rock was a quartz-feldspar-muscovite gneiss; no evidence concerning origin (igneous/sedimentary).
1055 Stn.11	Quartz-Kaolinite Rock. Dominantly kaolinite, as random, very coarse "books"; flakes up to 0.3 mm across. Scattered, irregular quartz grains.	Very coarse fabric, but no recognisable relict textures.	Occasional goethite and leucoxene films.	Rock could be a coarse, feldspathic lens from a quartzofeldspathic gneiss, or perhaps a pegmatite.
1056 Stn.11	Quartz-Kaolinite Rock. Dominantly kaolinite, pseudomorphous after very coarse feldspar (?orthoclase); scattered, fractured quartz patches.	Good pseudomorphous textures after feldspars. Very coarse fabric.	Zircon crystals up to 1.5 mm. Euhedral oxide opaques.	Believed to be a kaolinised pegmatite, probably of igneous origin.
1057 Stn.12	Kaolinised Gneiss. Shapeless masses of interlocking quartz grains set in a mass of kaolinite aggregates and pseudomorphs after feldspars.	Vague preferred orientation, coarse fabric.	Intergranular goethite films.	Originally a quartzofeldspathic gneiss, but of unknown origin; featureless.
1058 Stn.12	Kaolinised Gneiss. Generally fairly small (< 1 mm), stringers of stressed quartz grains, shapeless masses of kaolinised feldspar.	Uniform fabric with preferred orientation, but not markedly gneissic.	Scattered subparallel muscovite flakes. Goethite films.	A kaolinised quartz-feldspar-muscovite gneiss; origin and metamorphic grade uncertain.
1059 Stn.14	Kaolinised Gneiss. Lenses, granular masses of stressed quartz, small shapeless patches of ultrafine kaolinite, fine muscovite patches.	Fabric more granular than gneissic, with weak preferred orientation.	Goethite films. Cross-cutting kaolinite veins. Rounded zircon.	Presence of rounded zircon indicates sedimentary origin, but other details obliterated.
1060 Stn.14	Kaolinised, Feldspathic Metaquartzite. Mainly clear, unstressed mosaic quartz, with stringers and patches of kaolinised feldspar.	Granular, but with preferred orientation of kaolinitic lenses.	Small leucoxenic rutile grains and rounded zircon.	Quartz-rich metasediment which grades into gneiss with increase in feldspar.
1061 Stn.17	Kaolinised Gneiss. Coarse, stressed, fractured quartz masses; aggregates and streaks of fine kaolinite with fine goethite.	Coarse gneissic, lensoid fabric; some evidence of shearing.	Relict muscovite patches; a few coarse rutile masses.	Origin not known. Rutile may be secondary (from ?biotite). Fresh rock was quartz-feldspar-mica gneiss.
1066 Stn.26	Kaolinised Gneiss. Mostly shapeless masses of fine kaolinite after feldspar, coarse stressed quartz; goethite boxworks after coarse garnet.	Very coarsely-granular fabric, with fracturing and minor shearing.	General Fe-staining.	Differs from other gneisses in containing garnet; probably upper greenschist/lower amphibolite facies.

Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Comments
1067. Stn.29	Kaolinised Gneiss. Thin, subparallel lenses of highly stressed quartz, shapeless K-feldspar grains, fine kaolinitic matrix.	Well-defined gneissic fabric, with superimposed shearing.	Small muscovite flakes throughout matrix. Rounded zircon.	Rock is less severely kaolinised, contains some feldspar. Sedimentary origin, probably greenschist facies.
1068 Stn.29	Kaolinised Gneiss. Thin streaks/lenses of stressed quartz, bands of muscovite flakes, K-feldspar patches, abundant kaolinite.	Good gneissic fabric with younger shearing and fracturing.	Small aggregates of fresh and chloritised biotite. Fe-staining.	Broadly similar to 1067, with primary minerals preserved despite pervasive kaolinisation.
1069 Stn.29	Kaolinised Gneiss. Wide bands of kaolinised feldspar with altered and fresh muscovite, ?biotite; quartz lenses; granular quartz-kaolinite bands.	Coarsely banded, gneissic, with younger shearing.	Crosscutting kaolinite veins. Patchy Fe-staining.	Similar to 1067, 1068, but no feldspar has survived. Granular quartz-kaolinite bands could be ?intrusive.
1070 Stn.29	Quartz-Kaolinite Rock. Irregular, branching patches of highly stressed quartz, shapeless kaolinite masses, relict K-feldspar grains.	Fabric coarsely granular, not gneissic, perhaps ?igneous.	Patches of randomly orientated muscovite flakes.	Rock may have been a granite or granitoid (i.e. metasedimentary). Fabric differs from that of gneisses.
1071 Stn.29	Kaolinised Gneiss. Irregular lenses, stringers of stressed quartz, subparallel muscovite aggregates, very abundant ultrafine kaolinite.	Medium/coarse gneissic fabric disturbedby younger shearing.	Shear zones with quartz, muscovite fragments and compact kaolinite.	Fairly featureless and of unknown origin; simple composition.
1072 Stn.29	Kaolinised Gneiss. Granular, stressed quartz lenses, bunches of deformed muscovite flakes, patches of fine, compact kaolinite.	Medium/coarse, granular to gneissic fabric. Uniform.	Fibrous sericite bundles = altered sillimanite. Quartz-muscovite veins.	Rock was quartz-feldspar-muscovite-sillimanite gneiss, ie. amphibolite facies; probably metasedimentary.
1074 Stn. 32	Biotite-Orthoclase Rock. Scattered, large biotite flakes (up to 2 mm) with associated monazite, randomly set in interlocking coarse/medium orthoclase.	Strange, formless fabric, neither igneous nor metamorphic. Medium-coarse.	Apatite, metamict ?allanite, ilmenite/rutile intergrowths. Oligoclase.	Monazite, apatite grains appear corroded; rock is fresh, but origin is puzzling. Perhaps an igneous-related vein/body.
1075 Stn.33	Quartz-Feldspar-Biotite Gneiss. Anhedral to subhedral K-feldspar, oligoclase; stressed quartz patches; random biotite flakes; a few garnet crystals (almandine).	Fabric not particularly gneissic; almost igneous. Coarse, homogeneous.	Well-rounded zircons with pleochroic haloes in biotite.	Although fabric not especially gneissic, mineral assemblage and sedimentary origin are appropriate to this classification.
1076 Stn.33	Quartz-Feldspar Gneiss. Patches of eutectoid K-feldspar/plagioclase intergrowths, granular orthoclase and interstitial mosaic quartz.	Featureless, granular, medium/coarse fabric; distinctive textures.	Hematitised magnetite grains; degraded biotite patches. Rounded zircon.	Simple composition, featureless rock; sedimentary origin indicated by detrital zircon.

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Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Comments
1077 stn.35	Quartz-Kaolinite Rock. Very largely fine, compact kaolinite flakes, with interspersed small, stressed quartz patches.	Medium-grained, weakly orientated. Vermiform kaolinite textures.	None detected.	In all these rocks, stress phase (i.e. dynamic metamorphism) occurred whilst competent, i.e. before kaolinisation.
1078 stn.35	Kaolinised Microgneiss. Parallel, thin bands/stringers/streaks of fine mosaic quartz, broader bands of fine kaolinite.	Good preferred orientation and fine banding, fine /medium grain-sizes.	Diffuse patches of leucoxene, possibly from ?biotite decomposition.	No schistosity seen, thus probably a microgneiss, of sedimentary origin(?)
1079 stn.36	Kaolinised Gneiss. Subparallel streaks of stressed mosaic quartz, kaolinite bands with muscovite flakes, a few feldspar poikiloblasts.	Typical lensoic, gneissic fabric, uniform, coarse.	Fine leucoxene, occasional earthy hematite.	Quite similar to 1068 in particular. Probably sedimentary in origin.
1080 stn.36	Kaolinised Gneiss. Dominantly composed of coarse kaolinite, with abundant interstitial amorphous silica; quartz virtually absent.	Semi-schistose fabric; medium-grained, sheared.	None detected	Kaolinite appears to be pseudomorphous after a fibrous silicate, possibly tremolite or sillimanite.
1081 stn.38	Kaolinite Rock. Massive ultrafine, semi-amorphous and fibrous kaolinite, with embedded altered oxide opaques. No quartz.	Vague preferred orientation, poorly defined relict textures.	Subparallel leucoxene streaks.	Origin of rock unknown, presumably strongly feldspathic, possibly igneous (?trachytic) or metamorphic (Al-silicates).
1082 stn. 40	Kaolinised Gneiss. Irregular, blocky masses of highly stressed quartz set in massive, fine-grained kaolinite with small muscovite flakes.	Coarse gneissic fabric mainly indicated by aligned quartz.	Irregular grains of pale, cloudy rutile.	Originally quartz-feldspar-muscovite gneiss, perhaps with biotite (rutile may be derived from Biotite).
1083 (I.S. 33330) stn 40	Kaolinised Breccia. Angular and splintery fragments of stressed quartz, kaolinite pseudomorphs after feldspar fragments, embedded muscovite shreds.	Tectonic breccia fabric with weak preferred orientation.	Ultrafine white leucoxene.	Brecciation pre-dated kaolinisation, because all fragments are angular; originally a gneiss.

APPENDIX 3b

PETROGRAPHIC REPORT ON

DRILL SAMPLES

GENERAL COMMENTS

The modal estimations include the secondary minerals, so that the figure for plagioclase, when it is altered to sericite, is plagioclase plus sericite.

The naming of the quartz feldspar gneisses uses acid plutonic compositions for convenience of comparison. Thus gneisses with significant alkali feldspar are 'granitic', modest alkali feldspar are 'granodioritic', and negligible alkali feldspar 'tonalitic'. All, of course, have significant quartz. This nomenclature is entirely petrographic, i.e., it does not assume any genetic connection with the granite suite.

Excluding the microgabbro 1278, metaporphry 1289 and altered basalt 1282, the cores represent a suite of metamorphic gneisses that, with rare exceptions such as granolite, 1284, are not readily classified genetically or in terms of their metamorphic grade. There is also plenty of evidence of retrogressive metamorphism, which appears much more active in acid gneisses than in basic. This is demonstrated by the biotite replacement of garnet.

With the exception of 1284, the basic gneisses are of amphibolite grade, e.g. 1259 and 1267.

The general composition of the acid gneisses is quartz-plagioclase (oligoclase-andesine) - biotite $\pm$ garnet $\pm$ K feldspar. (Note their similarity to the Potosi Gneiss of Broken Hill, a source of contention with regard to origin). In some gneisses, it is possible to argue for the metasomatic source of the potash, perhaps associated with the retrogressive activity related to ?acid intrustions.

In one sample (1287) andalusite was seen to be developing in the decussate biotite masses, supporting the thermal

episode. Dislocation metamorphism has affected a number of the gneisses, producing a mylonitic product in one instance (1269). Unless macroscopic fabrics such as sedimentary layering is preserved, i.e., psammite-pelite alternates, the literature shows that most workers revert to geochemistry to identify the primary rock type. Note, however, the sandy appearance of the quartz in 1291.

In summary, the bulk of the samples are acid gneisses whose parent material cannot be equivocally identified by microscopy. They suffered at least amphibolite grade regional metamorphism, and may have experienced granulite conditions, subsequently affected by retrogression, perhaps associated with thermal metamorphism, allied to alkali metasomatism. A cataclastic imprint was also important at a late stage in their development.

0050

1265 COM 1

MACROSCOPIC: Biotite semi-pelitic schist
MICROSCOPIC: Biotite leptite

Plagioclase	45-50%
Quartz	35-40%
Biotite	5-10%
K Feldspar	5-10%
Apatite	Trace
Opaques	Trace

This is a fine grained leucocratic semi-schist or micro-gneiss, with biotite occurring in rough bands separating wide quartz feldspar layers. The mica is finer grained than most previously described in this suite of cores, with long dimensions rarely exceeding a millimetre. It also has a yellow to foxy red pleochroism, contrasting the 'browns' of the previous samples. On a microscopic scale, orientation of the individual flakes is only moderate.

The core also is distinguished by the appearance of fine K feldspar, entirely allotriomorphic or interstitial to the coarser plagioclase or K feldspar. The quartz tends to form oriented lens with, internally, a mosaic-like quartzite texture. The plagioclase (andesine) is in part anti-perthic. It forms granoblastic texture associations, individuals rarely exceeding 0.5 mm. Much is spotted with alteration products. It also has yellow ? limonite penetrating the cleavage planes, visible as a yellow stain macroscopically.

There are minor veins of limonite stained ? epidote.

It has a more alkali composition than the tonalitic group. The term leptite is used for a medium to high leucocratic fine grained metamorphite, where schistocity is lacking.

1266 COM 2 0051

MACROSCOPIC:

MICROSCOPIC: Altered garnet biotite-tonalitic gneiss

Quartz	40-50%	SECONDARY
Feldspar	40-50%	Chlorite
Biotite	15-20%	Sericite
Garnet	1%	Leucoxene
Tourmaline	1%	Carbonate
Sphene	1%	
Muscovite	1%	

This is a poorly foliated, probably part recrystallized tonalitic gneiss. The gross texture remains gneissose with lenses of quartzite, moderately oriented, separating granoblastic plagioclase and strips of dark mica. There are a few fine relict garnets, surrounded by chloritised biotite.

The evidence for recrystallization under low pressure conditions, is given by the fine non-deformed quartzite mosaics, the cloudiness of the plagioclase, and the finely crystalline descussate biotite to hydrobiotite aggregates. A green pleochroic ? hydrobiotite appears to be an intermediate stage of the alteration to chlorite.

Carbonate development, particularly in these mica zones, is mainly of vein type. Tourmaline forms several equidimensional 0.3 mm colourless to pale green crystals within quartzite.

Semi-opaque masses of 0.2 - 0.3 mm diameter are interpreted as secondary sphene/leucoxene products of the recrystallization of altered ilmenite, whose idioblastic outline remains as a palimpsest.

It is interpreted as a quartz-plagioclase biotite gneiss that has been recrystallized under thermal metamorphism.

1267 COM 3 0052

MACROSCOPIC: Amphibolite

MICROSCOPIC: Partially sheared biotite amphibolite

Plagioclase	50-60%	SECONDARY
Hornblende	40-50%	Sericite
Biotite	3- 5%	Saussurite
Opaques	1%	Epidote
Apatite	1%	Chlorite
Sphene		
Quartz		

This is a probable metagabbro that retains a non-lineated texture, composed essentially of hornblende and calcic plagioclase. Grain diameters averaged between 0.5 and 1.5 mm. Apatite was the main accessory with non-magnetic opaques.

Subsequent cataclastic forces have resulted in the development of semi-mylonitic zones, and the partial recrystallization of the amphibole and alteration accompanying strain in the plagioclase. The fracture zones are about 0.2 mm wide and consist of amphibole and feldspar, plus ? quartz, with individual rarely exceeding 50 microns. Their composition and width is not consistent, sometimes they become saussuritic bands when traversing plagioclase, or dominantly amphibole where the blast has been sheared out. Some contain sphene but are surprisingly deficient in biotite. Fine cubic opaques are also common.

Away from these zones, the regional fabric gives indications of deformation history, the millimetric amphibole is now fringed by fibrous actinolitic hornblende, while the plagioclase is cloudy and develops complex twin patterns, not unlike the crosshatch pattern of microcline, twjnning can also be strongly deformed.

Biotite tends to form bunches fringing the amphibole, or associated with opaques, apatite, and the sphene surrounded the ? ilmenite. Only in the layer occurrences is chlorite developing. Much of the mica is limonite stained however.

1268 COM 4

0054

MACROSCOPIC: Leptite

MICROSCOPIC: Biotite leptite

Plagioclase	70-75%
Quartz	20-30%
K Feldspar	3- 5%
Biotite	1%
Opaques	1%
Apatite	1%

A medium grained granoblastic leucocratic 'gneiss', dominated by an anti-perthitic plagioclase of andesine composition. The coarse quartz has a distribution suggestive of a rough banding or gneissocity.

The plagioclase averages about a millimetre, and are equidimensional. Contacts are variable, from straight edges, against each other, to highly irregular with the interstitial quartz or microcline. Twinning is typical of medium to high grade metamorphic conditions, complex with 'veeing' common. The feldspar is fresh, apart from traces of sericite in the cleavages. Potash feldspar, apart from the anti-perthite, is confined to minor interstitial envelopes to the plagioclase. Quartz may also have this habit, and there is evidence of replacement of the plagioclase.

Biotite is irregularly dispersed, with no apparent orientation, associated with oxidised opaques, of red colour macroscopically. This tonalitic composition rock has experienced relatively high metamorphic temperatures as indicated by the presence of anti-perthite. Possibly this is the result of a thermal event, accompanying silification and alkali metasomatism.

1269 COM 5 0055

MACROSCOPIC: Mylonite

MICROSCOPIC: Porphyroclastic mylonite

Plagioclase, Quartz	90-95%	VEIN: K Feldspar
Chlorite	5-10%	
Opaques	10 2%	
Zircon	Trace	
Apatite	Trace	

The interval appears to be a classical example of dislocation metamorphism presumably of a biotite tonalitic 'gneiss'. Recrystallization has not occurred and thus the texture consists of relict fragments of coarse material, always highly deformed, of plagioclase and quartz, set in a very fine grained crushed matrix.

There are millimetric lenses and bands of totally deformed quartz, now ribbon textured quartzite. Plagioclase clasts are common, from 0.5 mm down to the matrix grain size of about 25 microns. These feldspars are relatively fresh, apart from bending of the twin planes.

The matrix texture consists of tightly packed lens-shaped quartz and feldspar fragments enclosed within a thin chlorite schistocity. Fine rod-like opaques are common in the chlorite; there are occasional coarser leucoxene-sphene lenses. Zircon is rounded, probably unaffected, whereas the rare apatites are clearly broken. There are thin veinlets of potash feldspar, subsequent to the deformation.

1270 COM 6 0056

MACROSCOPIC: Garnet biotite gneiss contact

MICROSCOPIC: Contact between garnet biotite quartz plagioclase gneiss (A) and granitic gneiss

	A
Quartz	35-40%
Plagioclase	35-40%
Garnet	10-15%
Biotite	10-15%
K Feldspar	Trace
Zircon	Trace
Opaques	Trace

The finer grained schistose part of the sample (A) is a typical semi-pelitic gneiss, medium to coarse grained, with the schistocity only shown by biotite. The biotite, quite fresh with a yellow to foxy red pleochroism, forms well oriented bunches, except when it is 'entangled' with the garnets, where it tends to follow the outline of the latter. The equidimensional garnets are 1 - 2 mm diameter, usually containing coarse rounded quartz inclusions. The matrix is an inequigranular granoblastic association of quartz and plagioclase feldspar (oligoclase), with diameters rarely exceeding 0.5 mm. There is minor K feldspar within the plagioclase, probably an incipient anti-perthite.

The leucocratic contact rock is a very coarse (0.5 cm) granitic type with microcline, ? microperthite, possibly in excess of a sodic plagioclase, with myrmekitic contacts and quartz.

The garnet biotite metamorphite is potentially a paragneiss, although related to the quartz plagioclase tonalitic gneisses previously described.

1271 COM 7 0057

MACROSCOPIC: Garnetiferous granite gneiss
MICROSCOPIC: Biotite garnet granodioritic gneiss

Quartz	35-40%
Plagioclase	35-40%
K Feldspar	15-20%
Garnet	5-10%
Biotite	3- 5%
Zircon	Trace

Rocks of this coarseness are difficult to judge from a small piece of quartered core. However, the slide examined under very low power shows that there is a distinct lineation of the quartz. The texture can be described as xenoblastic inequigranular.

Due to their fractured nature, the garnets were not fully retained in the slide. Their relatively idioblastic outline is clear, and the presence of coarse rounded quartz inclusions. The biotite, of similar type to 1270, has also a degree of orientation.

The plagioclase, probably oligoclase, is frequently sericitisized, and rarely develops simple twjnning. Some are anti-perthitic. Grain sizes range from 0.5 to 1 mm. The K feldspar is similar of habit and size, and is perthite.

There is evidence of some recrystallization with fine quartz and K feldspar rimming the coarse plagioclases.

The dominance of plagioclase over alkali feldspar places the rock compositionally in the granodiorite composition. It has significant potash feldspar, absent from the tonalitic gneisses 1258-1270.

1272 COM 8 0058

MACROSCOPIC: Chloritic granite gneiss

MICROSCOPIC: Biotite garnet granodioritic gneiss

Quartz	30-35%
Plagioclase	30-35%
'Biotite'	15-20%
K Feldspar	10-15%
Garnet	3- 4%
Muscovite	1- 2%
Zircon	Trace
Sphene	Trace
Leucoxene	Trace

This is a coarse, poorly gneissose, partly recrystallized gneiss. It is characterised by coarse 'garnets' that have almost entirely been replaced by a fine decussate textured green mica. Up to 15% of garnet is preserved in fine 'islands' within the micaceous substitute. The garnets were millimetric, or centimetric, as is clear from the hand specimen. The palimpsests contain numerous rounded quartzite inclusions to 0.5 mm.

Smaller 'garnet' zones contain areas of 'normal' brown biotite, never containing relict garnets, and possibly are recrystallized coarse biotite.

The non-garnet bulk of the rock consists of inequigranular granoblastic plagioclase and quartz. Some of the feldspar is heavily spotted with white mica, while the quartzite mosaic character of the quartz indicates recrystallization. The occasional potash feldspar is strongly perthitic and also spotted with mica.

This rock shows again, like 1266 evidence of a contact retrograde metamorphism, superimposed on regional This was not at the lowest temperatures of the green schist facies because of the formation of biotite rather than chlorite.

1273 COM 9 37.8m

0059

MACROSCOPIC: Garnetiferous acid 'gneiss'

MICROSCOPIC: Garnet tonalitic 'gneiss'

Plagioclase	40-50%
Quartz	40-50%
Garnet	10-15%
K Feldspar	2- 4%
Biotite	1- 2%
Opaques	1%

The texture of this interval shows little evidence of a preferred fabric, and perhaps could be described as 'granulitic'. The hand specimen demonstrates a well disseminated, rather orange (? spessartite) garnet, in a leucocratic medium grained matrix. In thin section the garnets are idioblastic, lacking inclusions apart from rare quartz, and also zircon. All have cracks and perimeters replete with fine sericite.

The biotite, although not chloritised, is full of needles of ? rutile. Its deep red-brown colour indicates an iron plus ?manganese-rich variety. It shows little evidence of orientation. Opaque material is allotriomorphic to the garnets. It appears likely to be titanium-rich as indicated by leucoxenic rims or inclusions.

The plagioclase-quartz association indicates that some replacement of the former by the latter has occurred. The feldspar is poorly twinned, cloudy and of oligoclase composition.

Microcline appears more abundant in the slide than is shown by staining of the core. The quartz shows evidence of strain and partial recrystallization.

Clearly related to 1272, with much less replacement of garnet.

1274 COM 9 38.4m

0060

MACROSCOPIC: Garnetiferous acid gneiss

MICROSCOPIC: Biotite garnet tonalitic gneiss

Quartz	40-45%
Plagioclase	40-45%
Garnet	15-20%
Biotite	3- 5%
Opaques	1%

A very similar lithology to 1273, mainly differing in its finer grain sizes and greater content of garnet and biotite. The garnets are subidioblastic, rarely containing quartz inclusions. Most are singly disseminated, but there are also groups attached by biotite clusters. Biotite also occurs with the quartz feldspar matrix, in single, often oriented, yellow to red-brown pleochroic flakes, again heavily penetrated by needle-like ? rutile.

The plagioclase-quartz textures are identical to 1273, except for grain size, and the more obviously deformed or lineated quartz. The opaques are non-magnetic, and may include a little sulphide. Genesis and metamorphic history as for 1273.

0061

1275 COM 10

MACROSCOPIC: Altered garnetiferous acid 'gneiss'

MICROSCOPIC: Biotite garnet tonalitic 'gneiss'

Quartz	35-40%	SECONDARY
Plagioclase	35-40%	Chlorite
'Biotite'	15-20%	Sericite
Garnet	5-10%	Leucoxene
Muscovite	3- 5%	
Opaques	1%	
Rutile	1%	
Zircon	Trace	

Another garnet-bearing, poorly foliated 'gneiss' in which the garnets are considerably altered to a mica, as in 1272. Millimetric garnets remain as islands, usually more than 50%, replaced by fine decussate green and brown biotite. 'Normal' coarse biotite is less than 1%, not oriented, and containing the needles of ? rutile. In the slide several of the micaceous mats after garnet also contain significant chlorite.

The bulk of the fabric is the granoblastic quartz plagioclase association with the feldspar, typically cloudy due to incipient sericitization, resulting in the yellow colour of the hand specimen. These feldspars form aggregates of 0.2 - 0.3 mm individuals, with poor twinning development and an oligoclase composition.

The quartz is coarser grained and, by its elongated nature, with a fair degree of parallelism, emphasizes the regional metamorphic fabric. Much of these quartz fringes have recrystallized, and lamellar extinction patterns indicate considerable strain history. Opaque or semi-opaque masses, linked to the 'garnets', may exceed 0.5 mm and are composites of opaques sensu stricto and leucoxene/rutile, suggesting an ilmenitic primary phase.

Frequently, sericite is coarse enough to be classified as muscovite, which with most of the biotite, is not strictly a prograde mineral, although included in the table above as such. Genesis identical to 1274.

1276 COM 11 37.5m 0063

MACROSCOPIC: Altered granite gneiss
MICROSCOPIC: Quartz feldspar metasomatic 'gneiss'

K Feldspar	40-50%	SECONDARY
Plagioclase	40-50%	MICA
Quartz	10-15%	
Opaques	1%	
Apatite	1%	
Zircon	Trace	

A totally leucocratic acid gneiss in which most of the feldspar is stained by very fine limonite/hematite. In the case of the plagioclase, it may be accompanied by fine sericite, but otherwise the feldspars are quite fresh.

The 'gneiss' texture is again subtle and only clear in slide from the lens habit of the quartz. These are about 0.5 mm on average in length and outlines are mostly quite irregular, almost amoeba-like, apart from the consistent orientation. There is also a blebby quartz component within the feldspars.

The texture of the dominant feldspars is markedly interlocking and inequigranular. This is partly due to replacement of plagioclase by microcline. Excellent examples show relict albite twinned stained plagioclase separated by non-stained, similarly oriented, K feldspar, The microcline is coarsely perthitic and the albite exsolution lamellae may be strongly stained, whereas the host is clear. The composition of the normal plagioclase is probably oligoclase. Where twjnning is visible it is of the metamorphic type.

Apatite crystals, to 0.2 mm, and irregular outline, are the main accessory. All the 'opaques' are altered, ? leucoxenised.

Local patches of bright yellow mica appear all of secondary origin.

The extent of the K 'metasomatism' shows this rock to have had a complex history. The replacement of plagioclase by microcline is, however, not uncommon in so-called igneous granites.

0065

1277 COM 11 38.5m

MACROSCOPIC: Granite gneiss band within altered dioritic gneiss

MICROSCOPIC: Granodiorite gneiss enclosing altered basic gneiss band

A		B	
Plagioclase	40-50%	Plagioclase	50-60%
Quartz	40-50%	Actinolite	30-35%
Microcline	10-15%	Quartz	3- 5%
Zircon	Trace	Clinozoisite	3- 5%
		Microcline	2- 3%
		Opaques	3- 5%
		Apatite	1%

The acid band appears macroscopically identical to the previous sample. However, it is much less potassic and is granodioritic in composition, with quartz considerably greater in content. Otherwise, the staining is similar, but the replacement texture is not apparent, the microcline being interstitial to the plagioclase.

The 'basic' gneiss is characterised by a anti-perthite plagioclase, and a ferromagnesian, possibly a primary pyroxene, now entirely retrogressed to lamellar actinolite pseudomorphs, accompanied by a reaction rim of clinozoisite.

The texture is granoblastic, approaching granuloblastic, with grain sizes rarely exceeding 0.5 mm. There is a quite marked lineation. This is due to a tendency for long dimensions to lie parallel and is accentuated by opaque material, frequently present as broad rims to the amphibole long dimensions. The opaques are non-magnetic oxides, probably oxidised. All have the clinozoisite rims. Some transparent limonite is visible but no secondary titanium minerals.

The anti-perthite feldspar and the possible pyroxene prograde mineralogy and the 'granulite' texture, suggest a highly metamorphic, possible granulite grade, rock. This has been altered and this may be related to the mica substitution of the garnets in earlier samples.

0067

1278 COM 12

MACROSCOPIC: Magnetic basic intrusive

MICROSCOPIC: Altered microgabbro

Plagioclase	50-60%	SECONDARY
Clinopyroxene	35-40%	Hydrobiotite
Opaques	2- 3%	Chlorite
Alkali Feldspar)		Actinolite
Quartz)	2- 3%	
)		

This is a classical example of a basic intrusive, largely composed of calcic plagioclase (labradorite) and augite. The clinopyroxene forms 1 - 2 mm, rather block, masses often penetrated by finer laths of plagioclase, representing an incipient ophitic texture. A finer generation of pyroxene (0.5 mm) tends to be the most altered, to a mixture of hydromica, chlorite and actinolite, starting at the margins.

The plagioclase laths range up to 2 x 0.2 mm dimensions, but most lengths are under 0.5 mm. Albite twinning is very well developed. Zoning may occur. Alteration is negligible compared with the pyroxene. The interstitial areas between feldspars are occupied by a micrographic intergrowth of K feldspar and quartz, indicating a relatively well differentiated type.

The opaques are apparently magnetite dominated rather than ilmenite.

1279 COM 13 34.5 m

0068

MACROSCOPIC: Altered biotite gneiss

MICROSCOPIC: See below

Plagioclase	40-45%
Biotite	40-45%
Amphibole	10-15%
Quartz	3- 5%
Clinozoisite	2- 3%
Opaques	1%
Sphene	Trace

This is an interval difficult to classify or name. This is because it is to a large degree recrystallized. The only relict aspect is plagioclase occurring as scattered, 0.3 - 0.5 mm, partly sericitised equidimensional crystals, frequently with a clear albitic rim. Occasional coarser, 1 - 2 mm, feldspar masses are part recrystallized with some invasion of quartz.

These feldspars are surrounded by fine grained, poorly oriented, associations of biotite, actinolite hornblende, quartz and plagioclase. The biotite is yellow to dark brown, mostly quite fresh, and in bunches, often poorly oriented, of individuals under 0.1 mm. Overall they give a rough schistose texture to the rock: some clusters, however, appear to be decussate replacements of a coarser ferromagnesian. The replacement of a ferromagnesian, now totally removed, is emphasized by the amphibole, present as bunches of thin disoriented lamellae, with a pale green to blue-green pleochroism.

Finally, there is a fine semi-pelitic schistose association of biotite, plagioclase and quartz, plus semi-blastic clinozoisite, that may represent the new prograde fabric.

In summary, it is considered to have been a medium to coarse basic gneiss that has been largely recrystallized, involving pressure as well as metasomatic activity.

0070

1280 COM 13 36.4m

MACROSCOPIC: Altered granite gneiss

MICROSCOPIC: Cataclastically deformed granite 'gneiss'

K Feldspar	45-50%	SECONDARY
Quartz	35-40%	Chlorite
Plagioclase	10-15%	Spidote
Biotite	1- 2%	
Opaques	1%	
Sphene	Trace	
Apatite	1%	

This leucocratic gneiss is seen in section to have a marked cataclastic texture, although in no way, a mylonite. However, recrystallization under stress is common, particularly quartz. The overall outline of the quartzes is linear, but internally they may have a fine, extremely corrugated, quartzite mosaic texture.

The feldspar is dominantly microcline perthite, with the coarse albite lamellae, frequently iron stained. The feldspar is less deformed than the quartz, but recrystallization has often occurred at the contacts. There is also ample evidence of replacement of the accompanying plagioclase, similar to that seen in 1276. The plagioclase, which has a brown cloudy appearance, has clear albite rims. Owing to the replacement and partial recrystallization, the micro-texture of these feldspar associations is extremely irregular. There are some trails of crushed material which can be described as mylonite zones.

Mafics are represented by irregular groupings of fine mica or hydromica or chlorite, plus epidote, some with sphene-rimmed opaques. The not uncommon apatites have oval corroded outlines.

The gross preferred fabric is assumed to be predislocation, so that 'gneiss' nomenclature can be applied.

1281 COM 14 0071

MACROSCOPIC: Granite gneiss
MICROSCOPIC: Alkali granite gneiss

K Feldspar	45-50%
Quartz	40-45%
Plagioclase	10-15%
Opaques	Trace

This is a totally leucocratic granitic gneiss, probably of identical origin to 1280, but lacking the extensive cataclastic overprint. Some recrystallization of the quartz, however, has occurred. The linear distribution of quartz best demonstrates the regional metamorphic fabric. Other quartz is rounded, forming inclusions in feldspar.

The microcline forms strongly perthitic simple granoblastic 0.5 - 1 mm associations. Contacts are often castellated against each other and against plagioclase. The minor cloudy sericitic plagioclase sometimes has a relict partly replaced appearance.

The rare opaques are translucent, probably leucoxenized ilmenite. The presence of perthite indicates either a deformed igneous granite or a regional metamorphic gneiss above green schist facies, in either case, orthogneiss.

1282 COM 15 0072

MACROSCOPIC: Altered granite gneiss

MICROSCOPIC: Cataclastically deformed granite gneiss

K Feldspar	45-50%	SECONDARY
Quartz	35-40%	Chlorite
Plagioclase	10-15%	Sericite
Biotite	5-10%	Epidote
Apatite	1%	
Opaques	1%	
Zircon	Trace	

A granitic gneiss of similar character to 1280. Thus, it has experienced cataclastic deformation, past regional metamorphism. The texture is therefore partly a palimpsest gneiss, and partly a semi-mylonite. In the first category, the outline of the quartz remains linear, if often curved or folded. Internally, recrystallization has always occurred, particularly at the margins.

The feldspars portray a complex association of perthite enveloping and replacing plagioclase, with extremely irregular margins and contacts, plus frequent mylonite zones of very fine feldspar. As in the other samples, the plagioclase is distinguished by cloudiness (sericite) and limonite staining.

The biotite forms millimetric, tightly packed, aggregates, enclosing opaques and apatite. Their fineness and their tendency to general orientation suggest that they were formed by replacement of another ferromagnesian subsequently deformed, or represent recrystallized biotite under dislocation metamorphism. The slide also features numerous fractures or shear zones infilled with epidote and chlorite.

1283 COM 16 0073

MACROSCOPIC: Chloritised acid gneiss

MICROSCOPIC: Altered biotite tonalitic gneiss

Plagioclase	70-80%	SECONDARY
Quartz	15-20%	Chlorite
Biotite	5-10%	Sericite
Opaques	1- 2%	Epidote
Apatite	1%	
Zircon	Trace	

A deformed gneiss, poorly lineated, similar in texture to 1280 and 1282, but with plagioclase totally dominant.

The main fabric is a mosaic of cloudy sodic plagioclase, equidimensional crystals varying between 0.2 and 1 mm diameter. Contacts are often highly irregular due to incipient mylonitization. Twinning is poorly preserved but when present is curved.

Quartz is as usual in this deformed rock totally recrystallized, although its gross lenticular habit may be of prograde origin. There are few inclusions of quartz in feldspar but some veining.

The micaceous zones, as described previously, are decussate aggregates of fine greenish biotite and/or chlorite. Positive evidence for the retrograde origin of the mica is shown by several clusters of amphibole-shaped laths, now pseudomorphed by a secondary biotite. These are surrounded by chlorite.

The opaques are oxides, probably oxidised (non-magnetic), some with rhombic outlines, concentrated within the mica zones, associated with apatite. Apatite reaches 0.3 mm lengths and are rather ovoid and slightly corroded. The zircons are very fine and perfectly rounded.

Clearly related to some of the earlier described tonalitic gneisses.

0075

1284 COM 17

MACROSCOPIC: Basic gneiss

MICROSCOPIC: Deformed basic granolite

Plagioclase	70-75%
Orthopyroxene	20-25%
Quartz	2- 3%
Opaques	1%
Apatite	1%
Biotite	1%

A non-foliated plagioclase-rich slightly deformed and recrystallized granulite. The limonite staining of the feldspar produces a misleading pinkish colour to the hand specimen. The plagioclase (andesine) forms a semi-granuloblastic texture, with individuals in the 0.3 - 0.5mm range. Commonly the margins have a fine recrystallized feldspar component and quartz. Quartz also occurs very sporadically as interstitial matrix to the often triple pointed plagioclase contacts.

The orthopyroxene forms 0.5 mm average subidioblastic pleochroic crystals, either singly or in clusters. Optics indicate hypersthene, perhaps iron-rich. Limonite filled cracks are common.

Opaque oxides are allotriomorphic to the pyroxene, with which they are usually in contact.

A typical high grade metamorphic product of a basic igneous rock, subsequently deformed.

1285 COM 18 0076

MACROSCOPIC: Altered garnetiferous acid gneiss
MICROSCOPIC: Biotite garnet tonalite gneiss

Plagioclase	35-40%	SECONDARY
Quartz	35-40%	Sericite
Biotite	15-20%	Limonite
Garnet	5-10%	
Muscovite	1%	
Opaques	Trace	
Zircon	Trace	

A grossly foliated garnetiferous tonalitic gneiss, in which all garnets are more than 50% replaced by mica, in similar fashion to that described for 1275.

The slide covers a garnet-rich zone of the core piece. The texture is well demonstrated macroscopically by the contrasting 'blue' quartz and 'yellow' feldspar.

The quartz form is typically linear, 2 - 3 mm in length, but internally a recrystallized mosaic is normal although the mylonitic character is absent.

The feldspar is poorly twinned, cloudy with sericite, and of oligoclase composition. Internal contacts can be relatively smooth for the groups of 0.3 - 0.5 mm plagioclases, but highly irregular against quartz.

The garnets were idioblastic, averaging around a millimetre, now representec by islands of relict garnet in a pseudomorphous fine green ? biotite matrix. Brown coarse biotite is mostly attached to these masses with a moderate degree of orientation. These again have extensive inclusions of needle-like ? rutile. In the totally altered garnet zones, the biotite is accompanied by fine muscovite. 'Opaque' material in the slide is entirely oxidised to limonite.

Comments on genesis, etc as for 1272.

1286 COM 19 0077

MACROSCOPIC: Biotite amphibolite

MICROSCOPIC: K feldspar biotite hornblende plagioclase Schist

Hornblende	45-50%
Plagioclase	30-35%
K Feldspar	15-20%
Biotite	5-10%
Sphene	1%
Apatite	1%
Opaques	1%

This is poorly banded, but moderately well lineated, basic schist containing significant quantities of K feldspar in the matrix. The nature of the amphibole, pale green pleochroism, and low refractive index, and the soda-rich plagioclase indicate green schist rather than amphibolite grade.

The preferred fabric is due to the biotite and, to a lesser extent, the amphibole. The latter forms quite short laths, 0.2 - 0.3 mm, with a weak green pleochroism, and generally idioblastic habit. With the mica it tends to enclose discontinuous bands to lenses of the feldspars. The brown biotite is well oriented when separate from the amphibole as irregular trails. The mica is also characterised by an abundance of sphene inclusions in semi-wedge habit 0.2 mm in length. These are not associated with the actinolite.

The felsic zones are composed of fine to medium grained albite, up to 0.4 mm, cemented by K feldspar, and probably part replaced leading to pseudoperthite formation. Locally, the K feldspar is dominant, with masses over 0.5 mm.

The evidence suggests that a basic schist has been subjected to K metasomatism.

1287 COM 20 0078

MACROSCOPIC: Altered garnetiferous acid gneiss

MICROSCOPIC: Andalusite biotite garnet plagioclase quartz gneiss

Quartz	45-50%	SECONDARY
Plagioclase	30-35%	Sericite
Biotite	5-10%	Chlorite
Garnet	5-10%	
Andalusite	3- 5%	
Rutile	1%	
Muscovite	1- 2%	
Tourmaline	1%	
Zircon	Trace	

Clearly closely related to earlier samples such as 1285. This interval is less micaceous and more quartose, and the high quartz content suggests that a tonalitic connotation is misleading. The degree of alteration of the garnets to green mica is more variable, some are almost fresh, while others are completely gone, and the main product is either clay or chlorite. The hypothesis that this alteration is the result of thermal metamorphism is reinforced in this sample by the development of andalusite entirely within the altered mica zones. The andalusites are rather poorly developed, but occasional coarser (0.4 mm) laths make identification possible.

There is also a coarse zone where quartz, intergrown or substituting for plagioclase, has an internal format resembling graphic or cuniform texture, the significance of which is not fully understood. This zone is also characterised by coarse disoriented muscovite flakes.

The quartz plagioclase texture is similar to that of 1285, except that quartz is more abundant and there is fine recrystallization at internal contacts.

'Opaque' material, associated with biotite, has apparently altered or leucoxenised producing coarse rutile. Possibly the formation of rutile is related to the other post-tectonic metamorphism.

0080

1288 COM 21

MACROSCOPIC: Altered garnet leptite

MICROSCOPIC: Biotite garnet granodioritic gneiss

Quartz	45-50%	SECONDARY
Plagioclase	35-40%	
K Feldspar	10-15%	
Garnet	3- 5%	
Biotite	3- 5%	
Muscovite	1%	
Opaques) Rutile))	1%	

The only preferred fabric visible in thin section is the orientation of biotite. This is thinly disseminated except where the garnets are abundant. The garnets form highly irregular masses, with green mica-filled cracks normal. The idioblastic character of part of these garnets suggests that they were formerly much larger crystals, now partly silicified, as they all occur in a matrix of quartz. These quartz-garnet zones frequently exceed a millimetre and form bands, perhaps indicating primary control.

The non-garnet portion of the slide is a fine to medium granoblastic quartz feldspar association. The plagioclase, which is quite calci, andesine, rarely exceeds 0.3 mm. Most is fresh but shows deformation of the twin planes. The quartzes are coarser, but internally totally recrystallized.

The microcline has a more irregular distribution, but may exceed 0.5 mm. Myrmekitic rims against plagioclase are not uncommon. The lamellar habit of the opaques and their leuxoxenic fringes indicate ilmenite. There is also discrete rutile, probably recrystallized leucoxene. There is one occurrence of coarse, radiating muscovite in the slide.

Comments for genesis as for previous garnet gneisses.

1289 COM 22 41.5m 0081

MACROSCOPIC: Meta porphyry

MICROSCOPIC: Biotite porphyritic meta rhyolite

Plagioclase)		SECONDARY
K Feldspar)	75-80%	Chlorite
)		
Quartz	15-20%	Leucoxene
Biotite	3- 5%	
Apatite	1%	

This is an acid volcanic that has been regionally metamorphosed, accompanied by some probable shearing. Plagioclase phenocrysts of millimetric diameter are not uncommon, all show extensive sericitization, and rather ragged margins. There are rare, in the slide, lenses of quartzite, which may be deformed phenocrysts.

The main fabric is a fine grained (under 50 microns) lineated mosaic of quartz and two feldspars, imprinted with a thin but well oriented biotite framework. Both feldspars are poorly twinned but are estimated to be about equal in content based on cobaltrinitrite staining of the hand specimen. The high relief of the quartz indicates the plagioclase to be albite. Both are slightly stained, which also allows contrast with the quartz. Evidence for shearing is given by thin (0.2 mm) zones while biotite is very fine and non-oriented, and the linear character of the quartzofeldspathic matrix is lost.

The porphyry appears to have undergone a much weaker, lower grade regional metamorphism than most of the gneisses seen in this suite. If it forms part of the same succession, it is not unknown for acid volcanics to resist quite high grades of metamorphism, compared with some sediments. At Broken Hill recognisable acid tuffs are in contact with sillimanite garnet schists, the latter of pelitic origin (Stanton, Inst. Min. Met. Trans. B., June, 1976). Alternatively, of course, the porphyry was a late intrusion.

1290 COM 22 50.9m 0082

MACROSCOPIC: Leptite

MICROSCOPIC: Sericitized plagioclase leptite.

Quartz	45-50%	SECONDARY
'Plagioclase'	45-50%	Sericite-muscovite
Biotite	1%	Chlorite
Opaques	1%	Leucoxene
Apatite	Trace	

This is a totally leucocratic fine grained gneiss, in which the feldspar, probably plagioclase, is totally altered to sericite and muscovite.

The microfabric shows a modest lineation of the quartz. The quartz masses average 0.2 - 0.3 mm externally but internally are always a fine quartzite.

The feldspar had similar dimensions and crystal faces are often preserved against the quartz.

The fine disseminated opaques may be largely ilmenite based on their leucoxene association.

Fractures are common, infilled with chlorite, K feldspar, etc.

Possibly a paragneiss, that has experienced retrogressive metamorphism of a similar nature to that responsible for the alteration of garnet, etc., in earlier samples.

1291 COM 23 59.5m 0083

MACROSCOPIC: Biotite gneiss

MICROSCOPIC: Metasomatised biotite tonalitic gneiss

Quartz	40-45%	SECONDARY
Plagioclase	35-40%	Sericite
Biotite	10-15%	Leucoxene
K Feldspar	10-15%	Saussurite
Rutile	1- 2%	
Zircon	1%	
Apatite	Trace	

This is a moderately well banded gneiss, in which the prograde plagioclase feldspar has been partly altered to sericite, and the biotite has been either partly recrystallised from another ferromagnesian, and also bleached. This is believed to be associated with potash metasomatism.

The gross texture consists of long lenses and discontinuous bands of quartz and plagioclase-biotite. The quartz masses are of millimetric dimensions and, unlike much of the quartz in the described cores here, are made up of a tightly packed semi-spherical 0.2 mm average quartz 'grains', similar in appearance to a cemented mature quartz sand. This is facilitated by the presence of interstitial K feldspar, often only a thin skin.

The bulk of the microcline is attached to the plagioclase masses where replacement has clearly occurred. The preference of the micas for these plagioclase zones is very marked. The biotite either occurs as coarse fresh well oriented laths, or fine disoriented material. Some of the biotite has lost its dark brown colour. Penetrating some of these mica associations and following the schistocity are trails of semi-opaque, ? secondary titanium oxides.

There are also pseudomorphs, now composed of coarse rutile, of either ilmenite or titanomagnetite.

The gneiss is supposed to have been tonalitic, subsequently metasomatised but without dislocation.

1292 COM 23 60.5m

0085

MACROSCOPIC:)
MICROSCOPIC:) Chloritised amygdular porphyrite 'basalt'
)

This is a totally altered, probably extrusive, near surface basic volcanic. Its completely altered nature means that it cannot be specifically defined as tholeiitic, spilitic, alkali basalt, etc. However, there is palimpsest evidence for the presence of significant primary ferromagnesians such as pyroxene, suggesting that it was not from the spilitekeratophyre group.

The fabric has two principal aspects, firstly the phenocryst 'plagioclase' and 'ferromagnesian' that grade in size down to matrix. The coarsest laths, now entirely replaced by a fine clay and/or sericite, reach lengths of 0.5 mm. The less abundant mafic phenocrysts are euhedral, and squat, either clinopyroxene or olivine. They are dominantly composed of chlorite. The matrix consists of both components, with the 'feldspar' dominant, in an allotriomorphic limonite-stained ground mass, spotted with fine ? leucoxene.

The second major aspect of the fabric is the vesicle. There are various types ranging from perfect vesicles infilled with radiating chlorite (amygdales) to ovoid chloritic-filled vesicles intergrown with coarse quartz. Another type of amygdale is clay-filled, and all three may combine to give semi-centimetric sized masses.

The slide also features coarse masses of quartz and a probable coarse plagioclase, almost entirely altered, but identified by twin palimpsests. It is suggested that this material may be foreign to the lava, i.e., xenoliths incorporated before consolidation and therefore subject to deuteric activity. An alternative explanation is that they are very coarse (3 mm) glomeroporphyritic accumulations. However, there is no evidence for primary quartz in the matrix.

1293 COM 24

0086

MACROSCOPIC: Biotite gneiss

MICROSCOPIC: Garnet biotite tonalitic gneiss

Quartz	45-50%	SECONDARY
Plagioclase	30-35%	Sericite
Biotite	15-20%	Chlorite
Muscovite	2- 3%	
Garnet	1- 2%	
Opaques	1%	
Apatite	1%	
Zircon	Trace	

A partly altered biotite-rich tonalitic gneiss, with minor garnet, quite similar to a number of the described cores. The preferred fabric is poorly preserved, apart from a rough banding due to the biotite distribution, also some of the individual biotite flakes are well oriented. As in a number of these biotitic gneisses, there is evidence of recrystallization of the mica. Thus the micaceous masses, externally millimetric dimensions, are internally a decussate aggregate of fine disoriented flakes. Locally the biotite is accompanied by similar textured muscovite, quite well oriented, and unusual for these garnet biotite gneisses. In this mode there is a relatively common occurrence (zircon etc) of inclusions with pleochroic halo in the biotite. In parts the biotite is extensively chloritized with accompanying leucoxene/sphene development.

The granoblastic quartz plagioclase fabric is quite similar to that of the leptite, 1290.

The sodic plagioclase (? oligoclase) is rarely unsericitised, twinning is poorly developed and of the metamorphic 'vee' pattern. The more abundant quartz forms relatively simple interlocking mosaic, of individuals with 0.1-0.2 mm diameters. Garnet is confined to a few small separate

clusters within biotite masses. Likewise, the square to columnar oxide opaques are entirely confined to biotite. Apatite is relatively coarse and of anhedral habit, contrasting the perfect rounding of the much finer zircons.

Comments on genesis, etc as for the other gneisses.

1294 COM 25 0088

MACROSCOPIC: Garnet gneiss

MICROSCOPIC: Biotite garnet tonalitic gneiss

Plagioclase	50-55%	SECONDARY
Quartz	35-40%	Chlorite
Garnet	5-10%	
Biotite	3- 5%	
Opaques	1%	
Zircon	Trace	

It can almost be described as a garnet leptite, with almost 90% quartz and plagioclase with the remainder garnet. Biotite is fine grained, and present as single moderately oriented flakes, separate from the garnet. In parts of the slide the mica appears chloritised but the distinctly coarser nature of these chlorites suggests that they are another ferromagnesian such as pyroxene.

The garnet is characteristically poikiloblastic, enclosing rounded quartz. These millimetre composites could have been the result of alteration and silicification as the outer parts of the often isolated garnet component has faces present. Some of the smaller garnets are almost perfect inclusion-free dodecahedra.

The quartz, subordinate to the feldspar, tends to form semi-linear 0.3 to 0.5 mm length rather blebby grains, often single rather than composite. The enclosing plagioclase has the usual characteristics, sericitization, poor twinning but relatively smooth internal contacts, i.e., granoblastic.

The non-magnetic opaque oxides have the same habit variation as 1293, but are not associated with biotite.

See other garnet gneisses and summary for further comments.

APPENDIX 4a

RECONNAISSANCE SAMPLE ANALYSES

stn/sample	Uppm	Thppm	Bappm	Srppm	Vppm	Yppm	Snppm	Moppm	Asppm	Cuppm	Pbppm	Zrppm	Agppm	Nippm	Coppm	Crppm	Ceppm	Lnppm	Nbppm	Zrppm
1/1001	<5	5	1000	200	10	<10	3	<3	<5	50	<10	<10	<2	<10	10	<5	40	10	<5	190
1/1002	25	20	500	<30	30	10	5	3	<5	50	<10	200	<2	60	40	115	380	250	<5	135
1/1003	5	100	500	<30	10	10	3	<3	<5	15	<10	30	<2	50	<10	<5	250	140	10	230
6/1005	<5	<5	500	50	50	10	5	3	<5	<10	<10	30	<2	<10	15	55	40	70	<5	290
6/1006	10	110	500	<30	10	<10	3	5	<5	<10	<10	30	<2	<10	<10	<5	250	150	5	190
6/1007	10	30	1000	<30	20	10	5	5	<5	15	<10	35	<2	50	<10	<5	90	50	<5	220
6/1008	<5	90	1000	<30	10	10	5	3	10	15	<10	25	<2	65	<10	<5	220	90	5	530
6/1009	15	90	300	<30	<10	10	<1	5	<5	<10	10	35	<2	25	<10	<5	210	100	10	200
18/1010	<5	<5	1000	50	50	30	3	5	<5	130	<10	<10	<2	<10	10	165	<20	<10	<5	55
21/1012	15	50	1000	<30	30	<10	3	10	10	25	<10	30	<2	40	<10	<5	250	130	10	410
32/1074	<5	555	500	30	10	30	<1	5	<5	20	75	60	<2	60	<10	<5	1660	660	<5	35
13/1046		10							<5	110	30	480	2	180	90					
13/1047		110							<5	130	20	280	2	540	240					
24/1062	10	55																		
24/1063	<5	45																		
25/1064	<5	<5																		
25/1065	<5																			
30/1073	20																			

	Gneiss	Gneiss	Gneiss	Mylonite	Mylonite	Mylonite	Mylonite	Breccia	Meta-norite	Rhyolite	ht-ksp rock
stn/sample	1/1001	1/1002	1/1003	6/1005	6/1006	6/1007	6/1008	6/1009	18/1010	21/1012	32/1074
SiO_2	75.3	66.3	74.5	54.1	76.8	79.5	75.2	74.6	49.8	71.2	59.2
TiO_2	<0.01	0.50	0.29	0.70	0.16	0.24	0.21	0.21	1.40	0.37	1.07
Al_2O_3	14.9	14.7	11.9	14.4	11.4	9.5	11.5	11.6	13.6	13.5	19.9
Total Fe	0.04	6.22	3.42	10.1	2.86	4.29	2.98	2.68	15.1	4.37	3.50
MgO	0.63	1.82	0.39	5.33	0.22	0.23	0.30	0.21	6.47	0.63	1.67
CaO	1.78	0.05	0.85	9.68	0.20	0.34	0.53	0.56	10.5	1.33	1.65
Na_2O	4.26	0.82	2.53	3.75	2.37	1.70	2.05	2.24	1.97	2.24	6.47
K_2O	2.35	2.47	5.41	0.36	5.50	3.58	6.45	7.01	0.26	5.40	5.28

A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Afmeco Pty Ltd.

Area:

0092

Samples of: Waters.

Preparation:

Sheet No.: 1.

Batch No.: A 3552. (Your O/N 3697)

Date: 10.10.80.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description		U ppb	SO_4 ppm	As ppm	Cu ppb	Co ppb	Zn ppb
Wirrida	1013	<10	518	<0.1	<10	<5	140
Blue	1014	<10	244	<0.1	<10	<5	<25
Ants Nest	1015	<10	1088	<0.1	<10	<5	270
Ants Nest	1016	<10	1162	<0.1	<10	<5	55
Tescuva	1017	<10	120	<0.1	20	<5	500
Jacobs	1018	<10	586	<0.1	<10	<5	550
#53	1019	<10	125	<0.1	<5	<5	210
Cedric N	20	<10	110	<0.1	<5	<5	170
Cedric S	21	<10	425	<0.1	<5	<5	70
#34	22	<10	1725	<0.1	<5	<5	100
#42 E	23	<10	330	<0.1	<5	<5	40
#42 W	24	<10	330	<0.1	<5	<5	70
Bis	25	<10	395	<0.1	<5	<5	560
Bis	26	<10	395	<0.1	<5	<5	630
Aurora	27	<10	910	<0.1	<5	<5	50
Bore 0072 3013	28	<10	1150	<0.1	<5	<5	880
Bore 0072 3013	29	<10	1160	<0.1	<5	<5	600
Bore 0095 3016	30	<10	465	<0.1	7	<5	750
Bundi	31	<10	1105	<0.1	<5	<5	150
Crossroads	32	<10	945	<0.1	<5	<5	90
Comet O.S	33	<10	425	<0.1	7	<5	220
# 45 E	34	<10	820	<0.1	7	<5	90
# 45 W	35	<10	365	<0.1	15	<5	20
# 44	36	<10	1155	<0.1	<5	<5	1400
Bore 1072 9005	37	<10	615	<0.1	<5	<5	<5
Bore 1072 9007	38	<10	585	<0.1	<5	<5	190
Bore 1072 9007	39	<10	610	<0.1	<5	<5	160
Homestead	40	<10	41	<0.1	<5	<5	20
New Surprise	41	<10	840	<0.1	17	<5	600
Century	42	<10	1000	<0.1	8	<5	1500
Wina	1043	<10	825	<0.1	<5	<5	90

		Se ppb	V ppb
Wirrida	1013	<5	<50
Blue	4	<5	<50
Ants Nest	5	<5	<50
Ants Nest	6	<5	<50
Tescuva	7	<5	<50
Jacobs	1018	<5	<50

ANALYTICAL METHODS. Cu, Co, Zn determined by Solvent Extraction/AAS. U by Fluorimetry. SO_4 by Gravimetry. As by modified Gutzeit method. V by Colorimetry. Se determined by Special

APPENDIX 4b

DRILL SAMPLE ANALYSES

	Uppm	Thppm	Bappm	Srppm	Vppm	Yppm	Snppm	Moppm	Asppm	Cuppm	Pbppm	Zuppm	Agppm	Nippm	Coppm	Crppm	
COM 1	1.4	7	700	990	15	9	8	x	x	15	15	60	x	15	15	170	gneiss
COM 2	0.3	10	600	200	120	20	x	x	x	20	10	60	x	70	30	350	gneiss
COM 3	0.1	5	430	1600	120	25	8	x	x	x	10	45	x	60	25	190	amphibolite
COM 4	1.0	15	780	1000	10	6	7	x	x	5	5	35	x	10	10	310	gneiss
COM 5	Lost by Lab																
COM 6	1.0	15	790	390	80	20	30	5	x	10	15	65	x	25	15	370	gneiss
COM 7	0.6	6	920	410	20	20	x	x	x	5	5	25	x	10	10	310	gneiss
COM 8	x	9	1050	330	55	55	9	6	10	45	10	65	x	40	30	310	gneiss
COM 9 37.8m	0.6	15	600	370	160	40	7	x	x	40	10	110	x	65	35	440	gneiss
COM 9 38.4m	1.2	5	630	340	130	35	3	x	x	60	40	75	x	75	35	440	gneiss
COM 10	0.5	6	700	370	230	35	20	x	x	25	5	65	x	55	25	420	gneiss
COM 11 37.5m	0.2	15	1750	320	15	6	3	x	x	30	x	30	x	60	20	160	gneiss
COM 11 38.5	0.4	4	370	350	230	30	5	x	6	35	x	45	x	45	40	150	gneiss
COM 12	0.2	10	110	210	340	20	x	x	x	160	10	90	x	55	35	160	gabbro
COM 13 34.5m	0.3	8	530	240	220	30	x	x	6	40	15	220	x	235	85	90	basic gneiss
COM 13 36.4m	0.1	x	1600	280	8	x	6	x	x	40	x	20	x	30	15	210	gneiss
COM 14	0.1	3	1400	500	x	x	x	x	x	5	x	5	x	10	5	230	gneiss
COM 15	0.4	30	1300	460	20	10	8	x	x	40	x	50	x	20	15	280	gneiss
COM 16	x	3	710	750	120	10	4	x	x	20	10	105	x	65	45	190	gneiss
COM 17	0.2	x	1170	820	110	9	x	x	x	20	5	105	x	80	35	190	basic gneiss
COM 18	0.5	20	830	300	80	40	x	x	6	25	5	80	x	100	35	380	gneiss
COM 19	0.3	15	2150	1300	130	25	x	x	x	10	10	85	x	80	35	370	basic schist
COM 20	1.3	20	820	270	100	25	x	x	x	30	15	150	x	80	30	380	gneiss
COM 21	2.5	15	430	200	100	30	30	x	x	15	10	55	x	45	25	510	gneiss
COM 22 41.5m	x	15	340	960	50	10	4	x	x	10	5	35	x	15	10	130	meta porphyry
COM 22 50.9m	3.1	20	840	290	50	20	5	x	15	30	15	60	x	65	25	290	gneiss
COM 23 39.5m	0.2	30	700	140	210	15	x	x	10	175	10	100	x	100	40	530	gneiss
COM 23 60.5m	0.9	20	45	20	200	40	x	x	x	10	5	60	x	85	60	230	basalt
COM 24	0.5	6	540	310	65	20	3	x	x	x	10	70	x	60	30	410	gneiss
COM 25	1.4	25	370	310	75	25	5	x	x	35	30	130	x	70	25	470	gneiss

	gneiss COM 1	gneiss COM 2	amphibolite COM 3	gneiss COM 4	ultra mylonite COM 5	gneiss COM 6	gneiss COM 7	gneiss COM 8	gneiss COM 9 37.8m	gneiss COM 9 18.4m	gneiss COM 10	gneiss COM 11 37.5m	gneiss COM 11 38.5m	gabbro COM 12	basic gneiss COM 13 34.5m
SiO_2	64.7	67.1	53.2	68.5		69.5	72.1	67.5	62.2	65.9	64.9	70.3	56.7	49.5	50.5
TiO_2	0.45	0.55	0.85	0.20		0.62	0.15	0.16	1.85	0.56	0.52	0.24	1.65	1.55	1.40
Al_2O_3	18.5	15.2	17.5	17.4		14.7	15.2	15.2	16.3	15.6	16.3	14.4	13.4	15.7	14.2
Total Fe	2.35	5.00	7.35	1.95		4.80	2.95	6.45	7.40	6.60	6.30	2.80	14.2	12.3	14.8
MnO	0.03	0.04	0.09	0.01		0.04	0.03	0.09	0.11	0.08	0.08	0.01	0.13	0.14	0.16
MgO	0.6	2.8	5.2	1.2	Lost by Lab	1.8	1.0	2.5	2.7	2.5	3.0	0.7	2.7	6.4	6.0
CaO	4.00	0.66	7.00	3.65		2.10	2.00	1.35	2.35	1.95	1.90	0.42	4.45	10.2	3.10
Na_2O	4.82	1.88	5.33	5.28		4.04	3.81	2.68	3.78	3.51	2.79	4.66	4.30	2.19	1.78
K_2O	1.20	2.57	0.82	1.00		2.20	2.65	2.60	1.75	1.90	2.20	4.20	1.40	0.34	3.65
P_2O_5	0.25	0.04	0.56	0.07		0.05	0.05	0.03	0.06	0.05	0.04	0.13	0.03	0.17	0.20

	gneiss COM 13 36.4m	gneiss COM 14	gneiss COM 15	gneiss COM 16	basic gneiss COM 17	gneiss COM 18	basic schist COM 19	gneiss COM 20	gneiss COM 21	meta porphyry COM 22 41.5m	gneiss COM 22 50.9m	gneiss COM 23 59.5m	basalt COM 23 60.5m	gneiss COM 24	gneiss COM 25
SiO_2	71.8	73.0	69.7	58.2	54.9	64.1	56.0	64.2	74.3	73.1	70.5	63.4	50.5	69.9	66.9
TiO_2	0.23	0.02	0.26	1.00	1.11	0.38	0.82	0.55	0.44	0.14	0.41	1.45	1.15	0.57	0.57
Al_2O_3	14.8	14.4	15.3	17.0	19.3	15.4	14.5	16.8	12.2	16.4	13.6	14.9	14.4	12.9	13.8
Total Fe	1.60	0.44	2.50	8.30	8.85	6.95	8.40	6.35	5.45	1.80	4.75	7.45	10.5	7.10	6.05
MnO	0.01	x	0.02	0.05	0.06	0.09	0.10	0.05	0.05	0.02	0.05	0.05	0.09	0.05	0.07
MgO	0.7	x	0.7	3.5	3.6	2.4	6.4	3.6	1.2	0.4	3.6	5.3	9.9	2.7	3.8
CaO	0.94	0.66	1.35	3.00	4.80	1.55	5.25	1.15	2.35	1.70	1.80	1.10	0.30	1.30	2.00
Na_2O	5.23	4.15	5.26	3.97	4.76	3.11	4.26	2.18	1.56	5.9	1.06	2.15	0.56	2.29	3.18
K_2O	4.05	5.25	3.70	1.55	2.25	2.70	2.85	2.65	1.15	3.05	2.60	4.30	4.30	2.35	1.00
P_2O_5	0.05	0.02	0.15	0.45	0.74	0.06	0.54	0.04	0.03	0.08	0.06	0.03	0.1	0.04	0.05

APPENDIX 5

0097

AFMECO PTY. LTD.

REVIEW OF AEROMAGNETIC SURVEY

OVER EL 621

WIRRIDA PROSPECT

SOUTH AUSTRALIA

by

B. A. Dockery

Consulting Geophysicist

March-April, 1981.

B.A. Dockery & Associates Pty. Ltd.
15 Parian Place,
Rossmoyne,
W.A. 6155

REVIEW OF AEROMAGNETIC SURVEY OVER EL 621

WIRRIDA PROSPECT, SOUTH AUSTRALIA.

INTRODUCTION:

An airborne magnetometer survey was carried out by Aerodata Services Pty. Ltd. of 42 Churchill Avenue, Subiaco, Western Australia, over part of EL 621, Wirrida Prospect, South Australia, on the 9th. and 10th. of January, 1981. The Wirrida Prospect was in central South Australia, 690 km. north-west of Adelaide. The survey area was bounded by latitudes 29°45'S, 30°00'S and longitudes 134°15'E and 134°21'10"E.

The aim of the survey was to define the magnetic character of the area in order to assist geological mapping of the Prospect. In particular, depths to magnetic basement were required to assist planning of a reconnaissance drilling programme. The regional geology of the Coober Pedy 1:250 000 map sheet showed the Prospect to be covered by Quaternary wind blown quartz sand and Tertiary silcrete. Preliminary geological sampling of the minor basement outcrops had provided rock types of banded iron formation, kaolinised gneiss, a kaolinite rock of possibly igneous origin and a kaolinised breccia.

Publicly available geophysical data for the Prospect consisted of aeromagnetic and Bouguer anomaly contour maps of the 1:250 000 Coober Pedy Sheet. The aeromagnetic data was collected on north-south lines flown 1 mile (1.6 km.) apart at a mean terrain clearance of 500 feet (152.4 m). The gravity data was collected from a square grid of stations spaced 4 miles (6.4 km.) apart.

The magnetic contour map showed an irregular pattern of maxima and minima poorly defined by the broad line spacing. There was a general east-west trend in the Prospect area cut by prominent north-west trending lineations. The Bouguer anomaly contour map showed a maximum to the north of the Prospect area on an east-west trend with a steep slope down to the south.

The regional magnetic and gravity data was interpreted as showing that Proterozoic basement occurred at or close to the surface within the Prospect. It was expected that the detailed aeromagnetic survey would define the location, depth and possible rock types within the surveyed area.

METHOD:

Approximately 280 squ. km. in the south-west corner of EL 621 were surveyed by 42 north-south flight lines spaced 250m. apart and 3 east-west tie lines spaced 10 km. apart. The mean terrain clearance was 150m. for the Cessna 206 survey aircraft.

The Geometrics G813 proton precession magnetometer recorded readings of the total magnetic intensity at 0.5 second intervals, equivalent to approximately 25m. between readings. The data was recorded with a resolution of 0.2 nanotesla and a noise envelope that varied from 0.3 to 1.0 nanotesla. It was stored on magnetic tape via a Hewlett Packard 9875 Casette Tape unit and displayed on 24 cm. wide paper chart showing the magnetometer trace at 1 nanotesla per cm. and 10 nanotesla per cm. and the radio altimeter trace at a scale of 1000 feet (304.8 m.) to 20 cm. The altitude was measured by a Sperry AA100 Radio Altimeter. Navigation was carried out visually with the aid of 1:20 000 scale photo mozaics. The flight path

was recorded by a Vinten Mk 111 tracking camera. Control of the magnetometer and camera cycling and the data recording was achieved with a Hewlett Packard 9825 computer.

The diurnal magnetic field was recorded on paper chart during the survey using a Geometrics G 826 proton precession, base-station magnetometer. This operated on a 10 second cycle time with a resolution of 1.0 nanotesla. Survey lines were to be reflown when the non-linear variation of the diurnal field exceeded 5 nanotesla in 5 minutes. The diurnal record was also used to correct the flight data to a common magnetic level.

The flight path was recovered visually from the tracking film onto the 1:20 000 photo mozaic by plotting every 40th. fiducial point, approximately 1 km. spacing. The plotted points and control points from the photographs were digitised to provide the positioning for the computer processing of the data.

Standard 1:25 000 and 1:100 000 planimetric map sheets were provided by Afmeco Pty. Ltd. as base maps for the data presentation. Computer processing and plotting of the data provided maps at both 1:25 000 and 1:100 000 scale of the flight path, stacked magnetic profiles at a vertical scale of 100 nanotesla per cm. and magnetic contours with a 10 nanotesla contour interval. Additional information supplied by Aerodata was the analog charts, annotated, folded and stacked in a folder of envelopes, the tracking film, the flight strips showing the recovered flight path, the flight logs and a magnetic tape of the digital data.

INTERPRETATION:

Visual inspection of the stacked profiles and contour maps has been carried out by the author to determine the approximate location and trends of sources giving rise to

magnetic features. Depth estimates were made on well defined magnetic maxima using the half maximum slope method. The relative amplitudes of the magnetic maxima were used as an indication of the likely rock types causing the various features. This information was used to construct an interpretation diagram on two sheets at a scale of 1:25 000, labelled "Geological Rock Units Interpreted from Magnetics".

The depth estimates were variable but this was considered to reflect the inherent inaccuracies in the method used to calculate them. It is most likely that all the magnetic features arose from sources within 20 metres of the ground surface.

Prominent features of the results are:-

(i) a suite of north-west to south-east striking dolerite dykes,

(ii) a strong magnetic maximum in excess of 3000 nantotesla amplitude in the centre of the surveyed area over a known outcrop of banded iron formatien,

(iii) an east-west strike along the southern boundary of the surveyed area, and

(iv) a strike slightly east of north in the northern three-quarters of the surveyed area with a cross trend of about 120^{o} East of North.

Much of the area has little magnetic expression implying a negligible magnetic susceptibility commonly associated with fine grained sedimentary rocks. These magnetically flat areas may occur over gneissic rocks of sedimentary origin. Except for the linear dolerite dyke suite, the magnetic pattern is irregular in the remaining areas.

The north-west trending dolerite dyke suite appears to have suffered minor folding and dislocation since the dolerite was emplaced. Else where the rock units must be more highly folded and faulted. In particular, the irregular patterns in the northern three quarters of the surveyed area are considered to arise from highly contorted remanents of mafic and banded iron rock units. The extreme maximum in the centre of the area is considered to arise from an isolated lens of banded iron formation of limited depth extent.

An east-west striking fault is assumed to occur at about $29^{\circ}57'20"S$ to divide the north-south striking area in the north from the east-west striking area in the south. Possibly the southern-most rock units showing east-west strikes are younger and/or less metamorphosed than those to the north as they exhibit more regular trends and there is a gravity slope down to the south at about $29^{\circ}55'S$.

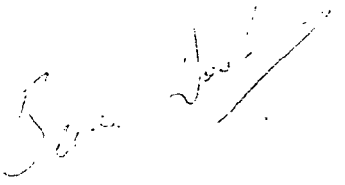
No detailed mathematical analysis of the magnetometer data has been carried out. The visual estimates of source locations may have an accuracy of $\pm$ 200m. Accurate analysis or modelling of individual features could be undertaken if future geological and geochemical investigations show that it is warranted.

CONCLUSIONS AND RECOMMENDATIONS:

A pseudo-geological map of the surveyed area has been derived from a visual inspection of the aeromagnetic data. Rough approximations of the depth to magnetic sources indicate that they are all within 20m. of the ground surface.

A shallow exploratory drilling programme should be carried out to test the geological and geochemical nature of the various rock units proposed by the geophysical interpretation. No indication of the mineralization potential of the Prospect was gained from the aeromagnetic study. As the Quaternary and Tertiary cover is so thin, detailed carborne or low-level airborne (70m. mean terrain clearance) gamma spectrometer surveying may be warranted for future exploration of the Prospect.

A reassessment of the aeromagnetic data could be useful once the results from a shallow drilling programme are available. If aeromagnetic surveying is proposed for other parts of the Prospect, the line spacing should be closer, say 200m., as the source depths are shallower than expected when planning this survey.



2nd. April, 1981.

(B. A. Dockery)
B.Sc.(Hons),Dip.Comp.,A.M.Aus.I.M.M.,
Consulting Geophysicist.

COOBER PEDY

WOORONG

5738

AFMECO PTY. LTD.

TN

SCALE: 1:100 000

2 0 2 4 6 8 10 12 Km

AUSTRALIAN MAP GRID

YERADA 5639	PHILLIPSON 5739	COOBER PEDY 5839
JUMBUCK 5638	WOORONG 5738	INGOMAR 5838
MULGATHING 5637	CARNDING 5737	BULGUNNIA 5837

LOCATION INDEX

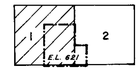
UNIVERSAL TRANSVERSE MERCATOR PROJECTION

Planimetric information from COOBER PEDY (SH53-6) 1:250 000 Topographic map, SERIES R 502, Edition 1, 1966

REFERENCE

- Secondary road
- Track
- River or Creek
- Telephone line
- Fence
- Building, Windmill, Yard
- Landing ground
- Control point major, minor
- Water tank
- E.L. Boundary
- 9 — Station location and number (1-19 & 22-25)
- 20 — Drill hole location and number: AFMECO (Total = 25)
- BHP — BHP drill hole location
- Boundary of Aeromagnetic Survey
- ② — Ground magnetic profiles

SHEET LAYOUT



Sheet 1 of 2

3839-1

To Accompany Report N°. WY 81.4.

REVISION	DATE		
		DRAWN	A.E.M.
		DATE	December 1981
		GEOLOGY	G. Styles
		APPROVED	
REVISION Nº	SIZE	DRAWING Nº	SH53-6 136 4060

WIRRIDA - S. AUST.
E.L. 621

STATION AND DRILL HOLE LOCATIONS

Sheet 1 of 2

3839-1 PLATE 1(a)

3839-2

COOBER PEDY

INGOMAR

5838

AFMECO PTY. LTD.

TN

SCALE 1:100 000

2 0 2 4 6 8 10 12Km

AUSTRALIAN MAP GRID

PHILLIPSON 5739	COOBER PEDY 5839	ENGENINA 5939
WUORONG 5738	INGOMAR 5838	PEAK 5938
CARNDING 5737	BILGUNNIA 5837	BON BON 5937

LOCATION INDEX

UNIVERSAL TRANSVERSE MERCATOR PROJECTION

Planimetric information from "COOBER PEDY (SH 53-6) 1:250 000 Topographic map, SERIES R 502, Edition 1, 1966

REFERENCE

- Primary road
- Secondary road
- Track
- River or Creek
- Fence
- Building, Windmill, Yard
- Landing ground
- Control point major, minor
- Water tank, Waterhole
- E.L. Boundary
- 21 Station location and number (20 & 21)

SHEET LAYOUT

Sheet 2 of 2

To Accompany Report No. WY 81.4.

3839-2

REVISION	DATE	DRAWN A.E.M.
		DATE December 1981
		GEOLOGY G.Styles
		APPROVED
REVISION No	SIZE	DRAWING No SH 53-6 136 4061

WIRRIDA - S. AUST.
E.L. 621

STATION AND DRILL HOLE LOCATIONS

Sheet 2 of 2

PLATE 1(b)

134° 00'
29° 30'

134° 30'
29° 30'

29° 40'

29° 45'

29° 50'

30° 00'

134° 00'

134° 15'

134° 20'

134° 25'

134° 30'

E.L. 621

BHP

BHP

BHP

This area was compiled from an enlargement of the Coober Pedy (1:250 000) BMR Aeromagnetic map to form the Woorong 5738 1:100 000 sheet area.

Airbourne Magnetic Survey (AFMECO).

To Accompany Report No. WY 81.4.

LEGEND

19 ○ Drill Hole Location and Number

24 ● Station Location and Number

E.L. Boundary

N

DRAWN	A.E.M.
DATE	Dec. 1981
COMPILED	G.Styles
APPROVED	
DWG. NO.	SH53-6.136.4055.
REV.	

AFMECO PTY. LTD.

SCALE 1 : 100 000 — 1 0 1 2 3 4 km

WIRRIDA - S.AUST.
E.L. 621

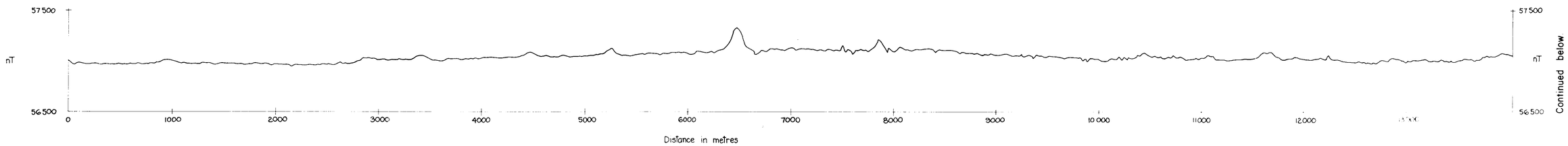
AEROMAGNETIC MAP of TOTAL INTENSITY CONTOURS

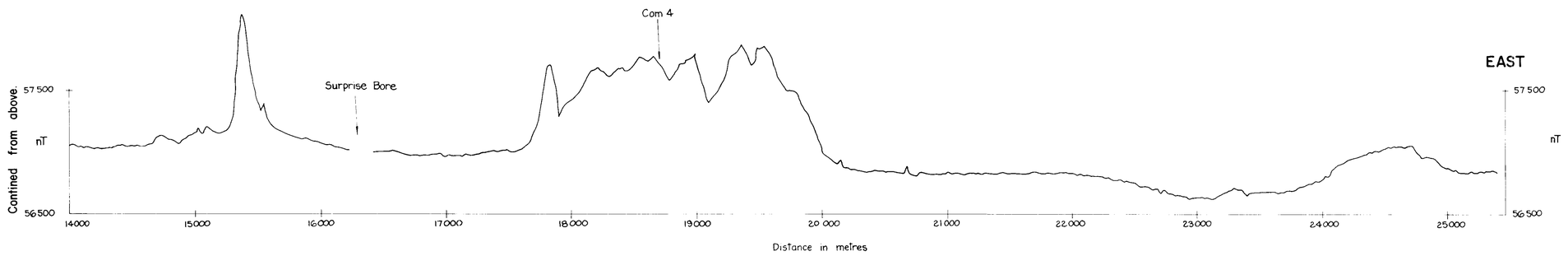
PLATE 2

3839-3

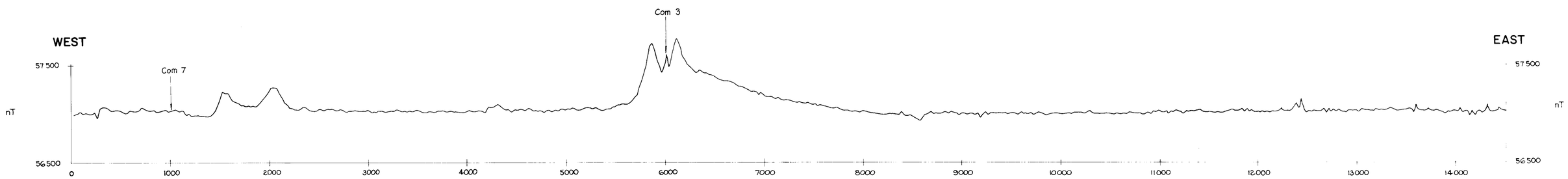
3839-3

LINE 1





LINE 2



3839-4

3839-4

To Accompany Report N° WY81.4

Plate 3a

REVISION	DATE
Redrawn AEM	Nov. '81

DWG N° SH 53-6. 136. 3957.

DRAWN J.M.

DATE March '81

COMPILED G.R.S.

APPROVED

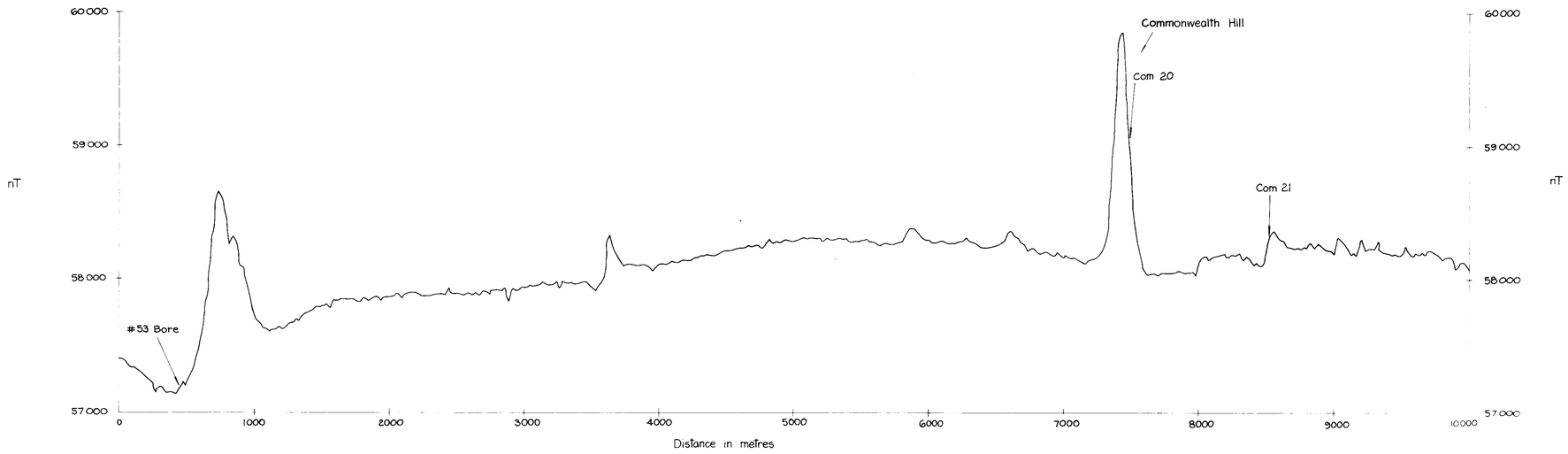
AFMECO PTY. LTD.

SCALE Horizontal Scale 1: 20 000

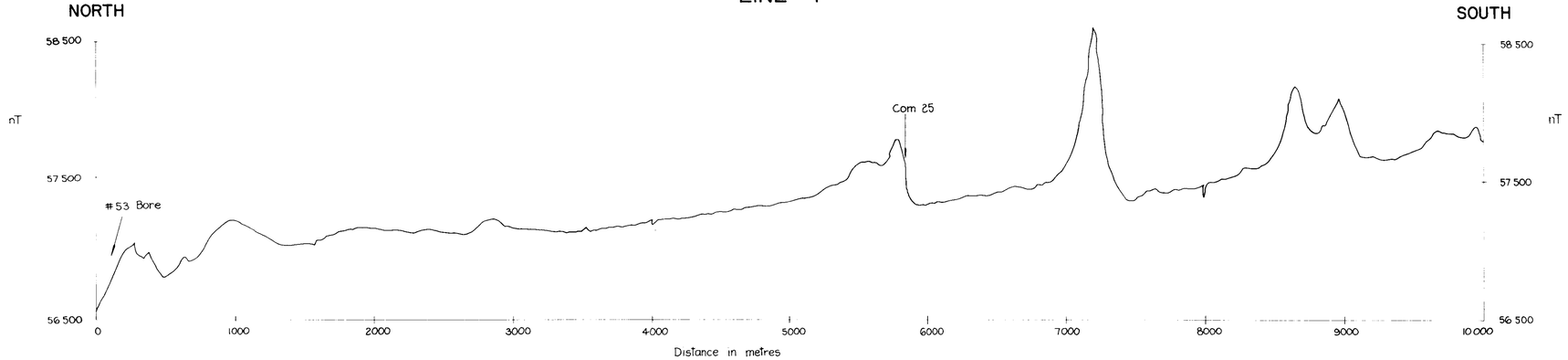
S AUST. - WIRRIDA PROJECT

LINES 1 & 2
GROUND MAGNETIC PROFILES
and
DRILL HOLE LOCATIONS

LINE 3



LINE 4



3839-5

To Accompany Report N°. WY 81.4 3839-5 *Plate 3b*

REVISION	DATE
Redrawn AEM	Nov. '81

AFMECO PTY. LTD.

SCALE Horizontal Scale 1:20000

DRAWN J.M.

DATE March '81

COMPILED G.R.S.

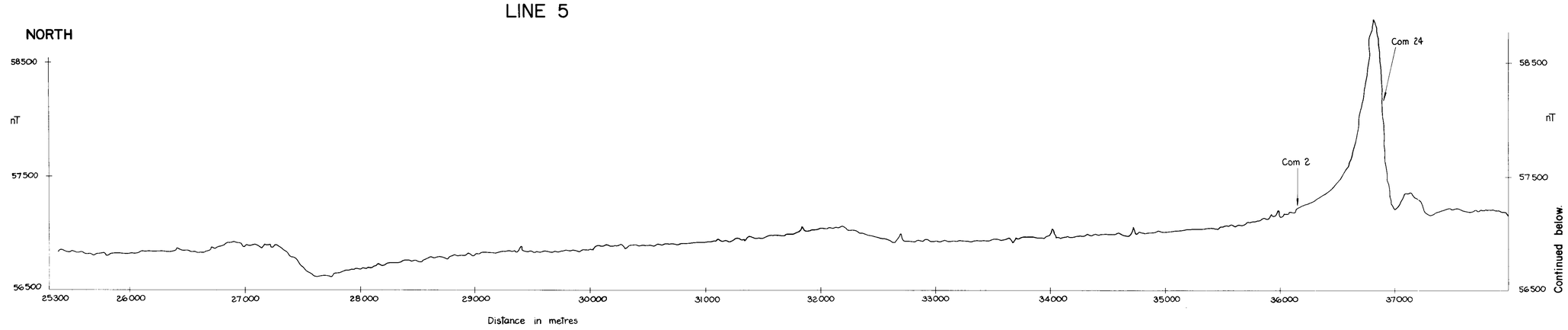
APPROVED

DWG. N° SH 53-6. 136. 3958.

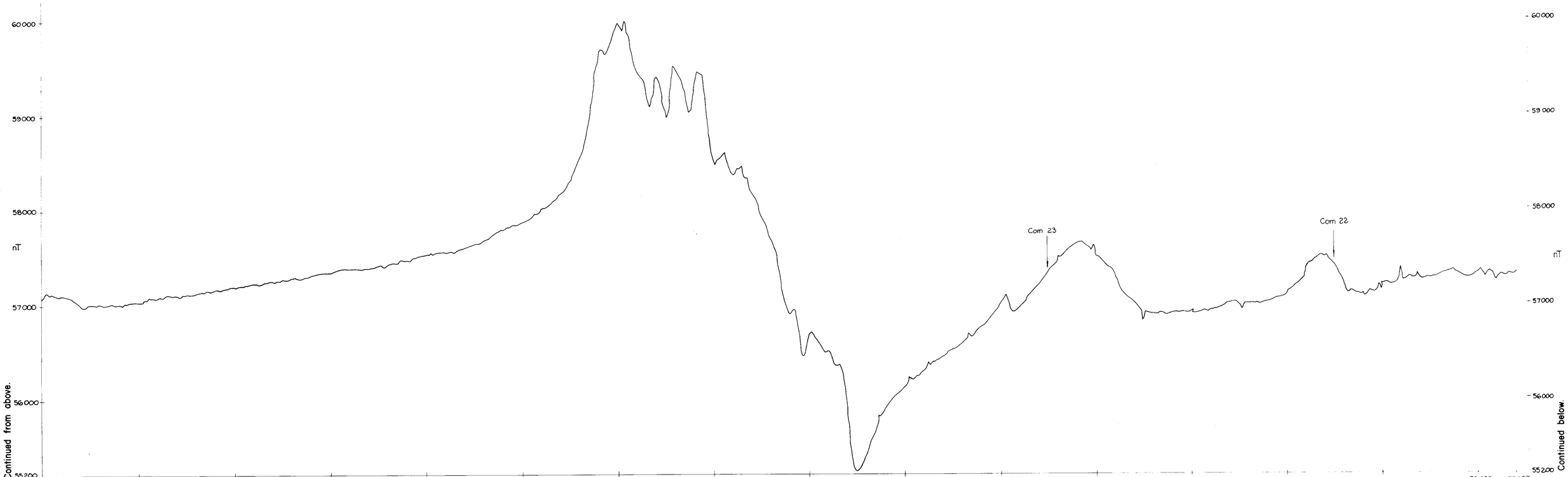
S AUST - WIRRIDA PROJECT
LINES 3 & 4
GROUND MAGNETIC PROFILES
and
DRILL HOLE LOCATIONS

LINE 5

NORTH

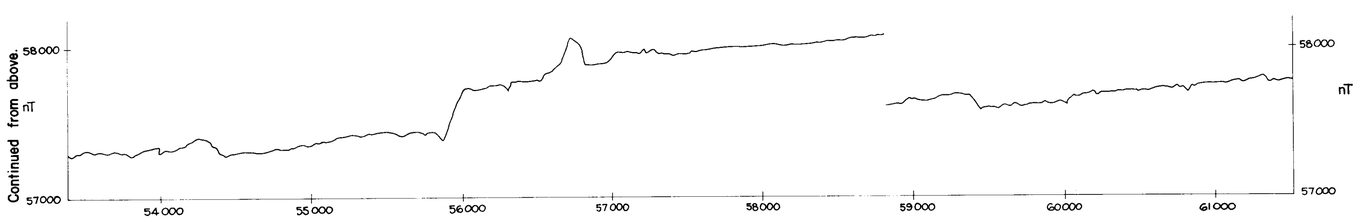


Distance in metres



Distance in metres

SOUTH



Distance in metres

3839-6

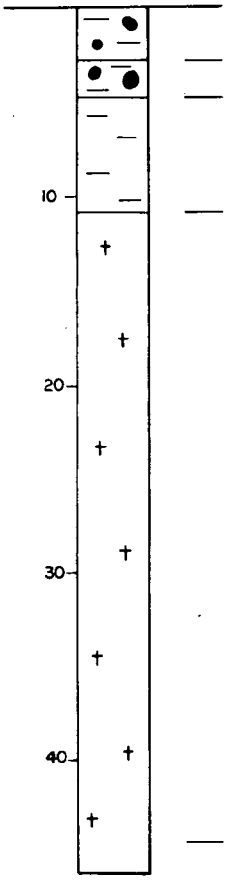
3839-6

To Accompany Report N°. WY81.4 *Plate 3c*

REVISION	DATE		AFMECO PTY. LTD.
Redrawn AEM	Nov. '81		SCALE Horizontal Scale 1 : 20 000
		DRAWN J.M.	S.AUST. - WIRRIDA PROJECT
		DATE March '81	LINE 5
		COMPILED G.R.S.	GROUND MAGNETIC PROFILE and DRILL HOLE LOCATIONS
DWG. N° SH 53-6. 136. 3959.		APPROVED	

0104

COM 1



red brown clay + fine to coarse grained sand

medium to coarse grained sand + mottled light green - white - red brown clay

clay, light greenish grey, minor limonitic yellow mottles.

decomposed basement

gneiss

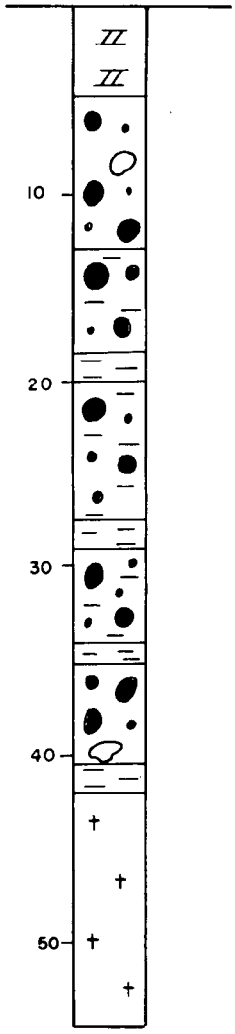
E.O.H. 46·5 m

To Accompany Report No. WY. 81·4. *Plate 4 (a)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1cm = 4m)
COMPILED G.R.S. (3·81)	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. No SH53-6136.4077	DRILL HOLE LOG – COM 1
REV.	

COM 2

0105



ferricrete

medium to coarse grained sand + gravel, up to 1cm., sub rounded clear quartz, minor white clay matrix

medium to coarse grained sand, poorly sorted, max. 5mm, abundant white clay matrix

light whitish greyish clay

medium to coarse grained (3mm) sand, rarely 5-6 mm, sub rounded clear quartz + light whitish clay

light greenish whitish clay

sand, medium to coarse grained, (as described above)

grey clay + medium to coarse grained sand

medium to coarse grained, sub rounded clear (tr. red stained) quartz gravel at base

light brown clay

decomposed basement

gneiss

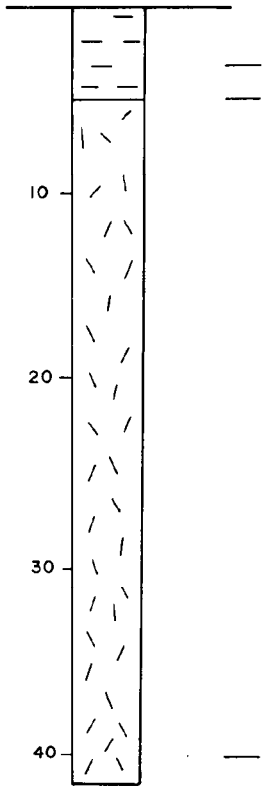
E.O.H. 54·5m

To Accompany Report No. W.Y. 81·4. *Plate 4(b)*

	DRAWN N.C.	AFMECO PTY. LTD.
	DATE JAN. '82	SCALE 1:400 (1cm = 4m)
	COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
	APPROVED	E.L. 621
	DWG. No SH53-6.136.4078	DRILL HOLE LOG – COM 2
	REV.	

COM 3

0106



white clay + coarse grained massive gypsum

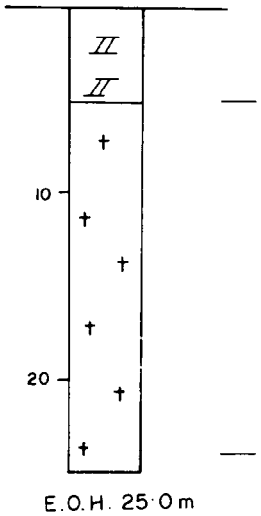
brown clay + coarse grained massive gypsum

decomposed basement

amphibolite

E.O.H. 41·5 m

COM 4



ferricrete - Fe cemented red brown clay + medium to coarse grained sand

decomposed basement

leptite

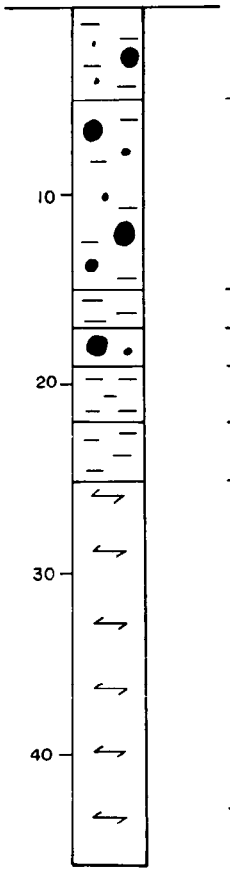
E.O.H. 25·0 m

To Accompany Report No. W.Y. 81·4. *Plate 4 (c)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1cm = 4m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. NO SH53-6.136.4079	DRILL HOLE LOGS - COM 3 & 4
REV.	

0107

COM 5



red brown clay + fine to coarse grained sand

medium to coarse grained sand + light greyish white clay matrix, weakly consolidated. Sub rounded clear quartz.

clay, brownish-greyish
medium to coarse grained sand, clear + grey sub rounded quartz + minor limonitic yellow-brown clay
light brown clay
dark brown clay

black lignitic clay, oxidised at top

decomposed basement

ultra mylonite

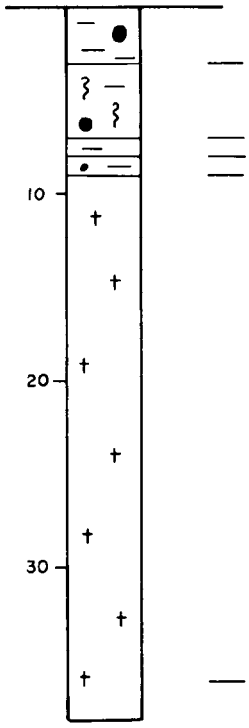
metreage	SPP2 c/s
15	25
16	35
17	30
18	45
19	25
20	30
21	35
22	35
23	35
24	35
25	35
26	30

To Accompany Report No. W.Y. 81·4. *Plate 4 (d)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1cm = 4m)
COMPILED G.R.S.	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. Nº SH53-6.136.4080.	DRILL HOLE LOG – COM 5
REV.	

COM 6

0108



red brown clay + fine to coarse grained sand

gypsum cemented medium to coarse grained sand + red brown clay

white clay + massive gypsum

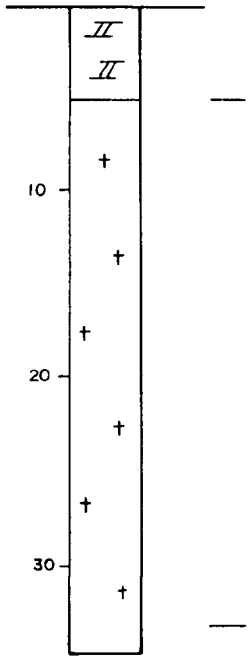
medium grained sand + light greyish white clay

decomposed basement

gneiss

E.O.H. 38·0m

COM 7



ferricrete

decomposed basement

gneiss

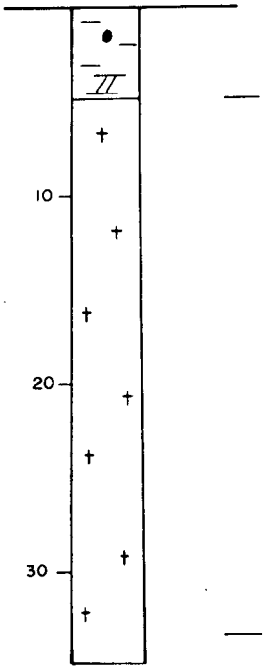
E.O.H. 35·0m

To Accompany Report No. W.Y. 81·4. *Plate 4 (e)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1 cm = 4 m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. NO SH53-6.136.4081	DRILL HOLE LOGS - COM 6 & 7
REV.	

COM 8

0109



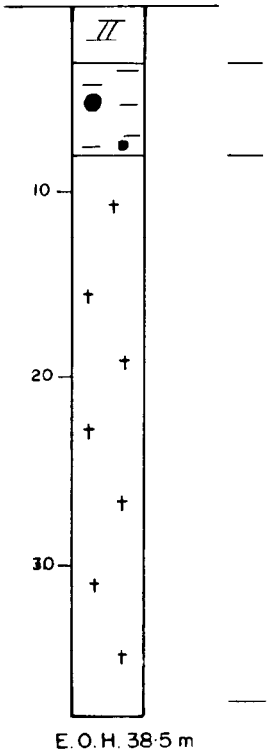
red clay † fine to coarse grained sand

silcrete

decomposed basement

gneiss

COM 9



ferricrete

clay, mottled brown - green † medium to coarse grained sub angular - sub rounded quartz.

decomposed basement

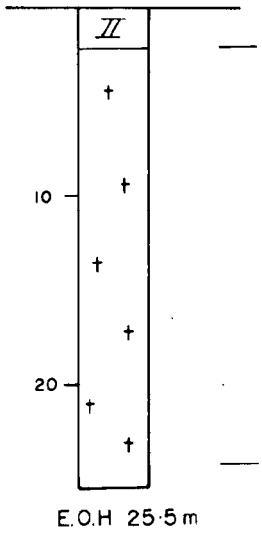
gneiss

To Accompany Report No. W.Y. 81·4. *Plate 4(f)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1cm = 4m)
COMPILED G R S 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. No SH53-6.136.4082	DRILL HOLE LOGS - COM 8 & 9
REV.	

COM 10

0110



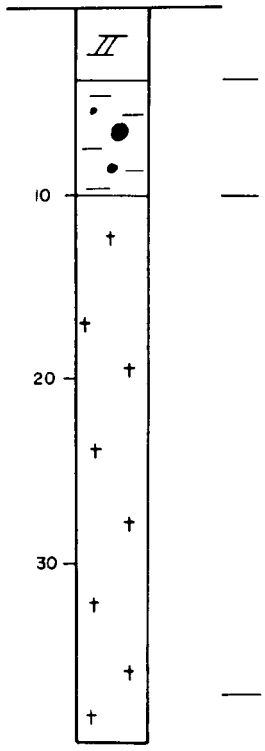
ferricrete

decomposed basement

gneiss

E.O.H 25·5 m

COM 11



ferricrete

light greenish-whitish clay + medium to coarse grained sub rounded - sub angular clear quartz

decomposed basement

gneiss, coarse acid - basic bands

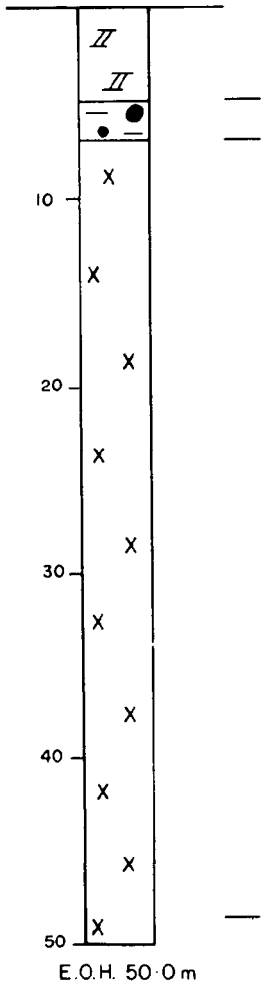
E.O.H. 39·5 m

To Accompany Report No. W.Y. 81·4. *Plate 4(g)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1 cm = 4 m)
COMPILED G.R.S. 3·81.	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. NO SH53-6.136.4083	DRILL HOLE LOGS-COM 10 & 11
REV.	

COM 12

0111



ferricrete

clay, mottled green + brown medium to coarse grained sub rounded - sub angular clear quartz sand

decomposed basement

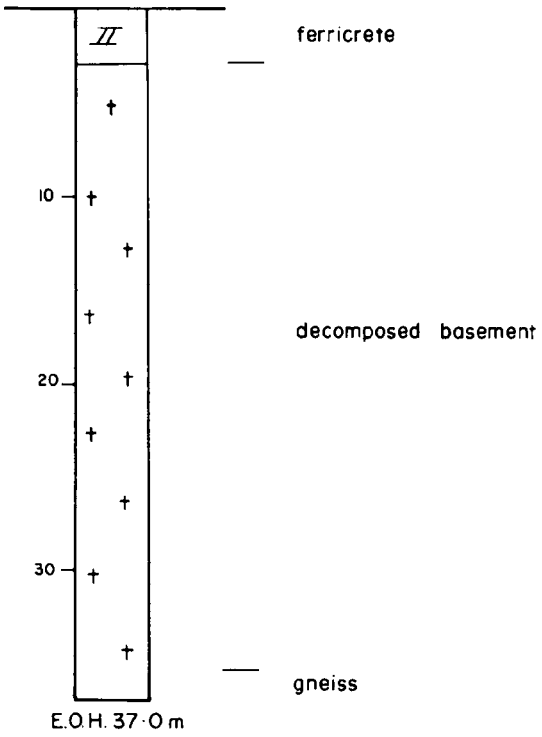
micro gabbro

To Accompany Report No. W.Y. 81·4. *Plate 4 (h)*

DRAWN N. C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1cm = 4m)
COMPILED G. R. S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. No SH53-6.136.4084	DRILL HOLE LOG – COM 12
REV.	

0112

COM 13

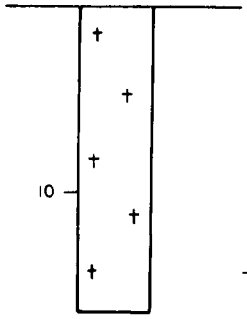


To Accompany Report No. W.Y. 81·4. *Plate 4(i)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1 cm = 4 m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. NO SH53-6.136.4085	DRILL HOLE LOG — COM 13
REV.	

COM 14

0113



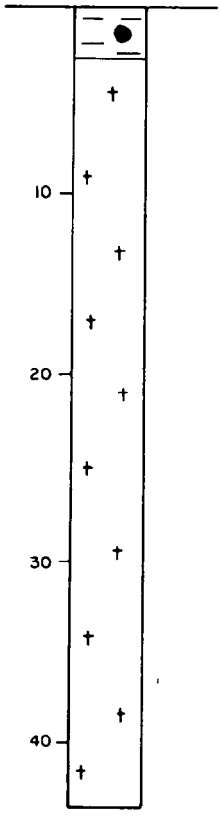
red clay † sand

decomposed basement

gneiss

E.O.H. 16·6 m

COM 15



red clay † sand

decomposed basement

gneiss

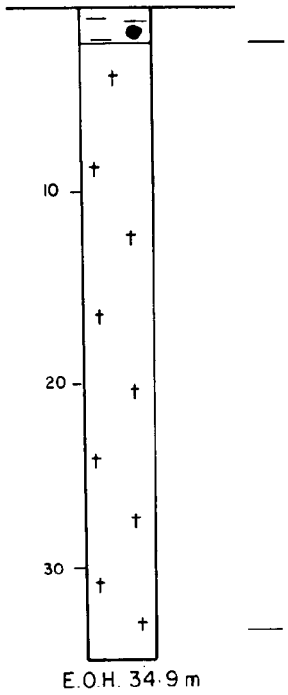
E.O.H. 43·5 m

To Accompany Report No. W.Y. 81·4. *Plate 4 (j)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1 cm = 4 m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. NO SH53-6.136.4086	DRILL HOLE LOGS - COM 14 & 15
REV.	

COM 16

0114



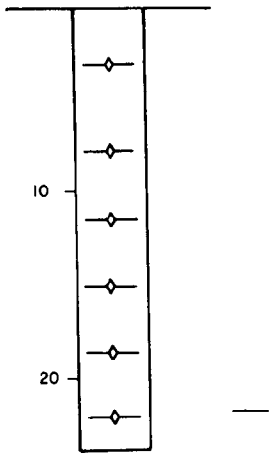
red clay and sand

decomposed basement

gneiss

E.O.H. 34·9 m

COM 17



red clay t sand

decomposed basement

granolite

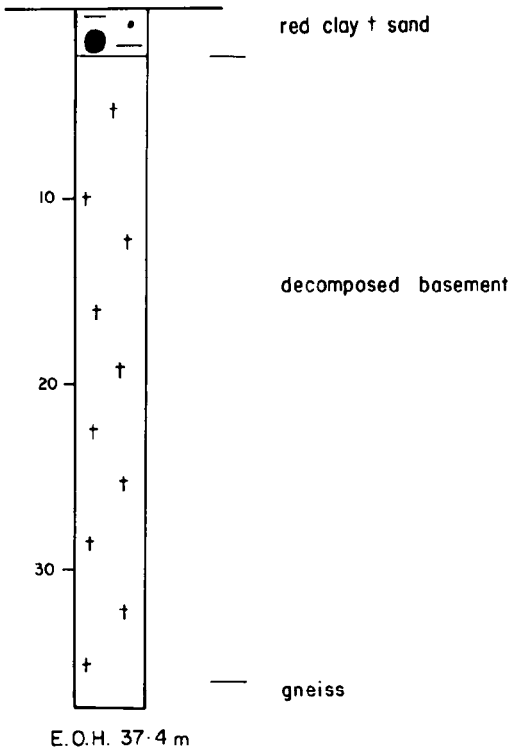
E.O.H. 24·0 m

To Accompany Report No. W.Y. 81·4. *Plate 4 (k)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1 cm = 4 m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. NO SH53-6.136.4087	DRILL HOLE LOGS - COM 16 & 17
REV.	

0115

COM 18

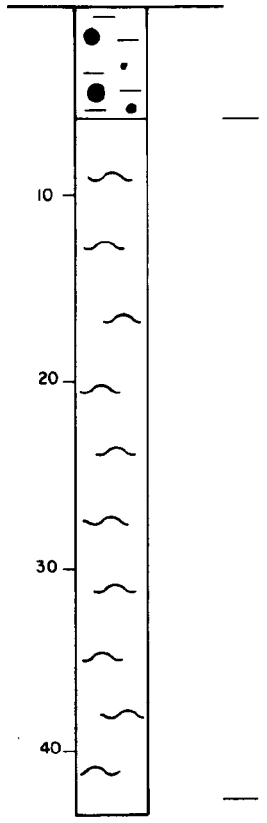


To Accompany Report No. W.Y. 81·4. *Plate 4(1)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1 cm = 4m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. No SH53-6.136.4088	DRILL HOLE LOG – COM 18
REV.	

0116

COM 19



red clay † sand

mottled green - white - yellow - brown clay † medium to coarse grained sand

decomposed basement

schist

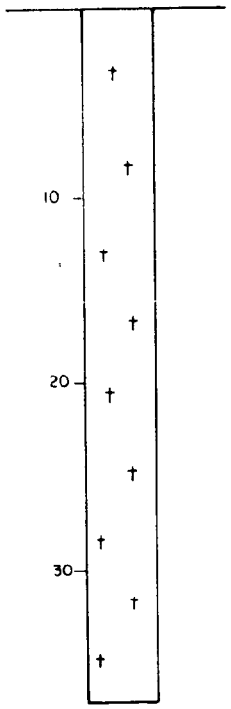
E.O.H. 43·5m

To Accompany Report No. W.Y. 81·4. *Plate 4 (m)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1 cm = 4 m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. No SH53-6.136.4089	DRILL HOLE LOG – COM 19
REV.	

COM 20

0117



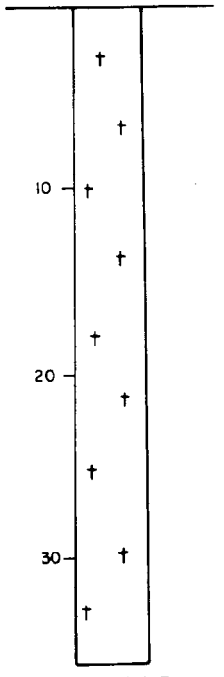
surface rubble

decomposed basement

gneiss

E.O.H. 37·0 m

COM 21



red clay † sand

decomposed basement

gneiss

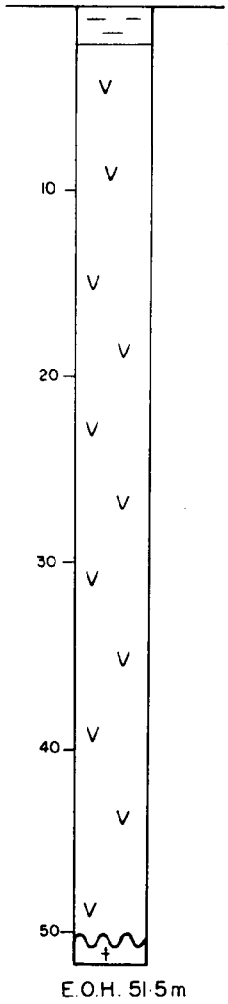
E.O.H. 35·5m

To Accompany Report No. W.Y. 81·4. *Plate 4(n)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1 cm = 4 m)
COMPILED G. R. S. 3·81.	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. NO SH53-6.136.4090	DRILL HOLE LOGS-COM 20 & 21
REV.	

COM 22

0118



red clay and sand

decomposed basement

weathered mafic (?) basic rock

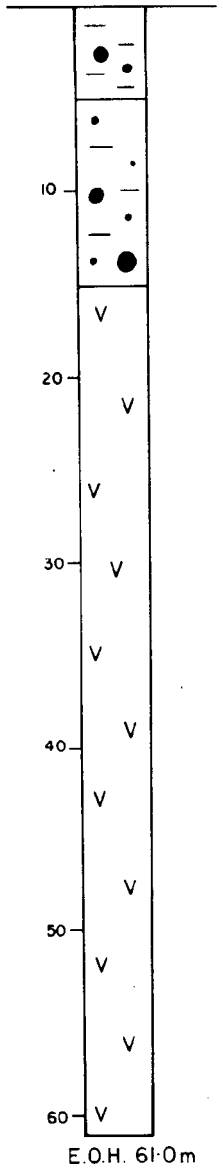
41·5m - 42m meta porphyry
42m - 50·5m weathered mafic (?) basic rock

pebbles of red hematitic clay at base → weathering, soil gneiss

To Accompany Report No. W.Y. 81·4. *Plate 4(o)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1 : 400 (1cm = 4m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. No SH53-6.136.4091	DRILL HOLE LOG – COM 22
REV.	

COM 23



red brown clay + sand

medium to coarse grained sand + minor white clay

decomposed basement

green biotitic rich clay

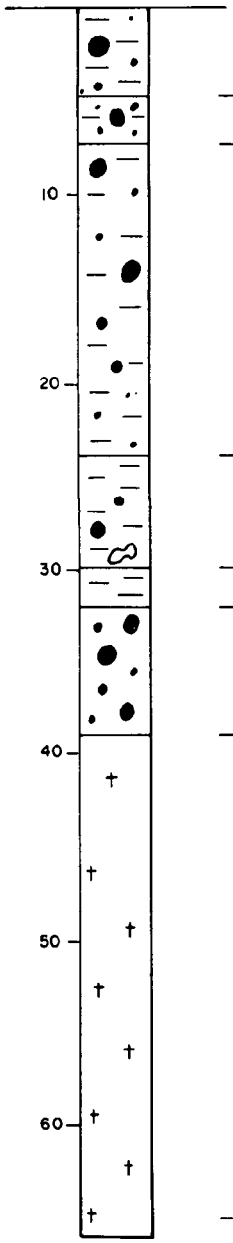
basalt, with xenolith of gneiss at top

To Accompany Report No. W.Y. 81·4. *Plate 4(p)*

DRAWN N. C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1cm = 4m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. No SH53-6.136.4092	DRILL HOLE LOG - COM 23
REV.	

0120

COM 24



red clay + medium to coarse grained sand

sand, poorly sorted, fine to coarse grained (5mm), angular, clear quartz + white & red clay

sand, medium to coarse grained (2mm) in moderately hard white clay matrix clear angular - sub angular quartz

fine to coarse grained sand in abundant soft white clay matrix + thin clay beds

white clay + medium to coarse grained sand , gravel at base clear angular - sub angular quartz

yellow + brown clay

sand, medium to coarse grained + grey clay, abundant pyrite

34m - 35m large pyrite cemented sandstone fragments

decomposed basement

gneiss

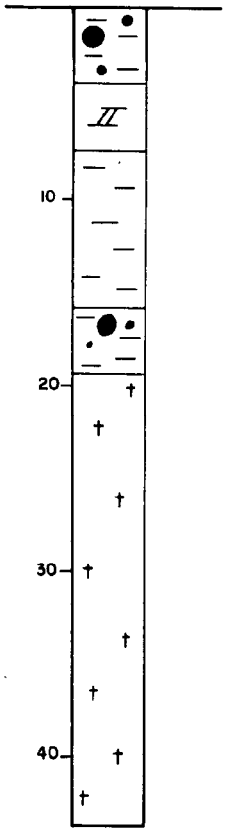
E. O.H. 66·0m

To Accompany Report No. W. Y. 81·4. *Plate 4 (q)*

DRAWN N.C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1 cm = 4m)
COMPILED G. R. S. 3·81	WIRRIDA PROJECT - S. AUST.
APPROVED	E.L. 621
DWG. No SH53-6.136. 4093	DRILL HOLE LOG – COM 24
REV.	

0121

COM 25



red brown clay + medium to coarse grained sand

silcrete

white clay

purple + limonitic yellow clay + medium to coarse grained sub rounded clear quartz

decomposed basement

gneiss

EOH 43·5m

To Accompany Report No. 81·4. *Plate 4(r)*

DRAWN N. C.	AFMECO PTY. LTD.
DATE JAN. '82	SCALE 1:400 (1cm = 4m)
COMPILED G.R.S. 3·81	WIRRIDA PROJECT - S. AUST. E.L. 621
APPROVED	DRILL HOLE LOG - COM 25
DWG. Nº SH53-6.136.4094	
REV.	

AFMECO PTY. LTD.

11-13 Lucknow Place, West Perth, Western Australia
P.O. Box 526, West Perth, Western Australia, 6005
Telephone: (09) 321 9618, 321 9681
Telex: AFMECO 92077 Perth

MQ/ds 82-0501

0122

25th February, 1982

The Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD S.A. 5063

Dear Sir,

Mining Act 1971 to 1978
Exploration Licence No. 621
3rd Quarter Report, Year 2
Period 21.10.81 to 20.1.82

During the period covered by this report AFMECO Pty Ltd did not conduct field work within the area of the tenement.

The report containing all data collected during the extensive drilling programme in previous quarters has been forwarded to the Department.

Please find attached a statement of expenditure covering this report period.

Yours faithfully,
AFMECO PTY LTD

J.-P. POGGI,
Managing Director

Encl.:

STATEMENT OF EXPENSES RELATING TO EXPLORATION PROGRAMME
E.L. 621 QUARTER 21.10.81 to 20.1.82

	$
PERSONNEL (FIELD WORK, EVALUATION, OFFICE WORK)	960.98
MATERIAL (DIRECT)	2.52
TRAVEL, ACCOMMODATION (DIRECT)	193.35
CONTRACTS, SUPPLIES	2,622.66
DRAFTING SERVICES, PREP. OF REPORTS & MISCELLANEOUS	114.76
MANAGEMENT/OVERHEADS	194.71
	$4,088.98

Commitment: $35,000

Permit Year Ends: 20.4.82

Total Expenditure Reported to Date: $78,307.08

AFMECO PTY. LTD.
11-13 Lucknow Place, West Perth, Western Australia
P.O. Box 526, West Perth, Western Australia, 6005
Telephone: (09) 321 9618, 321 9681
Telex: AFMECO 92077 Perth

0124

Q/lk 82-1107

17th May, 1982

The Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD SA 5063

Dear Sir,

Mining Act 1971 to 1978
Exploration Licence No. 621
4th Quarter Report, Year 2
Period 21/1/82 to 20/4/82

During the period covered by this report, Afmeco Pty Ltd, did not conduct field work within the area of the tenement.

The quarter was devoted to office studies of data collected during previous quarters and a programme assessment made in preparation for the anticipated renewal of this licence, application for which was made on 3rd March, 1982.

We enclose for your information and retention an expenditure statement for the report period.

Yours faithfully,
AFMECO PTY. LTD.

J.-P. POGGI
Managing Director

Encl.

STATEMENT OF EXPENSES RELATING TO EXPLORATION PROGRAMME

WIRRIDA - EL 621 21/1/82 to 20/4/82

PERSONNEL (FIELD WORK, EVALUATION, OFFICE WORK)	1 497.12
MATERIAL (DIRECT)	1.17
TRAVEL ACCOMMODATION (DIRECT)	
CONTRACTS, SUPPLIES	646.52
DRAFTING SERVICE, PREPARATION OF REPORTS &	252.97
MISCELLANEOUS	
MANAGEMENT/OVERHEADS	
	$2 397.78

Commitment $35,000

Permit Year Ends 20.4.82

Total Expenditure Reported: $80 704.87

AFMECO PTY. LTD.
(Incorporated in South Australia)
11-13 Knowl Place, West Perth, Western Australia
P.O. Box 526, West Perth, Western Australia, 6005
Telephone: (09) 321 9618, 321 9681
Telex: AFMECO 92077 Perth

0126

MQ/ds 82-2359

11th November, 1982

The Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD S.A. 5063

Dear Ian,

Mining Act 1971 to 1978
Exploration Licence No. 1009
1st Quarter, Year 1
Period 7.6.82 to 6.9.82

This Exploration Licence was granted on June 7th, 1982 and consists of the area formerly covered by EL No. 621 and also held by AFMECO Pty. Ltd.

During the period covered by this report no field work programmes were carried out. The quarter was occupied by collection and review of data from the previous terms exploration.

Please find attached an expenditure statement for the period covered by this report.

Yours faithfully,
AFMECO PTY LTD

J.-P. POGGI,
Managing Director

STATEMENT OF EXPENSES RELATING TO EXPLORATION PROGRAMME

Exploration Licence No. 1009

Period 7.6.82 to 6.9.82

	$
PERSONNEL (FIELD WORK, EVALUATION, OFFICE WORK)	474.00
MATERIAL (DIRECT)	-
TRAVEL, ACCOMMODATION (DIRECT)	-
CONTRACTS, SUPPLIES	-
DRAFTING SERVICE	-
PREP. OF REPORTS	-
MISCELLANEOUS	-
MANAGEMENT/OVERHEADS	47.00
TOTAL	$ 521.00

0128

AFMECO PTY. LTD.
(Incorporated in South Australia)

11-13 Lucknow Place, West Perth, Western Australia
P.O. Box 526, West Perth, Western Australia, 6005
Telephone: (09) 321 9681 Telex: 92077

MQ/ds 83-0134

17th February, 1983

The Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD S.A. 5063

Dear Sir,

Mining Act 1971 to 1978
Exploration Licence No. 1009
2nd Quarter Report, Year 1
Period 7/9/82 to 6/12/82

During the period covered by this report the following exploration work was conducted over the area of the E.L. 1009. Details are as follows:-

(1) Geophysical

Re-interpretation of previously flown aeromagnetic records defined five anomalies, possibly due to kimberlites, located within the tenement.

Localised ground magnetics were used to define more accurately the outline of these occurrences.

(2) Sampling

Soil samples were collected over the areas of interest and are at present in the process of being separated prior to analysis. Results are expected by mid-May.

(3) Drilling

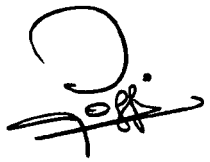
A rotary air blast programme consisting of sixteen drill holes with an average depth of 28 metres was conducted over the five anomalies defined by the geophysical programme.

(4) Results

Visual observation of the drilling samples appear to provide negative results. This will probably be confirmed by assay results due in mid-March.

We enclose for your information an expenditure statement for the period covered by this report.

Yours faithfully,
AFMECO PTY LTD



J.-P. POGGI,
Managing Director

Encl.: 1

STATEMENT OF EXPENSES RELATING TO EXPLORATION PROGRAMME 0130
E.L. 1009 PERIOD 7/9/82 to 6/12/82

	$
PERSONNEL (FIELD WORK, EVALUATION, OFFICE WORK)	7,560-83
MATERIAL (DIRECT)	-
TRAVEL, ACCOMMODATION (DIRECT)	1,797-88
CONTRACTS, SUPPLIES	1,080-00
DRAFTING SERVICE, PREP. of REPORTS & MISCELLANEOUS	9-94
MANAGEMENT/OVERHEADS	522-08
	$10,970-73

0131

EXPLORATION LICENCE 1009

WIRRIDA, SOUTH AUSTRALIA

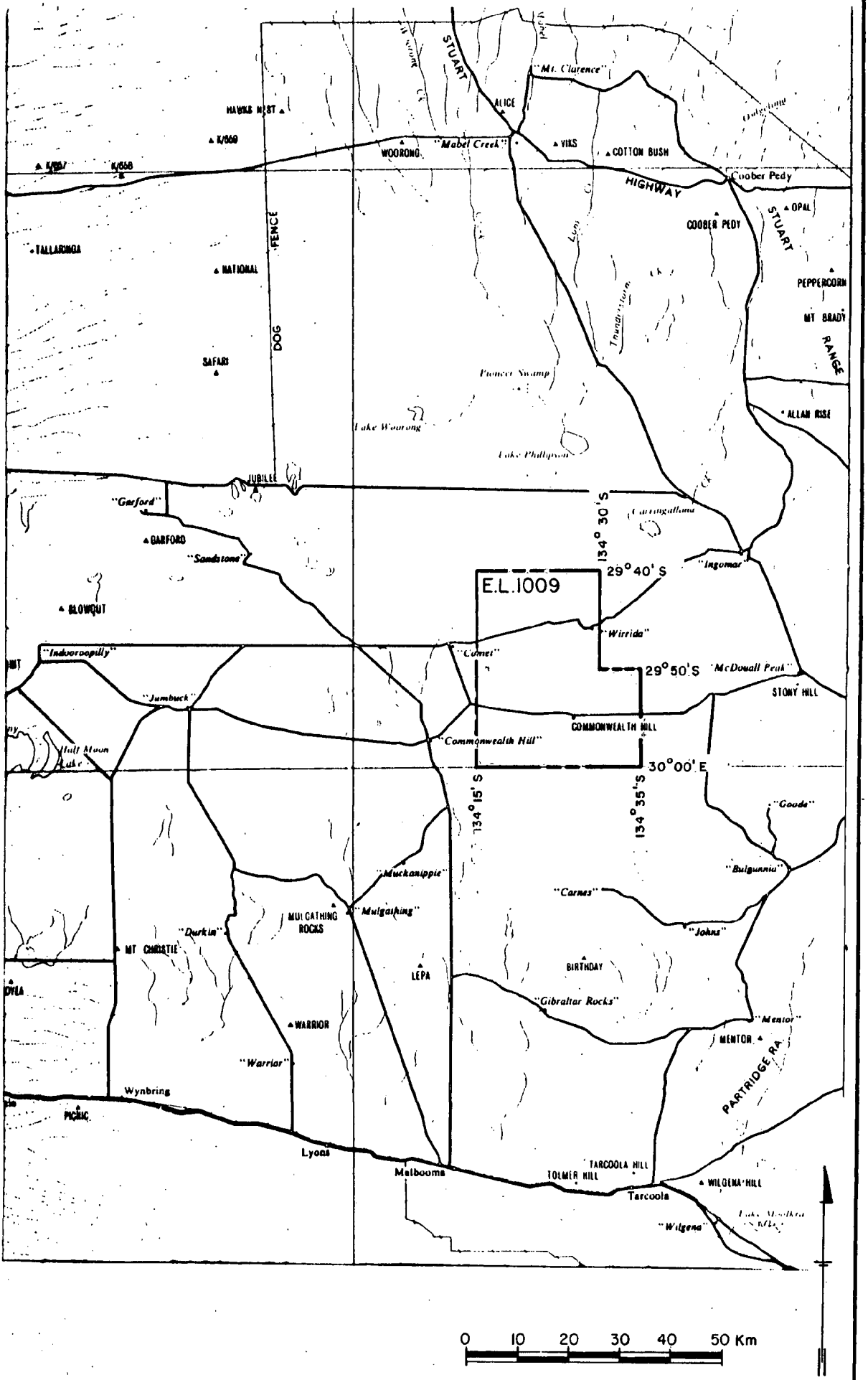
REPORT FOR THE QUARTER ENDED 5th MARCH, 1983

CONTENTS

FIGURES

Fig. 1

0133



Centre Melbourne	THE BROKEN HILL PROPRIETARY CO. LTD.	Project No. 6-F670
Date 22-4-83	E.L. 1009, WIRREDA, S.A.	Drawing No. A4-
	LOCATION MAP	

EXPLORATION LICENCE 1009

WIRRIDA, SOUTH AUSTRALIA 0134

REPORT FOR THE QUARTER ENDED 8th MARCH, 1983

1. FIELD INVESTIGATIONS

1.1 Drilling

Drilling of five aeromagnetic anomalies was completed in late January. Fifteen (15) percussion holes (drilled with an Investigator Mark 5 drill rig owned by Southern Drilling) totalling 266 metres were drilled on the E.L. All drill holes were sampled over two metre intervals and the bottom two samples were sent to Comlabs for analysis for copper, lead, zinc, nickel, cobalt, chromium, arsenic and niobium. Results are awaited. Petrographic work will be done on any samples which return anomalous geochemistry.

Drilling Summary

All drill co-ordinates are based on local grids.

Anomaly 1: The source of the magnetic anomaly was not found due to drilling difficulties, all the holes caving in before the target depth of 40 metres was reached. The stratigraphy of each hole is summarised below:

PCH 1	5000E/4900N
0-4m	Calcrete and laterite
4-16m	Clay
16-18m	Clay and quartz fragments
Hole abandoned	

PCH 2	5000E/4950N
0-4m	Calcrete and soil
4-20m	Clay
20-22m	Clay with some quartz
Hole abandoned	

PCH 3	5000/4850N
0-4m	Calcrete and soil
4-19m	Clay
Hole abandoned	

PCH 4	5000E/5350N
0-6m	Calcrete and laterite
6-10m	Clay
Hole abandoned	

Anomaly 2: The source of the magnetic anomaly appears to be magnetic dolerite or intermediate volcanic material. The stratigraphy of each hole is summarised below:

cont./..

PCH 10	5000E/5025N
0-2m	Calcrete and soil
2-20m	Clay
20-22m	Clay and weathered basement
22-24m	Intermediate volcanic

PCH 11	5000E/5050N
0-2m	Calcrete and soil
2-8m	Siltstone and clay
8-20m	Clay
Hole abandoned	

PCH 12	5000E/5000N
0-2m	Calcrete and soil
2-22m	Clay
22-27m	Weathered dolerite

Anomaly 3: The source of this anomaly appears to be a weathered ultramafic. Geochemistry and petrographic work should help to identify this material more fully.

PCH 7	4900E/4800N
0-6m	Soil and calcrete
6-20m	Clay
20-36m	Clay and weathered ultramafic

PCH 8	4900E/4825N
0-4m	Soil and calcrete
4-10m	Clay
10-24m	Clay and weathered ultramafic

PCH 9	4900E/4775N
0-4m	Calcrete and soil
4-8m	Clay
8-20m	Clay and metamorphosed ultramafic

Anomaly 4: Due to drilling difficulties none of the holes reached a significant depth. A larger rig would be needed to test this anomaly properly.

PCH 13	4800E/4600N
0-6m	Calcrete and ferricrete
Hole abandoned	

PCH 14	4800E/4550N
0-8m	Calcrete and ferricrete
Hole abandoned	

PCH 15	4800E/4650N
0-6m	Calcrete and silcrete
Hole abandoned	

cont./..

Anomaly 5: The source of this magnetic anomaly was intersected in both holes drilled in this anomaly. It appears to be a magnetic coarse grained igneous rock.

PCH 5	4850E/5025N
0-4m	Calcrete and soil
4-12m	Clay
12-14m	Coarse grained igneous material

PCH 6	4850E/5050N
0-2m	Calcrete and soil
2-10m	Clay
10-12m	Coarse grained green igneous material

Figure 1 gives the location of the anomalies together with the location of loam samples collected in October, 1983. The observing of these loam samples is about to start and should be completed by the end of the next quarter.

2. EXPENDITURE

Expenditure debited to E.L. 1009 during the three months December, 1982 and January, February, 1983, and the total expenditure to 28th February, 1983, are as follows:

	Quarter Ended 28 February 1983	Total to 28 February 1983
Wages and Salaries	$5,879	$13,598
Messing and Accommodation	373	1,012
Fares and Mobilisation	123	125
Transport	542	1,671
Sample Analysis	231	771
Drilling	2,095	2,095
Radio Communications	-	2
Mobilisation of Equipment	24	31
Surveying and Aerial Photographs	-	540
Occupancy and Location Expenses	-	3
Administration and Overheads	463	992
	$9,730	$20,840

0137

EXPLORATION LICENCE 1009

WIRRIDA, SOUTH AUSTRALIA

REPORT FOR THE QUARTER ENDED 6th JUNE, 1983

CONTENTS

FIGURE 1: E.L. 1009 Wirrida, S.A
Location of Loam Samples,
Anomalies and Drillholes

A2-355

EXPLORATION LICENCE 1009

WIRRIDA, SOUTH AUSTRALIA

0139

REPORT FOR THE QUARTER ENDED 6th JUNE, 1983

1. FIELD INVESTIGATION AND RESULTS

1.1 Geophysics

During May approximately 10 kilometres at 10 metre spacing of ground magnetic investigations were carried out across An2 and 3. These extra data indicate that An2 and 3 are probably due to a metamorphic zone in the basement, as the anomalies appear more linear and not isolated anomalies as first thought. (Locations of An2 and 3 are on Figure 1).

1.2 Loam Sampling

Six loam samples were collected across the anomalies, hand gravitated and observed, but no indicators were found. Chips from the drill holes did not contain any kimberlitic indicators either.

During the quarter, 114 loam samples out of the 247 collected in October, 1982 were processed and observed and found to be negative. (Locations of loam samples are on Figure 1).

2. EXPENDITURE

Expenditure debited to E.L. 1009 during March, April and May, 1983, was:

Wages and Salaries	$ 8,193
Fares and Mobilisation	383
Messing and Accommodation	144
Transport	1,088
Sample Analysis	1,331
Occupancy and Location Expenses	46
Administration and Overheads	559
	$11,744

Total expenditure to 31st May, 1983, is: $32,584

EXPLORATION LICENCE 1009

WIRRIDA, SOUTH AUSTRALIA

AFMECO-BHP MINERALS LTD. JOINT VENTURE

FINAL REPORT, SEPTEMBER 1983

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APPENDICES

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EXPLORATION LICENCE 1009, WIRRIDA SOUTH AUSTRALIA
AFMECO-BHP MINERALS LTD JOINT VENTURE
FINAL REPORT, SEPTEMBER 1983

1. INTRODUCTION

BHP Minerals Ltd has completed its exploration programme for diamondiferous kimberlites over EL 1009 in South Australia. This EL was due to expire on 5th June 1983 but was extended at our request for 3 months to the 5th September 1983 to allow completion of sample observing.

A loam sampling programme was carried out over the whole EL but no kimberlitic indicators were found. Interpretation of aeromagnetic data flown over the western half of the area for Afmeco resulted in 5 anomalies being selected for follow-up ground magnetics and drilling. No kimberlitic material was found although one anomaly (No3) appears to be due to an unusual metamorphic pyroxenitic rock.

Most early results are presented in previous quarterly reports but details of the ground magnetics, petrography, geochemistry and loam sampling not previously detailed are given below.

2. REGIONAL LOAM SAMPLING

As reported previously a total of 247 loam samples were collected in a regional programme covering the whole EL (Figure 1). The samples were mainly collected from along tracks and fence-lines with a spacing of 1km between sites. Each sample consisted of about 15kg of surface material, less than 4mm in diameter, collected from an area of 1 square metre. All the material was sent to BHP's heavy mineral laboratory where it was washed and concentrated using heavy liquids (TBE) and magnetic separation. The observing of these concentrates was done in BHP's Adelaide laboratory and the results are detailed in Appendix 1. No kimberlitic indicators were found.

Cont./..

3. AEROMAGNETICS AND GROUND MAGNETICS

As a result of interpretation of Afmeco's aeromagnetic data, 5 anomalies were selected for ground magnetic follow-up (see Figure 1). This work showed that all 5 anomalies needed to be drilled to test the anomaly. Results of this ground magnetics and the appropriate aeromagnetic data are presented in Appendix 2.

4. DRILLING

Descriptions of the 15 percussion holes drilled on the EL by Southern Drilling are given in the quarterly report ending 8th March, 1983 and are summarised in graphic log form in Figure 2.

5. GEOCHEMISTRY AND PETROGRAPHY

Drill chip samples were collected over 2 metre intervals for the entire drilling interval and the bottom 2 samples were assayed for Cu, Pb, Zn, Ni, Co, Cr, As and Nb by Comlabs in Adelaide. Unusual results were returned from drillholes testing Anomaly 3 (PCH 7, 8 and 9). Further samples were therefore sent to Comlabs for analysis. Some of the samples were also assayed for Ba, Sr, Rb, Zr and La. The results of all trace element geochemistry is presented in Table 1.

Because of the unusual geochemical results from Anomaly 3 several chips were hand picked from six of the samples and sent to Pontifex & Associates for thin sectioning and sample description. The descriptions given by Pontifex are given in Appendix 3. The samples examined were:-

Sample No.	Nole No.	Depth of Sample
DEA 6932	PCH 7	18-20m
DEA 6938	PCH 7	32-34m
DEA 6939	PCH 7	34-36m
DEA 6945	PCH 8	8-10m
DEA 6957	PCH 9	8-20m
DEA 6963	PCH 9	18-20m

Cont./..

The work by Pontifex & Associates reported that "the suite consists mainly of retrograde metamorphic rocks derived from 'pyroxenites' ". There were two samples that they interpreted as altered and retrograded basaltic to aluminous ultramafic rocks which alternatively may have lamprophyric affinities. To test this out these two samples (DEA 6939 and 6963) were resubmitted to Comlabs for Major element analysis (Table 2). Inspection of the thin sections was then made by an in-house petrologist who reported that the textures and geochemistry were more likely representative of metamorphic ultramafics. In a further attempt to confirm this result, 5 garnets and 5 ilmenites were hand picked from sample DEA 6963 and probed. All these proved to be non-kimberlitic.

6. FOLLOW-UP WORK

To ensure that the garnets and ilmenites had not originated in a nodule caught up in a kimberlitic intrusive some further ground work was carried out. The ground magnetics were extended over Anomalies 2 and 3 (both appeared to be magnetically very similar). This showed the anomalies were more elongate than it originally appeared and was therefore consistent with a metamorphic source (Appendix 2).

Six loam samples (CA 1252-1257) and two 30kg samples of drill chips (shovelled from around the drill holes PCH 7 and PCH 9) were collected from Anomaly 3 (see Figure 1). All these samples were washed and concentrated in a pleitz jig. The jig concentrates were then hand gravitated to produce an 'eye' of heavy minerals and these heavy minerals were then observed in BHP's Adelaide Laboratory. No kimberlitic indicators were found (see Appendix 1).

Cont./..

7. CONCLUSIONS

Although the exact nature of the magnetic source of Anomaly 3 is not known the ground magnetics, geochemistry, petrography and heavy mineral work shows it is a metamorphic ultramatic and is not kimberlitic. Other aeromagnetic anomalies are explained as either dolerite or coarse grained igneous material or are not explained at all due to drilling difficulties. No kimberlitic indicator minerals were found in any loam samples or drill chip concentrates. Further work could be done with a larger drill rig on anomalies not fully tested but considering the above results this is not recommended.

8. EXPENDITURE

Expenditure for the period 6/6/83-5/9/83 and for the total period of the J.V. is given below:-

Wages & Salaries	166.00
Field Support	16.00
Transport	194.00
Geochemistry	215.00
Sundries	21.00
Surveys	16,719.00
Administration & Overheads	1,733.00
	$19,064.00

Total Expenditure for the period of the Joint Venture is: $48,805.00.

TABLE 1 TRACE ELEMENT ASSAY RESULTS PERCUSSION DRILLING, E.L. 1009, WIRRIDA, S.A.

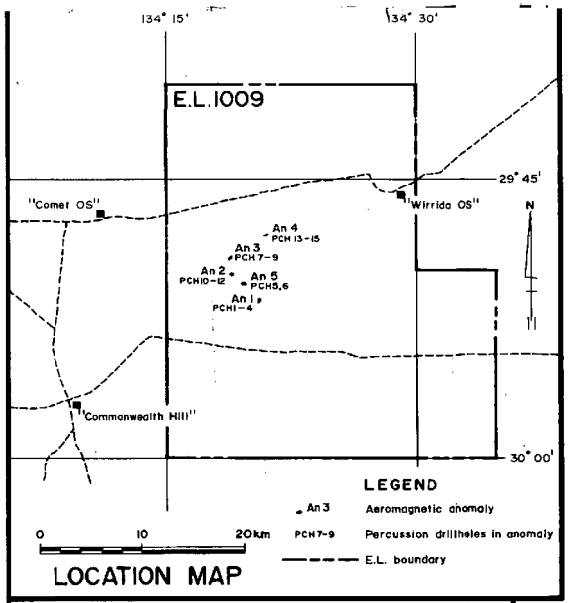
Anomaly No	Hole No	Sample (DEA)	Depth(m) From	To	Cu	Pb	Zn	Ni	Co	Cr	As	Nb	Ba	Sr	Rb	Zr	La
					Assay Results (ppm)												
1	PCH 1	6880	14	16	65	<4	14	12	<4	30	<2	14					
	1	6881	16	18	18	<4	22	18	<4	22	<2	14					
	PCH 2	6891	18	20	22	<4	18	14	6	24	3	16					
		6892	20	22	20	<4	16	20	6	18	<2	22					
	PCH 3	6901	14	16	16	<4	18	22	10	16	4	46					
		6902	16	18	16	<4	14	12	<4	22	<2	14					
	PCH 4	6906	6	8	16	12	44	24	6	30	7	14					
2	PCH10	6971	14	16	80	44	38	26	6	<4		10	330	660	42	195	120
		6972	16	18	170	18	65	60	22	12		7	470	310	70	230	100
		6973	18	20	100	40	60	34	12	12		8	370	490	55	200	100
		6974	20	22	55	6	80	30	16	38	3	5					
		6975	22	24	44	<4	150	75	26	42	4	7					
	PCH11	6982	10	12	26	30	16	12	<4	<4		10	230	250	4	165	90
		6983	12	14	90	30	42	22	10	<4		12	200	270	9	210	150
		6984	14	16	130	14	40	20	8	<4		12	240	120	30	210	20
		6985	16	18	195	28	65	48	24	30	12	12	360	530	26	165	100
		6986	18	20	145	65	110	55	20	30	6	12	390	740	48	135	80
	PCH12	6995	16	18	50	30	40	26	6	14		6	640	160	60	280	110
		6996	18	20	75	34	100	60	18	16		7	400	230	50	200	50
		6997	20	22	90	26	140	90	34	34		8	420	310	75	200	50
		6998	22	24	95	<4	250	260	75	90	12	8					
		6999	24	27	120	<4	270	320	95	100	7	7					
3	PCH 7	6992	0	2	22	16	34	20	<4	10	5	10	200	46	32	170	20
		6923	2	4	18	20	22	24	<4	12	3	10	590	115	24	190	<20
		6924	4	6	20	24	18	75	<4	55	6	9	310	155	12	85	20
		6925	6	8	16	16	20	70	<4	370	20	20	110	95	<2	65	20
		6926	8	10	20	60	55	180	14	440	8	9	180	440	12	70	90
		6927	10	12	38	30	320	800	80	360	7	8	270	780	24	50	110
		6928	12	14	50	14	180	430	46	300	3	4	340	790	38	50	150
		6929	14	16	90	16	350	930	120	400	14	5	230	590	26	75	250

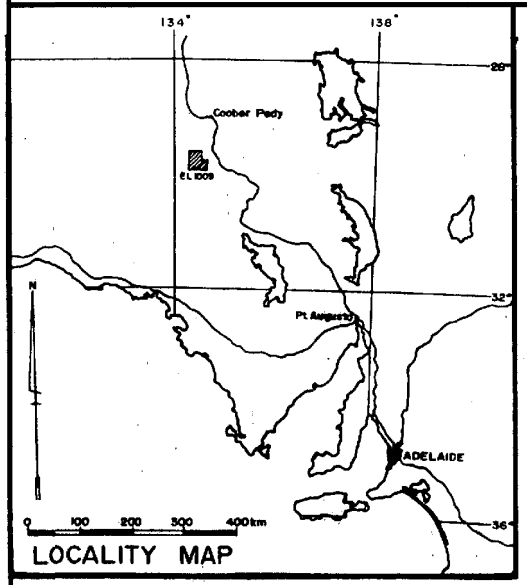
Anomaly No	Hole No	Sample (DEA)	Depth (m) From	To	Cu	Pb	Zn	Ni	Co	Cr	As	Nb	Ba	Sr	Rb	Zr	La
					Assay Results (ppm)												
3	PCH 7	6930	16	18	70	12	360	1250	200	470	16	7	125	125	18	85	170
		6931	18	20	50	24	170	910	75	539	5	6	85	100	9	70	40
		6932	20	22	30	22	150	820	75	470	2	6	120	80	18	75	20
		6933	22	24	28	16	140	850	75	400	6	5	240	65	38	70	20
		6934	24	26	38	14	120	860	85	350	6	10	220	55	85	55	30
		6935	26	28	140	16	130	1100	100	330	22	7	440	105	105	70	40
		6936	28	30	120	22	170	1050	100	330	46	8	570	80	105	50	90
		6937	30	32	36	18	65	520	44	380	10	6	160	195	30	80	20
		6938	32	34	46	<4	190	640	80	580	24	14					
		6939	34	36	22	<4	295	790	100	750	30	18	930	155	270	65	50
	PCH 8	6941	0	2	14	16	28	16	<4	12		10	270	65	30	185	20
		6942	2	4	22	20	28	22	<4	26		10	650	185	24	145	20
		6943	4	6	14	12	16	50	6	12		6	190	140	12	75	60
		6944	6	8	18	6	26	75	<4	130		3	400	105	16	42	30
		6945	8	10	48	10	290	310	30	420		6	620	135	6	70	50
		6946	10	12	50	30	175	320	22	390		8	320	750	<2	95	70
		6947	12	14	32	26	105	360	18	410		7	95	1750	<2	110	110
		6948	14	16	46	14	280	390	60	240		9	410	1750	170	135	120
		6949	16	18	55	20	320	570	100	250		8	770	3200	165	130	200
		6950	18	20	46	20	240	610	90	220		7	990	2450	185	160	110
		6951	20	22	65	<4	240	810	120	540							
		6952	22	24	75	<4	200	520	80	410							
3	PCH 9	6953	0	2	20	20	32	28	<4	14	<2	9	890	165	26	145	<20
		6954	2	4	20	20	34	50	<4	20	5	9	420	165	24	110	20
		6955	4	6	32	36	24	70	<4	1050	48	9	1650	420	12	105	70
		6956	6	8	38	65	34	120	<4	750	20	6	680	860	4	95	140
		6957	8	10	38	34	75	165	6	520	18	5	340	340	<2	75	90
		6958	10	12	100	22	470	600	60	470	9	6	590	200	34	65	90
		6959	12	14	120	30	530	700	65	740	14	6	1100	210	65	90	70
		6961	14	16	100	42	340	660	75	590	3	7	710	850	60	95	350
		6962	16	18	110	<4	490	690	110	950	6	9					
		6963	18	20	135	12	570	1000	160	520	16	10	560	80	300	100	160

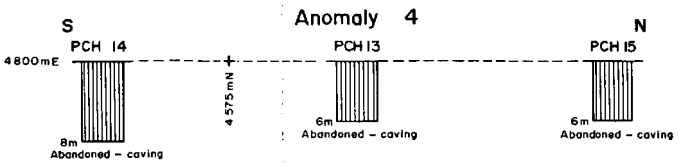
Anomaly No	Hole No	Sample (DEA)	Depth (m) From	To		Assay Results (ppm) Cu	Pb	Zn	Ni	Co	Cr	As	Nb	Ba	Sr	Rb	Zr	La
4	PCH13	7003	4	6	2	26	<4	36	30	8	50	12	14					
	PCH14	7007	6	8	2	24	<4	36	24	6	75	10	16					
	PCH15	7010	4	6	2	16	<4	16	14	2	20	4	10					
5	PCH 5	6913	10	12	4	50	<4	85	44	14	140	4	6					
		6914	12	14		20	<4	65	28	10	55	4	7					
	PCH 6	6919	8	10	4	32	<4	75	22	8	65	<2	6					
		6921	10	12		40	<4	70	34	10	85	<2	5					
			69	139														

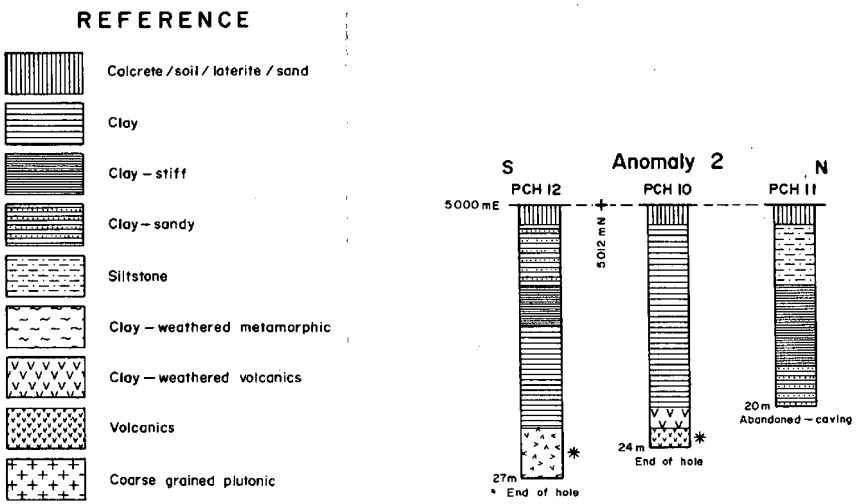
TABLE 2 MAJOR ELEMENT ASSAY RESULTS - ANOMALY 3, EL 1009

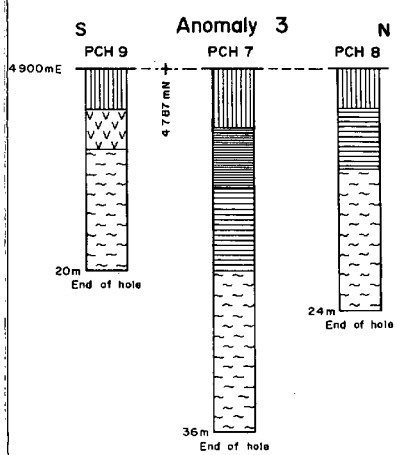
ANALYSIS	DEA 6963	DEA 6939
SiO_2	36.7 %	42.9 %
TiO_2	1.82%	2.15%
Al_2O_3	16.4 %	13.2 %
Fe_2O_3 (Total Fe)	21.8 %	16.1 %
FeO	3.00%	3.90%
MnO	0.16%	0.10%
MgO	6.70%	10.8 %
CaO	0.64%	1.66%
Na_2O	0.78%	1.73%
K_2O	2.85%	3.55%
P_2O_5	0.12%	0.16%
CO_2	<0.05%	<0.05%
LOI	11.9 %	7.4 %
H_2O	4.70%	3.00%
K/Na	4.06	2.30

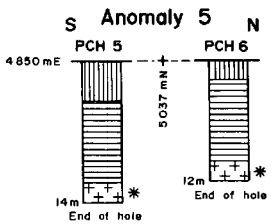


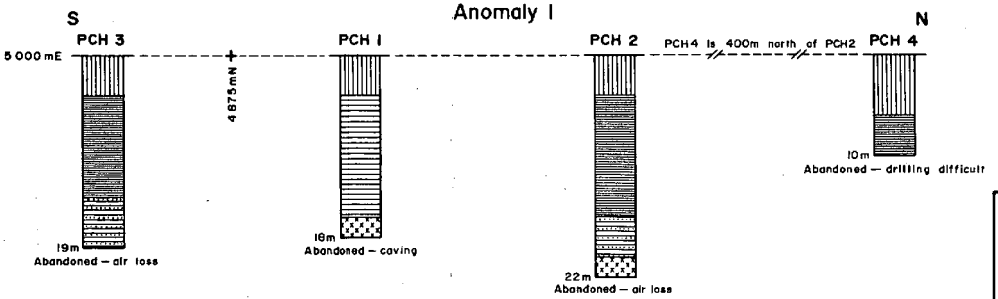


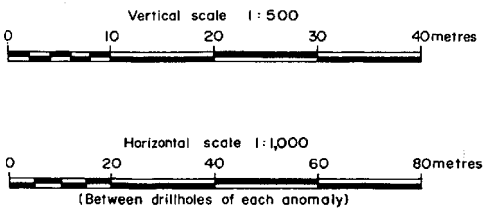












Note: Drillhole position is centre of graphic log.
Co-ordinates are based on a local grid for each anomaly.

Fig. 2

THE BROKEN HILL PROPRIETARY CO. LTD.
EXPLORATION DEPARTMENT

E.L.1009 WIRRIDA, S.A.
AFMECO J.V.
GRAPHIC LOGS

150

Prepared by: E.L.S.	Centre: Adelaide	
Date: 6-9-83	Project No: 6-F67-3	Drawing No: A3-171
Drawn: S.C.S.		

Revisions:

APPENDIX I

HEAVY MINERALS RESULTS SHEETS

CA 995 - CA1241
CA1252 - CA1257
PCH7
PCH9

Abbreviations

VC	Very common
C	Common
S	Several
R	Rare

NM = Non Magnetic faction
M = Magnetic faction

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0152

Sample No: CA0995 - CA1001 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: C. Hampson

Job No: F670 Result: Positive —

Date Started: 9-3-83 Negative CA0996 - CA1001

Date Finished: 11-3-83 Possible CA0995

7 samples

OBS Weight -.8+.4 = 226.9

CAN Weight -.4+.25 = 117.4

TOTAL = 344.3

~~Mags~~ 3 + 4 41.5 | ~~Non Mags.~~

	Fraction	+1.0	~~+0.8~~	~~+0.5~~	~~+0.4~~	~~+1.0~~	~~+0.8~~	~~+0.5~~	~~+0.4~~
	Weight	90.6	71.3	13.9	27.6	30.2	42.9	26.6	41.2
		CA0995	CA0996	CA0997	CA0997	CA0998	CA0999	CA1000	CA1001
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite	✓x2							
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	✓R		✓R					
	Amphibole								✓R
	Ilmenite	✓R	✓R						
	Limonite/Hematite	✓VC	✓VC	✓VC	✓VC	✓VC	✓VC	✓VC	✓VC
	Pyroxene			✓R					
	Quartz	✓R	✓R	✓R	✓R	✓R	✓R	✓R	✓R
	Tourmaline		✓R	✓R	✓R			✓R	✓R
	KYANITE	✓R		✓R	✓R	✓R	✓R	✓R	✓R
	RUTILE	✓R	✓R	✓R	✓R				
					CONTAMINATED				
				CONTAMINATED	CONTAMINATED				

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.
	2 Chromites - fair grains.		CT516 - Negative

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1002/3/4/5/6/7/8/9 Observer: C Stone

Area: C/Hill Mineralogist: C Esp

Job No: F670 Result: Positive

Date Started: 10-3-83 ~~Negative~~ (circled: Negative)

Date Finished: 14-3-83 Possible

Total weight: 107.9 gms. Total weight of -.4 + .25 = 81.6.		Mags ~~3 +~~ 4				~~Non Mags~~.			
	Fraction	~~+1.0~~	~~+0.8~~	~~+0.5~~	~~+0.4~~	~~+1.0~~	~~+0.8~~	~~+0.5~~	~~+0.4~~
	Weight	13.6	17.5	13.4	9.9	13.5	13.2	9.5	17.3
	SAMPLE NUMBER	CA1002	CA1003	CA1004	CA1005	CA1006	CA1007	CA1008	CA1009
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	....								
BACKGROUND MINERALS	Almandine Garnet					R ✓			
	Amphibole								
	Ilmenite								
	Limonite/Hematite	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓
	Pyroxene								R ✓
	Quartz	S ✓	R ✓	R ✓	R ✓	R ✓	R ✓	R ✓	R ✓
	Tourmaline		R ✓			R ✓	R ✓		R ✓
	Biotite	R ✓							
	Kyanite (blue & white)		R ✓	R ✓	R ✓	R ✓	S ✓	R ✓	R ✓
	* (-.4 + .25 Scanned)								

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION			PROBE NO.		

Comments ....

....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0154

Sample No: CA1010 - [illegible]
Area: COMMONWEALTH HILL
Job No: F670
Date Started: 14-3-83
Date Finished: 16-3-83

Observer: ROB
Mineralogist: [illegible]
Result: Positive
(Negative)
Possible

TOTAL WEIGHT OBS. 1 & SAMPLES = 273.7gms.		Mags 3 + 4				Non Mags.			
	Fraction	CA1010	CA1011	CA1012	CA1013	CA1014	CA1015	CA1016	CA1017
	Weight	25.6g	21.2g	24.3g	31.6g	29.1g	34.6g	50.0g	57.3
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	✓ R		✓ R	✓ R		✓ R	✓ R	✓ R
	Amphibole	✓ R		✓ R	✓ R	✓ R		✓ R	
	Ilmenite								
	Limonite/Hematite	✓ VC	✓ VC	✓ VC	✓ VC	✓ VC	✓ VC	✓ VC	✓ VC
	Pyroxene								
	Quartz	✓ C	✓ R	✓ S	✓ S	✓ R	✓ S	✓ S	✓ S
	Tourmaline	✓ S	✓ S	✓ S	✓ S	✓ R	✓ R	✓ R	✓ R
	Kyanite	✓ R			✓ R	✓ R	✓ R	✓ R	✓ R
	Rutile	✓ R	✓ R	✓ R	✓ R	✓ R	✓ R	✓ R	
	Zircon	✓ R			✓ S				
	Staurolite				✓ R	✓ R	✓ R		
	Barite					✓ R		✓ R	
	Ilmenite								✓ R

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments ..... SAMPLES CONSIST OF 99.99% LIMONITE .....

B.H.P. EXPLORATION

0155

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1018-CA1025 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: [signature]

Job No: F670 Result: Positive

Date Started: 11-3-83 Negative ✓

Date Finished: 15-3-83 Possible

8 samples

OBS Weight -8+.4 = 171.5

SCAN Weight -.4+.25 = 167.1

TOTAL = 338.6

		~~Mags 3 + 4~~				~~Non Mags.~~			
	Fraction	~~+1.0~~	~~+0.8~~	~~+0.5~~	~~+0.4~~	~~+1.0~~	~~+0.8~~	~~+0.5~~	~~+0.4~~
	Weight	42.7	47.4	56.0	34.5	42.8	55.0	24.4	35.8
		CA1018	CA1019	CA1020	CA1021	CA1022	CA1023	CA1024	CA1025
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet						√R		
	Amphibole	√R			√R	√R			
	Ilmenite		√R		√R		√R		√R
	Limonite/Hematite	√VC	√VC	√VC	√VC	√VC	√VC	√VC	√VC
	Pyroxene								
	Quartz	√R	√R	√R	√R	√R	√R	√R	√R
	Tourmaline	√R	√R	√R	√R	√R	√R	√R	
	KYANITE	√R	√R	√R	√R	√R	√R	√R	√R
	RUTILE		√R	√R		√R	√R	√R	√R

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments .....

.....

V.C. - Very Common C - Common S - Several R - Rare

B.H.P. EXPLORATION

0156

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1026/27/28/29/30/31/32/33 Observer: O'Neal

Area: Ekati Mineralogist: C. Eggler

Job No: F670 Result: Positive

Date Started: 14-3-83 Negative

Date Finished: 21-3-83 Possible

Total weight.. 263.1 gms. Total weight of +1+2S 265.7 gms. (Scanned)

	Mags 3 + 4				Non Mags.			
Fraction	+1.0	+0.8	+0.5	+0.4	+1.0	+0.8	+0.5	+0.4
Weight	7.7	15.2	24.0	42.2	42.7	37.9	29.2	64.2
	CA1026	CA1027	CA1028	CA1029	CA1030	CA1031	CA1032	CA1033
INDICATORS								
Pyrope/Knorringite								
Chrome Diopside								
Chromite								
Picroilmenite								
Other								
.....								
BACKGROUND MINERALS								
Almandine Garnet				R ✓		R ✓		R ✓
Amphibole								
Ilmenite								
Limonite/Hematite	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓
Pyroxene								
Quartz	R ✓	R ✓	R ✓	R ✓	R ✓	R ✓	R ✓	R ✓
Tourmaline		R ✓		R ✓	R ✓	R ✓		
Kyanite						R ✓		
Staurolite						R ✓		
Diopside						R ✓		

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments .....

V.C - Very Common C - Common S - Several R - Rare

B.H.P. EXPLORATION

0157

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1034 - CA1035 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: C. Eggington

Job No: F670 Result: Positive

Date Started: 16-3-83 Negative ✓

Date Finished: 16-3-83 Possible

35 Weight -8+1.4 65.4
AN Weight -4+.25 61.0
Total 126.4g

		Mags 3 + 4				Non Mags.			
	Fraction	~~+1.0~~	~~+0.8~~	+0.5	+0.4	+1.0	+0.8	+0.5	+0.4
	Weight	62.5	63.9						
		CA1034	CA1035						
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet								
	Amphibole								
	Ilmenite	✓R	✓R						
	Limonite/Hematite	✓VC	✓VC						
	Pyroxene								
	Quartz	✓R	✓R						
	Tourmaline	✓R	✓R						
	RUTILE	✓R	✓R						
	KYANITE	✓R	✓R						

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments .....

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B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET 0158

Sample No: CA1036 ——→ CA1041 Observer: ROB

Area: COMMONWEALTH HILL Mineralogist: C Elsp

Job No: F670 Result: Positive

Date Started: 29-4-83 Negative

Date Finished: 4-5-83 CA1036 — Possible

(-·4+·25) fraction of all samples was scanned. Total weight:- 136.0g

TOTAL 179.3 gms

		CA1036		CA1037		CA1038			CA1039		CA1040		CA1041	
Fraction		M	N/M	M	N/M	M	N/M		M	N/M	M	N/M	M	N/M
Weight		13·9	13·7	13·4	6·7	22·9	17·0g		27·5	16·9	8·7	16·2	9·8	12·6
INDICATORS														
Pyrope/Knorringite														
Chrome Diopside			?1											
Chromite														
Picroilmenite														
Other Broozite...			?1											
.....														
BACKGROUND MINERALS														
Almandine Garnet		S		R		R			R					
Amphibole			R											
Ilmenite														
Limonite/Hematite		VC	VC	VC	VC	VC	VC		VC	VC	VC	VC	VC	VC
Pyroxene														
Quartz			S		S		S			S		S		S
Tourmaline			R									R		
Orthopyroxene		R												
Rutile			S		S		S			S		S		S
Zircon														R

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.	
	CA1036 - 1 Cr Diopside (Possible) N/M +0·5	}	Probe	cr	—	AS76	DIOPSIDE	
	CA1036 1 Broozite · N/M +0·25	}			—	AS77	TREMOLITE	

Comments .....

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B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0159

Sample No: CA 1042

Area: C/H44

Job No: F670

Date Started: 2-5-83

Date Finished: 2-5-83

Observer: Stone

Mineralogist: C. Stone

Result: Positive / Negative / Possible

Total weight:
Obs: 15.7 gms.
Scan: 30.9 gms.

		Mags 3 + 4			SCAN	Non Mags.			SCAN
	Fraction			+0.5	-.4+.25			+0.5	-.4+.25
	Weight			7.9	17.0			7.8	13.9
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet								
	Amphibole								
	Ilmenite			S ✓	✓			R ✓	✓
	Limonite/Hematite			V.C ✓	✓			V.C ✓	✓
	Pyroxene								
	Quartz							S ✓	✓
	Tourmaline				✓				✓
	Zircon							R ✓	✓
	Rutile								✓

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

0160

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA 1043 Observer: Shere

Area: C/HILL Mineralogist: C. Clarke

Job No: F670 Result: Positive

Date Started: 2-5-83 Negative

Date Finished: 2-5-83 Possible

Total weight.
0.65 = 10.8 g
Scan = 28.8 g.

		Mags 3 + 4			SCAN	Non Mags.			SCAN
	Fraction	+1.0	-.5+.4	+0.5	-.4+.25	+1.0	-.5+.4	+0.5	-.4+.25
	Weight		4.2	3.8	23.7		1.3	1.5	5.1
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet		R ✓						✓
	Amphibole								✓
	Ilmenite			R ✓	✓				
	Limonite/Hematite		V ✓	V ✓	✓		V ✓	V ✓	✓
	Pyroxene								
	Quartz		R ✓	R ✓	✓		S ✓	S ✓	✓
	Tourmaline						R ✓	R ✓	✓
	Baryte						R ✓	R ✓	✓
	Kyanite						R ✓		✓
	Zircon						R ✓		✓
	Monazite								✓

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

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B.H.P. EXPLORATION

0161

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA 1044/45 Observer: Other

Area: C/HILL Mineralogist: C. Elsby

Job No: F670 Result: Positive

Date Started: 2-5-83 Negative

Date Finished: 3-5-83 Possible

Total weight.		CA 1044				CA 1045			
Obs:-(4H) 11.1. (4S) 9.7. Scan:-(4H) 30.1 (4S) 22.6.		MAGS 3+4		N/M		MAGS 3+4		N/M.	
	Fraction	-.8+.4	-.4+25	-.8+.4	-.4+25	-.8+.4	-.4+25	-.8+.4	-.4+25
	Weight	7.2	19.0	3.9	11.1	4.8	11.6	4.9	11.0
			(SCAN)		(SCAN)		(SCAN)		(SCAN)
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet								✓
	Amphibole	R ✓							
	Ilmenite	R ✓	✓	R ✓					
	Limonite/Hematite	V.C ✓	✓	V.C ✓	✓	V.C ✓	✓	V.C ✓	✓
	Pyroxene								
	Quartz	S ✓	✓	S ✓	✓		✓	S ✓	✓
	Tourmaline				✓				✓
	Zircon			S ✓	✓				✓
	Kyanite			R ✓	✓		✓	R ✓	
	Staurolite				✓				
	Andalusite				✓				
	Rutile				✓				

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

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B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA 1046
Area: E/H14
Job No: F670
Date Started: 3-5-83
Date Finished: 3-5-83

Observer: Shane
Mineralogist: C. Clyne
Result: Positive / (Negative) / Possible

Total weight:
Obs: 10.5 gms
Scan: 27-0 gms.

		Mags 3 + 4			'Scan'	Non Mags.			'Scan'
	Fraction	+1.0	+0.8	+0.5	-1+.25	+1.0	+0.8	+0.5	-1+.25
	Weight			5.5	14.5			5-0	12.5
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet								✓
	Amphibole								
	Ilmenite			R✓					
	Limonite/Hematite			V.C✓	✓			V.C✓	✓
	Pyroxene								
	Quartz			R✓	✓			S✓	✓
	Tourmaline								
	Kyanite							S✓	✓
	Staurolite							R✓	✓
	Rutile							R✓	✓
	Monazite							R✓	✓
	Zircon								✓

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
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B.H.P. EXPLORATION

0163

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA 1052/53/47 ..... Observer: Greene .....
Area: C/H/H ..... Mineralogist: L Clapp .....
Job No: F670 ..... Result: Positive .....
Date Started: 6-5-83 ..... Negative .....
Date Finished: 9-5-83 ..... Possible .....

Total weight:
Obs: - 42.9 gms
Scan: - 58.8 gms.

		CA 1047		CA 1052		CA 1053			
	Fraction	-8+4	-8+4	-8+4	-8+4	-8+4	-8+4		
	Weight	12.0	6.1	5.8	6.8	8.4	6.8		
		MAGS	N/M	MAGS	N/M	MAGS	N/M.		
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet		R ✓	R ✓					
	Amphibole								
	Ilmenite			R ✓					
	Limonite/Hematite	V.C ✓	V C ✓	V C ✓	V C ✓	V C ✓	V C ✓		
	Pyroxene								
	Quartz	R ✓	S ✓		S ✓	S ✓	S ✓		
	Tourmaline								
	Kyanite		S ✓		S ✓	R ✓			

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
.....

B.H.P. EXPLORATION

0164

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1048/49/50/51 ..... Observer: Cheene .....

Area: C/HILL ..... Mineralogist: C Edgson .....

Job No: F670 ..... Result: Positive .....

Date Started: 2-5-83 ..... Negative .....

Date Finished: 5-5-83 ..... Possible .....

Total weight
Olo: - 108.2 gms.
Dcm: - 101.3 gms.

		CA1048		CA1049		CA1050		CA1051	
	Fraction	-.8+.4	-.8+.4	-.8+.4	-.8+.4	-.8+.4	-.8+.4	-.8+.4	-.8+.4
	Weight	8.7	9.1	8.8	10.1	12.1	12.4	23.8	23.2
		MASS	N/M	MASS	N/M	MASS	N/M	MASS	N/M
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	R ✓			R ✓		R ✓	R ✓	
	Amphibole		R ✓						
	Ilmenite	R ✓	R ✓		S ✓			R ✓	R ✓
	Limonite/Hematite	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓
	Pyroxene								
	Quartz	R ✓	S ✓	R ✓	S ✓	R ✓	R ✓	R ✓	R ✓
	Tourmaline		S ✓				R ✓		
	Kyanite		R ✓		S ✓		S ✓		R ✓
	Barite				R ✓		R ✓		
	Corundum				R ✓				

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

.....

B.H.P. EXPLORATION

0165

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1054 — CA1059

Area: COMMONWEALTH HILL

Job No: F670

Date Started: 4-5-83

Date Finished: 9.5.83

Observer: ROB

Mineralogist: CEdgar

Result: Positive / (Negative) / Possible

Total 233.3 gm

		CA1054		CA1055		CA1056				CA1057		CA1058		CA1059	
	Fraction	M	N/M	M	N/M	M	N/M			M	N/M	M	N/M	M	N/M
	Weight Obs	2.8	3.8	6.0	9.4	5.7	10.4			5.5	6.5	8.5	7.7	15.2	4.[illegible]
	Weight Sc.	8.5		22.2		21.2				28.1		27.7		39.6	
INDICATORS	Pyrope/Knorringite														
	Chrome Diopside														
	Chromite														
	Picroilmenite														
	Other														
	.....														
BACKGROUND MINERALS	Almandine Garnet									R				R	R
	Amphibole														R
	Ilmenite														
	Limonite/Hematite	VC	VC	VC	VC	VC	VC			VC	VC	VC	VC	VC	VC
	Pyroxene														
	Quartz		S		S		C				C		C		C
	Tourmaline		R										R		R
	Barite		R		S		R						R		
	Rutile		R		S		S			R	S	R	S	S	S
	Kyanite		R		R		S				S				S
	Topaz												R		

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0166

Sample No: CA1061 Observer: ROB

Area: COMMONWEALTH HILL Mineralogist: C.E. Taylor

Job No: F670 Result: Positive

Date Started: 10-5-83 Negative

Date Finished: 10-5-83 Possible

Total 33.7g

		Mags 3 + 4				Non Mags.			
	Fraction	+1.0	+0.8	+0.5	+0.4	+1.0	+0.8	+0.5	+0.4
	Weight Obs				4.3g				47g
-4+.25 →	Scanned	14.4g				10.3g			
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet				R				
	Amphibole								
	Ilmenite								
	Limonite/Hematite				VC				VC
	Pyroxene								
	Quartz								C
	Tourmaline								
	Rutile								R
	Kyanite								R

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1060
Area: Commonwealth Hill
Job No: F670
Date Started: 12-5-83
Date Finished: 12-5-83

Observer: CAROLYN
Mineralogist: C Edgar
Result: Positive
Negative ✓
Possible

Total Weight 56.5g OBS 18.3g SCAN 38.2g		Mags 3 + 4				Non Mags.			
	Fraction	+~~1.0~~	+~~0.8~~	+.4 ~~+0.5~~	+.25 ~~+0.4~~	+~~1.0~~	+~~0.8~~	+.4 ~~+0.5~~	+.25 ~~+0.4~~
	Weight			12.6	27.5			5.6	10.7
				✓	✓			✓	✓
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet			R	R			R	R
	Amphibole							R	R
	Ilmenite								
	Limonite/Hematite			VC	VC			VC	VC
	Pyroxene								
	Quartz			R	R			S	C
	Tourmaline								
	KYANITE							S	S
	RUTILE							S	S
	ZIRCON								R

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
.....

B.H.P. EXPLORATION

0168

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1002/3/4/5/6/7/8/9..
Area: .....Colville.....
Job No: .....F670.....
Date Started: ..10-3-83.....
Date Finished: .14-3-83.....

Observer: .....Shane.....
Mineralogist: .....D Elsyn.....
Result: Positive .....
Negative .....
Possible .....

Total weight:- 107.9 gms. Total weight + -.4 + .25. = 181.6.

	Mags ~~3 + 4~~				Non Mags.			
Fraction	~~+1.0~~	~~+0.8~~	~~+0.5~~	~~+0.4~~	~~+1.0~~	~~+0.8~~	~~+0.5~~	~~+0.4~~
Weight	13.6	17.5	13.4	9.9	13.5	13.2	9.5	17.3
SAMPLE NUMBER	CA1002	CA1003	CA1004	CA1005	CA1006	CA1007	CA1008	CA1009
INDICATORS								
Pyrope/Knorringite								
Chrome Diopside								
Chromite								
Picroilmenite								
Other								
.....								
BACKGROUND MINERALS								
Almandine Garnet					R ✓			
Amphibole								
Ilmenite								
Limonite/Hematite	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓
Pyroxene								R ✓
Quartz	S ✓	R ✓	R ✓	R ✓	R ✓	R ✓	R ✓	R ✓
Tourmaline		R ✓			R ✓	R ✓		R ✓
Biotite	R ✓							
Kyanite (blue & white)		R ✓	R ✓	R ✓	R ✓	S ✓	R ✓	R ✓
*								
-.4 + .25 Stained								

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION			PROBE NO.		

Comments .....
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B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0169

Sample No: CA1010 — 1017 Observer: ROB

Area: COMMONWEALTH HILL Mineralogist: [signature]

Job No: F670 Result: Positive

Date Started: 14-3-83 (Negative)

Date Finished: 16-3-83 Possible

TOTAL WEIGHT OF 8 SAMPLES = 273.7g

		Mags 3 + 4				Non Mags.			
	Fraction	CA1010	CA1011	CA1012	CA1013	CA1014	CA1015	CA1016	CA1017
	Weight	25.6g	21.2g	24.3g	31.6g	29.1g	34.6g	50.0g	57.3
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	✓ R		✓ R	✓ R		✓ R	✓ R	✓ R
	Amphibole	✓ R		✓ R	✓ R	✓ R		✓ R	
	Ilmenite								
	Limonite/Hematite	✓ VC	✓ VC	✓ VC	✓ VC	✓ VC	✓ VC	✓ VC	✓ VC
	Pyroxene								
	Quartz	✓ C	✓ R	✓ S	✓ S	✓ R	✓ S	✓ S	✓ S
	Tourmaline	✓ S	✓ S	✓ S	✓ S	✓ R	✓ R	✓ R	✓ R
	Kyanite	✓ R			✓ R	✓ R	✓ R	✓ R	✓ R
	Rutile	✓ R	✓ R	✓ R	✓ R	✓ R	✓ R	✓ R	
	Zircon	✓ R			✓ S				
	Staurolite				✓ R	✓ R	✓ R		
	Enrite					✓ R		✓ R	
	Ilmenite								✓ R

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments ..... SAMPLES CONSIST OF 99.99% LIMONITE. .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1062-CA1066
Area: ~~Commonwealth Hill~~
Job No: F670
Date Started: 12-5-83
Date Finished: 13-5-83

Observer: CAROLYN
Mineralogist: C.E.Sym.
Result: Positive / (Negative) / Possible

Total Weight 213.7g		CA1062		CA1063		CA1064	CA1065	CA1066				
	Fraction	M	NM	M	NM	not mag separated	not mag separated	M	NM			
68.7g ← OBS	Weight	6.8	5.8	5.8	5.8	16.5	17.1	5.4	5.6			
145.0g ← SCAN	Weight	14.4	9.8	20.3	17.0	27.3	28.3	16.6	11.3			
INDICATORS												
	Pyrope/Knorringite											
	Chrome Diopside											
	Chromite											
	Picroilmenite											
	Other											
	.....											
BACKGROUND MINERALS												
	Almandine Garnet	R		R		R	R		R			
	Amphibole		R		R				R			
	Ilmenite											
	Limonite/Hematite	VC	VC	VC	VC	VC	VC	VC	VC			
	Pyroxene		R		R							
	Quartz	R	S	R	S	R	S	R	S			
	Tourmaline					R						
	KYANITE		S		R	S	R		R			
	RUTILE		R		R	S	R		R			
	ZIRCON		R		R	R			R			
	GOETHITE						R					

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
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B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1067, 68, 69, 70, 71.....
Area: ....Commonwealth Hill....
Job No: ..F670.....
Date Started: .12-5-83.....
Date Finished: ..20-5-83.....

Observer: ....Jaylecn.....
Mineralogist: .....
Result: Positive .....
Negative ...✓.....
Possible .....

TOTAL 227.7gm

	Fraction	CA1067 not mag seperated	CA1068 M3	CA1068 Non M	CA1069 not mag seperated	CA1070 not mag seperated	CA1071 not mag seperated
	Weight obs -8+14	12.1g	11.5g	19.1g	15.8g	30.5g	15.9g
	-14+25 Scanned	28.8g	16.1g	29.2g	16.7g	16.0g	16.0g
INDICATORS	Pyrope/Knorringite						
	Chrome Diopside						
	Chromite						
	Picroilmenite						
	Other						
	.....						
BACKGROUND MINERALS	Almandine Garnet	R	R	R		R	R
	Amphibole						
	Ilmenite						
	Limonite/Hematite	VC	VC	VC	VC	VC	VC
	Pyroxene						
	Quartz	S	R	R	S	S	S
	Tourmaline (green, brown, blue)	R		R	R	R	R
	RUTILE	R		R	R	R	R
	ZIRCON	R		R	R		
	KYANITE		R	R	R	S	R
	MONAZITE			R.		R	
	CORUNDUM						R

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
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B.H.P. EXPLORATION

0172

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA 1072 - 1076 ..... Observer: TRUDI .....

Area: COMMONWEALTH HILL ..... Mineralogist: C. Eb .....

Job No: F670 ..... Result: Positive .....

Date Started: 13:5:83 ..... Negative .....

Date Finished: 19:5:83 ..... Possible .....

		Mags 3 + 4					Non Mags.			
		1072	1073	1074			1075			1076
TOTAL 167 gm	Fraction	+1.0		+0.8	+0.5	+0.4	+1.0	+0.8	+0.5	+0.4
	Weight	33.7		10.4	19.0		14.8		7.5	
	Scan		14.2	12.2		23.5		14.2		16.5
INDICATORS	Pyrope/Knorringite									
	Chrome Diopside									
	Chromite									
	Picroilmenite									
	Other									
	.....									
BACKGROUND MINERALS	Almandine Garnet	R	R	R	R	R	R	R	R	R
	Amphibole									
	Ilmenite									
	Limonite/Hematite	VC	VC	VC	VC	VC	VC	VC	VC	VC
	Pyroxene		R			R		R		R
	Quartz	S	S	S	C	S	C	C	C	C
	Tourmaline GREEN/BROWN/BLUE	R	S	S	S	S	S		S	S
	KYANITE	S	S	R		R	S	S	R	S
	RUTILE		S	R	S	R	S		S	S
	ZIRCON		R			R		R		R
	BARITE					R	R	R		

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments .....

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CA 1077 → 1081
CA 1087 → 1089

B.H.P. EXPLORATION

0173

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1077/78/79/80/81/87/88/89 Observer: Irene

Area: COMMONWEALTH HILL Mineralogist: C.E. Stym

Job No: F670 Result: Positive

Date Started: 17-5-83 Negative

Date Finished: 18-5-83 Possible

Total weight:		CA 1077	CA 1078	CA 1079	CA 1080	CA 1081	CA 1087	CA 1088	CA 1089
Obs.: 67.5 gms	Fraction	-8+14	-8+14	-8+14	-8+14	-8+14	-8+14	-8+14	-8+14
Scan: 132.4 gms	Weight	9.0	12.0	11.1	7.2	4.7	8.3	8.0	7.0
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet				R ✓				
	Amphibole			R ✓	R ✓				
	Ilmenite								
	Limonite/Hematite	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓	V.C ✓
	Pyroxene								
	Quartz	R ✓	R ✓	R ✓	S ✓	S ✓	S ✓	S ✓	R ✓
	Tourmaline			R ✓					
	Garnet	R ✓	R ✓						
	Ilmenite		R ✓		R ✓	R ✓		R ✓	
	Pyrite		R ✓						
	Rutile							R ✓	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

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B.H.P. EXPLORATION

0174

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1082 ⟶ CA1086 Observer: RoB

Area: COMMONWEALTH HILL Mineralogist: C. Eby

Job No: F670 Result: Positive

Date Started: 18-5-83 (Negative)

Date Finished: 19-5-83 Possible

TOTAL WEIGHT = 130.2g

		CA1082	CA1083	CA1084	CA1085	CA1086			
	Fraction	-8+4	-8+4	-8+4	-8+4	-8+4			
	Weight	8.7g	6.2g	6.6g	7.1g	9.5g			
	Wt. Scanned	14.7g	16.5g	18.5g	23.0g	19.4g			
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	✓ R							
	Amphibole								
	Ilmenite								
	Limonite/Hematite	✓ VC	VC	VC	VC	VC			
	Pyroxene								
	Quartz	✓ C	✓ C	✓ S	✓ C	✓ S			
	Tourmaline	✓ R	R	R		R			
	Kyanite	✓ S	✓ R	R	✓ R	✓ R			
	Rutile	✓ R	✓ S	✓ R	R	✓ R			
	Barite					R			

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments .....

B.H.P. EXPLORATION

0175

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA 1090/91 ..... Observer: Greene .....

Area: COMMONWEALTH HILL ..... Mineralogist: C. Espy .....

Job No: F670 ..... Result: Positive .....

Date Started: 18-5-83 ..... Negative .....

Date Finished: 19-5-83 ..... Possible .....

Total weight:-
Obs.- 26.2
Scan.- 52.3

		CA 1090	CA 1091
	Fraction	-8+4	-8+4
	Weight	18.9	7.3
INDICATORS	Pyrope/Knorringite		
	Chrome Diopside		
	Chromite		
	Picroilmenite		
	Other		
	.....		
BACKGROUND MINERALS	Almandine Garnet		
	Amphibole		
	Ilmenite	-	
	Limonite/Hematite	V-C ✓	V.C ✓
	Pyroxene		
	Quartz	S ✓	S ✓
	Tourmaline		
	Zircon		R ✓

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

0176

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1092 ⟶ CA1096 Observer: ROB

Area: COMMONWEALTH HILL Mineralogist:

Job No: F670 Result: Positive

Date Started: 19-5-83 Negative

Date Finished: 23-5-83 Possible

Total 147.3 gm

		CA1092	CA1093	CA1094	CA1095	CA1096			
	Fraction	-8+4	-8+4	-8+4	-8+4	-8+4			
	Weight	9.8g	10.2g	8.9g	7.3g	7.3g			
	wt.Scanned	25.7g	24.2g	17.3g	20.0g	16.6g			
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet			R		R			
	Amphibole	R		R	R				
	Ilmenite								
	Limonite/Hematite	VC	VC	VC	VC	VC			
	Pyroxene								
	Quartz	✓C	✓C	✓S	✓C	C			
	Tourmaline		R	✓R					
*	Pyrite *	R①			R③	R			
	Kyanite	R	✓R	✓R	S	R			
	Barite			✓C					
	Rutile		✓R	✓R		S			

BOTTLED MINERALS	NUMBER OF GRAINS		IDENTIFICATION				PROBE NO.		

Comments .....

B.H.P. EXPLORATION * PYRITE present

0177

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1097-CA1102
Area: Commonwealth Hill
Job No: F670
Date Started: 19-5-83
Date Finished: 20-5-83

Observer: CAROLYN
Mineralogist: C Gleyn
Result: Positive
Negative ✓
Possible

Not mag. separated

			CA1097	CA1098	CA1099	CA1100	CA1101	CA1102		
Total Weight OBS + SCAN 151.1g		-8+.4 Wt. OBS	6.5	15.6	5.1	6.1	11.9	18.7		
		-4+.25 Wt. Scanned	13.6	13.9	12.6	14.5	15.9	16.7		
		Total Wt.	20.1	29.5	17.7	20.6	27.8	35.4		
INDICATORS	Pyrope/Knorringite									
	Chrome Diopside									
	Chromite									
	Picroilmenite									
	Other									
	.....									
BACKGROUND MINERALS	Almandine Garnet			√R		√R	√R	√R		
	Amphibole			√R						
	Ilmenite									
	Limonite/Hematite		√VC	√VC	√VC	√VC	√VC	√VC		
	Pyroxene									
	Quartz		√R	√R	√R	√R	√R	√R		
	Tourmaline		√R	√R		√R	√R			
	KYANITE		√R	√R	√R	√R	√R	√R		
	RUTILE		√R	√R	√R	√R	√R	√R		
*	* PYRITE *		×1 √R	×1 √R	×2 √R					
	ZIRCON						√R			

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
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B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1103/04/05/06/07/08/09. Observer: Irene and Carolyn
Area: C. Hill Mineralogist: C. Eby
Job No: F67 Result: Positive
Date Started: 22-6-83 Negative ✓
Date Finished: 29-6-83 Possible

IRENE — SHARED — CAROLYN

Total weight - obs: - 100 grms. Scan: - 119.2 grms.

		CA1103	CA1104	CA1105	CA1106	CA1107	CA1108	CA1109
	Fraction	-8+4	-8+4	-8+4	-8+4	-8+4	-8+4	-8+4
	Weight	9.2 / 13.8	12.6 / 17.8	3.1 / 14.2	5.8 / 7.5	5.7 / 6.1	2.7 / 3.8	3.1 / 4.6
		M / N/M	M / N/M	M / N/M	M / N/M	M / N/M	M / N/M	M / N/M
INDICATORS	Pyrope/Knorringite							
	Chrome Diopside							
	Chromite							
	Picroilmenite							
	Other							
	.....							
BACKGROUND MINERALS	Almandine Garnet	R / R	R		R	R	R / R	R
	Amphibole						R	
	Ilmenite							
	Limonite/Hematite	V.C / V.C	VC / VC	VC / VC	VC / VC	VC / VC	VC / VC	VC / VC
	Pyroxene							
	Quartz	S	S	R / S	C	S	S	R / R
	Tourmaline			R	R	R	R	R
	Kyanite	R	R	R	R		R	R
	Sanidine	R					R	R / R
	* Rutile			V.R			VR	VR

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
.....

B.H.P. EXPLORATION

0179

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1110 - CA1114 ....
Area: COMMONWEALTH HILL ....
Job No: F67 ....
Date Started: 27.6.83 ....
Date Finished: 30.6.83 ....

Observer: TRUDI + CHRIS ....
Mineralogist: C.E. ....
Result: Positive ....
Negative ....
Possible ....

SCAN 157.1
OBS 116.5

		CA1110		CA1111		CA1112		CA1113		CA1114 (CHRIS)				
	Fraction	-.8+.25		-.8+.25		-.8+.25		-.8+.25		-.8+.25				
	Weight	23.0	50.6	32.2	10?.6	21.7	118	12.6	6.5	4.3	4.1			
		NM	M	NM	M	NM	M	NM	M	NM	M			
INDICATORS	Pyrope/Knorringite													
	Chrome Diopside													
	Chromite													
	Picroilmenite													
	Other													
	.....													
BACKGROUND MINERALS	Almandine Garnet	R	R	S	R	S	R	R		R	R			
	Amphibole													
	Ilmenite													
	Limonite/Hematite	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC			
	Pyroxene							R						
	Quartz	S	R	S	S	S	R	S	R	S	R			
	Tourmaline GREEN/BROWN/BLUE	R	S	S		R	R	S	S	S	S			
	ALUMINIUM SILICATE	S		S	R	C		S		R				
	RUTILE	S	S	S		S		S		S				
	ZIRCON	R				R		R		R				
	CORUNDUM	R		R										
	BIOTITE			R						R				
	MONAZITE			R						R				

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.
	5 BLUE GRAINS CA1112	TOURMALINE / CORUNDUM SEM	A878 — TOURMALINE

Comments .....
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0180

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1115 - CA1119
Area: Commonwealth Hill
Job No: F67
Date Started: 24-6-83
Date Finished: 28-6-83

Observer: CAROLYN
Mineralogist: C.E.
Result: Positive
Negative ✓
Possible

-.4+.25 Scanned

Total Weight OBS and SCAN 135.6 grams

		CA1115		CA1116		CA1117		CA1118		CA1119	
	Fraction	-.8+.4		-.8+.4		-.8+.4		-.8+.4		-.8+.4	
	Weight	17.7	8.2	9.4	5.1	15.7	8.9	8.7	18.3	29.5	14.1
		NM	M	NM	M	NM	M	NM	M	NM	M
INDICATORS	Pyrope/Knorringite										
	Chrome Diopside										
	Chromite										
	Picroilmenite										
	Other										
	.....										
BACKGROUND MINERALS	Almandine Garnet		√R	√R		√R		√R	√R	√R	
	Amphibole					√R				√R	
	Ilmenite										
	Limonite/Hematite	√vc	√vc	√vc	√vc	√vc	√vc	√vc	√vc	√vc	√vc
	Pyroxene										
	Quartz	√R	√R	√R	√R	√R	√R	√R	√R	√R	√R
	Tourmaline	√R				√R		√R		√R	
	KYANITE	√R		√R		√R		√s	√R	√s	
	RUTILE			√R		√R		√R		√R	
	ZIRCON					√R				√R	
	CORUNDUM					√R					
	BARYTES					√R					
	MONAZITE									√R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
.....

B.H.P. EXPLORATION

0181

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1120 → CA1122 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: C.E.Sp

Job No: F67 Result: Positive

Date Started: 8-7-83 Negative /

Date Finished: 11-7-83 Possible

-.4+.25 fraction SCANNED

Total Weight
OBS= 79.1
SCAN= 120.3
TOTAL= 199.4

		CA1120		CA1121		CA1122			
	Fraction	-.8+.25	-.8+.25	-.8+.25	-.8+.25	-.8+.25	-.8+.25		
	Weight	35.5	17.5	55.9	28.8	39.5	22.6		
		NM	M	NM	M	NM	M		
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet				√R	√R			
	Amphibole	√R		√R					
	Ilmenite								
	Limonite/Hematite	√vc	√vc	√vc	√vc	√vc	√vc		
	Pyroxene								
	Quartz	√R	√R	√R	√R	√R	√R		
	Tourmaline			√R		√R			
	KYANITE	√R		√R		√R	√R		
	RUTILE	√R		√R					
	ZIRCON			√R					
	BARYTE					√R			

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

* Cubic Pseudomorphs in CA1123
* Pyrite in CA1125

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1123 → CA1125
Area: Commonwealth Hill
Job No: F67
Date Started: 28-6-83
Date Finished: 29-6-83

Observer: CAROLYN
Mineralogist: C. Elsom
Result: Positive
Negative ✓
Possible

-4+.25 Sawed

Total Weight OBS + SCAN 186.8g

		CA1123		CA1124		CA1125	
	Fraction	-8+.4		-8+.4		-8+.4	
	Weight	28.5	15.5	43.3	25.3	46.5	27.8
		NM	M	NM	M	NM	M
INDICATORS	Pyrope/Knorringite						
	Chrome Diopside						
	Chromite						
	Picroilmenite						
	Other						
	.....						
BACKGROUND MINERALS	Almandine Garnet	√R	√R	√R	√R		√R
	Amphibole			√R			
	Ilmenite						
	Limonite/Hematite	√vc	√vc	√vc	√vc	√vc	√vc
	Pyroxene						
	Quartz	√R		√R		√R	√R
	Tourmaline	√R		√R		√R	
	BARYTE	√R		√R		√S	
	KYANITE	√R	√R	√R	√R	√R	
	RUTILE	√R		√R		√R	
*	CUBIC PSEUDOMORPHS	√R					
	SILLIMANITE			√R		√R	
	MONAZITE					√R	
*	PYRITE					√R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0183

Sample No: CA1126 - CA1129 ... Observer: TRUDI

Area: COMMONWEALTH HILL ... Mineralogist: C. Ebsp

Job No: F67 ... Result: Positive

Date Started: 11.7.83 ... (Negative)

Date Finished: 20.7.83 ... Possible

		CA1126		CA1127		CA1128		CA1129	
TOTAL 421 grs.	Fraction	39.9	20.5	47.2	18.6	45.2	23.3	12.8	17.8
	SCAN	33.7	13.6	36.9	12.1	33.2	11.7	26.2	28.3
		NM	M	NM	M	NM	M	NM	M
INDICATORS: Pyrope/Knorringite									
Chrome Diopside									
Chromite									
Picroilmenite									
Other									
.....									
BACKGROUND MINERALS: Almandine Garnet		S	R		R	R	R	S	R
Amphibole									
Ilmenite									
Limonite/Hematite		VC	VC	VC	VC	VC	VC	VC	VC
Pyroxene		R				S		S	
Quartz		S	R	S	R	S	R	S	R
Tourmaline BROWN/GREEN/BLUE		S		S	R	R	R	R	
ZIRCON		R		S	R			R	
RUTILE		S		S	R	S		S	
ALUMINIUM SILLICATE		R		R		S	R	S	R
PSEUDOMORPHS		R							

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

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B.H.P. EXPLORATION

0184

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1130 - CA1131 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: C. Clay

Job No: F67 Result: Positive ✓

Date Started: 25-7-83 Negative

Date Finished: 27-7-83 Possible

Total Weight		CA1130		CA1131					
OBS 183.5 →	-.8+.4	23.0	60.2	24.8	75.4				
SCAN 95.2 →	-.4+.25	20.4	27.1	18.8	28.9				
TOTAL 278.7		NM	M3.4	NM	M3.4				
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet/SPESSARTINE	√R	√R	√R	√R				
	Amphibole	√R							
	Ilmenite	√S	√S	√R	√S				
	Limonite/Hematite	√VC	√VC	√VC	√VC				
	Pyroxene								
	Quartz	√R	√R	√R	√R				
	Tourmaline	√R		√R	√R				
	KYANITE	√S	√R	√S	√R				
	RUTILE	√S		√S					
	BARYTE	√R							
	STAUROLITE	√R		√R					
	CORUNDUM			√R					

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

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B.H.P. EXPLORATION

0185

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1132- CA1134
Area: Commonwealth Hill
Job No: F67
Date Started: 11-7-83
Date Finished: 14-7-83

Observer: CAROLYN
Mineralogist: C. [illegible]
Result: Positive
Negative ✓
Possible

-.4 +.25 fraction Scanned.

Total Weight
OBS 204.4
SCAN 123.9
TOTAL 328.3

		CA1132		CA1133		CA1134	
	Fraction	-.8+.25	-.8+.25	-.8+.25	-8+.25	-.8+.25	-.8+.25
	Weight	43.0	11.1	77.6	17.9	144.7	34.1
		NM	M	NM	M	NM	M
INDICATORS	Pyrope/Knorringite						
	Chrome Diopside						
	Chromite						
	Picroilmenite						
	Other						
	.....						
BACKGROUND MINERALS	Almandine Garnet	✓R	✓R	✓R	✓R	✓R	✓R
	Amphibole						
	Ilmenite				✓S		✓S
	Limonite/Hematite	✓VC	✓VC	✓VC	✓VC	✓VC	✓VC
	Pyroxene						
	Quartz	✓R	✓R	✓R	✓R	✓R	✓R
	Tourmaline	✓R		✓R		✓R	
	KYANITE	✓R		✓R		✓R	
	RUTILE	✓R		✓R	VR	✓R	
	BARYTE					✓R	
	STAUROLITE					✓R	

BOTTLED MINERALS

NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
Ilmenite in Mags -.4+.25 fraction CA1133 and 1134
V.C. Very Common C - Common

B.H.P. EXPLORATION

0186

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1135 - CA1140
Area: Commonwealth Hill
Job No: F670
Date Started: 10-5-83
Date Finished: 12.5.83

Observer: CAROLYN + JOY
Mineralogist: C.R.Boyd
Result: Positive
(Negative)
Possible

Total Weight 433.9g OBS - 214.1g SCAN - 219.8g		CAROL CA1135		CAROL CA1136		JOY CA1137		CAROL CA1138		CAROL CA1139		JOY CA1140		
	Fraction	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	
	Weight Obs	16.6	10.9	23.9	45.5	16.1	14.7	24.5	10.8	16.3	12.8	9.6	12.4	-8+.4
	Weight Scan	37.2		53.4		39.7		32.6		33.1		23.8		-.4+.25
INDICATORS	Pyrope/Knorringite													
	Chrome Diopside													
	Chromite													
	Picroilmenite													
	Other													
	.....													
BACKGROUND MINERALS	Almandine Garnet	R	R	R	R	R	R	R	R	R	R	R	R	
	Amphibole						R							
	Ilmenite			R						R				
	Limonite/Hematite	VC	VC	VC	VC	VC	VC	VC	VC	VC	VC	V.C.	V.C.	
	Pyroxene								R					
	Quartz	R	R	R	R			R	R	R	R		R	
	Tourmaline		R								R		R	
	KYANITE		R		R		S	R	R	R	R		R	
	RUTILE		R		R		R	R	S		S		R	
	SILLIMANITE						R		R		R		R	
	STAUROLITE						R						R	
	ZIRCON						R				R		R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
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B.H.P. EXPLORATION

0187

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA.1141, 42, 43, 44, ...
Area: .....Commonwealth Hill...
Job No: ....F67.....
Date Started: ..13-7-83.....
Date Finished: ..18-7-83.....

Observer: ...Joy/Geo. + CAROLYN
Mineralogist: .....
Result: Positive .....
(Negative) ✓
Possible .....

Total Weight		JOY CA1141		JOY 1142		CAROLYN 1143		CAROLYN 1144	
OBS 100.2		M3+4	NM	M3+4	NM	M3+4	NM	M3+4	NM
SCAN 129.9	Obs. -8+4	4.5g	13.8g	8.3g	23.4g	7.9	15.9	8.7	17.7
TOTAL 230.1g	Scanned -4+.25	6.3g	20.3g	7.9g	23g	9.8	26.4	9.8	26.4
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	R	R	R	R	√R	√R	√R	√R
	Amphibole			R					
	Ilmenite								
	Limonite/Hematite	VC	VC	VC	VC	√VC	√VC	√VC	√VC
	Pyroxene	R	R						
	Quartz	R	R		R	√R	√R	√R	√R
	Tourmaline				R		√R		√R
	Kyanite	S	R	R	R.	√R	√R	√R	√R
	Monazite				R				
	Zircon				R				
	Baryte						√R	√R	√R
	Rutile						√R		√R

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
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B.H.P. EXPLORATION

0188

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1145 — CA1148 ..... Observer: ROB .....

Area: COMMONWEALTH HILL ..... Mineralogist: [signature] .....

Job No: F67 ..... Result: Positive .....

Date Started: 14-7-83 ..... Negative .....

Date Finished: 18-7-83 ..... Possible .....

Total for 4 samples obs & scan ~30. 167.4 gms.		CA1145		CA1146		CA1147		CA1148	
	Fraction	M3+4	N/M	M3+4	N/M	M3+4	N/M	M3+4	N/M
	Weight	10.1g	21.6g	11.0g	27.0g	24.3g	40.7g	11.0g	21.7g
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	R		✓R		R	✓R	R	✓R
	Amphibole						R		✓R
	Ilmenite								
	Limonite/Hematite	VC	VC	VC	VC	VC	VC	VC	VC
	Pyroxene								
	Quartz	✓R	✓R		✓S		✓S		✓C
	Tourmaline		R		R		R		R
	Rutile		✓S		✓S		✓S		✓S
	Zircon		R						
	Kyanite		R		R		R		✓R
	Barite						R		R

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET 0189

Sample No: CA1149 - CA1152
Area: Commonwealth Hill
Job No: F67
Date Started: 14-7-83
Date Finished: 15-7-83

Observer: CAROLYN
Mineralogist: CES
Result: Positive
(Negative) ✓
Possible

Total Weight		CA1149		CA1150		CA1151		CA1152	
OBS 57.7	Fraction	-.8+.25	-.8+.25	-.8+.25	-.8+.25	-.8+.25	-.8+.25	-.8+.25	-.8+.25
SCAN 73.1	Weight	26.0	19.1	15.6	6.7	17.4	7.2	28.1	10.6
TOTAL 130.8		NM	M	NM	M	NM	M	NM	M
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet		√R		√R	√R	√R		√R
	Amphibole			√R		√R			
	Ilmenite		√S		√S		√S		√S
	Limonite/Hematite	√VC	√VC	√VC	√VC	√VC	√VC	√VC	√VC
	Pyroxene								
	Quartz	√R	√R	√R	√R	√R	√R	√R	√R
	Tourmaline	√R		√R				√R	
	KYANITE	√R	√R	√R	√R	√R	√R	√R	√R
	BARYTE	√R		√R		√R		√R	√R
	ZIRCON	√R				√R			
	RUTILE	√R		√R	√R	√R		√R	
	GEOTHITE					√R			

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0190

Sample No: CA1153-1156 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: C.B.

Job No: F67 Result: Positive

Date Started: 18-7-83 Negative ✓

Date Finished: 19-7-83 Possible

NM + M 3.4 NOT SEPARATED

			CA1153	CA1154	CA1155	CA1156				
TOTAL WEIGHT										
OBS 55.1 →		-.8+.4	18.2	12.3	11.7	13.0				
SCAN 89.9 →		-.4+.25	22.0	21.1	27.1	19.7				
TOTAL 145.0 →		TOTAL	40.2	33.4	38.8	32.7				
INDICATORS	Pyrope/Knorringite									
	Chrome Diopside									
	Chromite									
	Picroilmenite									
	Other									
	.....									
BACKGROUND MINERALS	Almandine Garnet		√R	√R	√R	√R				
	Amphibole				√R					
	Ilmenite			√R	√R	√R				
	Limonite/Hematite		√VC	√VC	√VC	√VC				
	Pyroxene									
	Quartz		√R	√R	√R	√R				
	Tourmaline		√R	√R	√R	√R				
	RUTILE		√R	√R	√R	√R				
	BARYTE		/R			√R				
	KYANITE		√R	√R	√R	√R				

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

.....

B.H.P. EXPLORATION

0191

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1157 - CA1160 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: C. Elyn

Job No: F67 Result: Positive

Date Started: 19-7-83 Negative

Date Finished: 20-7-83 Possible

NM & M3.4 not separated

Total Weight for 4 samples		CA1157	CA1158	CA1159	CA1160				
OBS 50.3 →	-.8+.4	9.3	9.7	23.1	8.1				
SCAN 58.5 →	-.4+.25	16.9	10.5	16.9	14.3				
TOTAL 108.8 →		26.2	20.2	40.0	22.4				
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	√R	√R	√R	√R				
	Amphibole			√R					
	Ilmenite	√R		√R					
	Limonite/Hematite	√vc	√vc	√vc	√vc				
	Pyroxene								
	Quartz	√R	√R	√R	√R				
	Tourmaline		√R	√R	√R				
	KYANITE	√R	√R	√R	√R				
	RUTILE	√R		√R	√R				
	BARYTE	√R	√s	√R					

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

0192

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1161 - CA1164
Area: Commonwealth Hill
Job No: F67
Date Started: 19-7-83
Date Finished: 20-7-83

Observer: CAROLYN
Mineralogist: [signature]
Result: Positive
Negative ✓
Possible

Total Weight		CA1161	CA1162	CA1163	CA1164				
OBS 65.5 →	-8+.4	10.3	28.4	11.1	15.9				
SCAN 57.5 →	-.4+.25	11.1	15.2	12.9	18.4				
TOTAL 123.0		21.2	43.6	24.0	34.2				
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	√R	√R	√R	√R				
	Amphibole	√R		√R	√R				
	Ilmenite	√R	√R	√R	√R				
	Limonite/Hematite	√Vc	√Vc	√Vc	√Vc				
	Pyroxene								
	Quartz	√R	√R	√R	√R				
	Tourmaline	√R	√R	√R	√R				
	KYANITE	√R	√R	√R	√R				
	RUTILE	√R	√R	√R	√R				
	BARYTE	√R	√R	√R	√R				
	MUSCOVITE		√R						
	ZIRCON			√R					

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0193

Sample No: CA1165 ... 7. CA1169 + 1170 Observer: ROB

Area: COMMONWEALTH HILL Mineralogist: C. Esp

Job No: F67 Result: Positive

Date Started: 20-7-83 Negative

Date Finished: 25-7-83 Possible

		CA1165	CA1166	CA1167	CA1168	CA1169	CA1170	
TOTAL 267.5gm	Fraction	-8+25	-8+25	-8+25	-8+25	-8+25	MAGS -8+25	NON-MAGS -8+25
	Weight	33.5g	27.0g	32.4g	51.2g	39.3g	62.4g	21.7g
INDICATORS	Pyrope/Knorringite							
	Chrome Diopside							
	Chromite							
	Picroilmenite							
	Other							
	.....							
BACKGROUND MINERALS	Almandine Garnet	✓R	R	R	✓R	✓R	✓S	✓R
	Amphibole	✓R		R	R	R		
	Ilmenite							
	Limonite/Hematite	VC	VC	VC	VC	VC	VC	VC
	Pyroxene							
	Quartz	✓S	✓S	✓C	✓C	✓S		✓S
	Tourmaline	R	R	R	✓R	✓R		✓R
	Rutile	✓R	✓R	R	✓R			✓R
	Staurolite	R				R		
	Kyanite	R	R	R	✓R			✓R
	Barite		R	R				
	Zircon			R				

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

0194

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: ....CA.1171.....
Area: ..COMMONWEALTH HILL....
Job No: .....F.67.....
Date Started: .....20.7.83.....
Date Finished: ....20.7.83.....

Observer: .....TRUDI.....
Mineralogist: .....
Result: Positive .....
(Negative) .....
Possible .....

						Non Mags.			
	Fraction	-.8+.4	-.4+.25	+0.5	+0.4	+1.0	+0.8	+0.5	+0.4
TOTAL 24.5 gm	Weight	14.0	10.5						
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	R	S						
	Amphibole								
	Ilmenite								
	Limonite/Hematite	VC	VC						
	Pyroxene		R						
	Quartz	S	S						
	Tourmaline BROWN/GREEN/BLUE	S	S						
	RUTILE	R	S						
	ALUMINIUM SILICATE	R	S						
	ZIRCON		R						

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
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B.H.P. EXPLORATION

0195

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1172 —— CA1175
Area: COMMONWEALTH HILL
Job No: F67
Date Started: 25-7-83
Date Finished: 26-7-83

Observer: ROB
Mineralogist: [signature]
Result: Positive
(Negative)
Possible

		CA1172	CA1173	CA1174	CA1175
MAGS 30+ & N.MAGS OBS	Fraction	-8+25	-8+25	-8+25	-8+25
TOTAL 73.2	Weight	13.7g	13.1g	17.1g	29.3g
INDICATORS	Pyrope/Knorringite				
	Chrome Diopside				
	Chromite				
	Picroilmenite				
	Other				
	.....				
BACKGROUND MINERALS	Almandine Garnet	✓R	R	✓S	✓S
	Amphibole	✓S	S	✓R	✓S
	Ilmenite				
	Limonite/Hematite	VC	VC	VC	VC
	Pyroxene				
	Quartz	✓C	C	✓S	
	Tourmaline			R	✓R
	Kyanite	R✓	R	R	✓R
	✓Rutile	R	S		✓
	Barite	R	S	S	
	Topaz			R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
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B.H.P. EXPLORATION

0196

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1176 - CA1179 Observer: TRUDI

Area: COMMONWEALTH HILL Mineralogist: C. Gh

Job No: F67 Result: Positive

Date Started: 26.7.83 (Negative)

Date Finished: 27.7.83 Possible

		CA1176		CA1177		CA1178		CA1179	
TOTAL 69.4	Fraction	-.8+.4	-.4+.25	-.8+.4	-.4+.25	-.8+.4	-.4+.25	-.8+.4	-.4+.25
	Weight	7.9	11.6	1.0	7.5	5.0	8.5	11.8	11.1
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	S	S	S	S	S	S	S	S
	Amphibole								
	Ilmenite								
	Limonite/Hematite	VC	VC	VC	VC	VC	VC	VC	VC
	Pyroxene	R	S	S	S	R	R	R	S
	Quartz	S	S	S		S	S	S	S
	Tourmaline GREEN/BROWN	S	C	S	C	S	S	S	S
	RUTILE	S	S	R	S	R	S		S
	STAUROLITE	R		R			R		
	KYANITE (WHITE)	R	R	R	S	R	S		S
	ZIRCON				R		R		
	APATITE					R			
	*GAHNITE ?						RX1		

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.
	1	GAHNITE ? CA1178	AS113 - GAHNITE
	1	UNKNOWN (BLUE/GREY)	CA1178 AIII4 ~~GAHNITE~~ CORUNDUM

Comments .....

B.H.P. EXPLORATION

0197

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1180 — CA1183 Observer: ROB

Area: COMMONWEALTH HILL Mineralogist: C.E.

Job No: F67 Result: Positive

Date Started: 27-7-83 (Negative)

Date Finished: 29-7-83 Possible

TOTAL 132.5 g

		CA1180	CA1181	CA1182	CA1183
	Fraction	-8+25	-8+25	-8+25	-8+25
	Weight	15.6g	28.6g	48.2g	40.1g
INDICATORS	Pyrope/Knorringite				
	Chrome Diopside				
	Chromite				
	Picroilmenite				
	Other				
	.....				
BACKGROUND MINERALS	Almandine Garnet	✓ R	✓ R	✓ S	✓ S
	Amphibole	✓ R	R	✓ S	✓ R
	Ilmenite				
	Limonite/Hematite	VC	✓C	VC	✓C
	Pyroxene				
	Quartz	✓ C	✓C	✓ S	✓ S
	Tourmaline		R	R	R
	Kyanite	✓ R	R	R	✓ R
	Rutile	✓ S	✓ R	✓ R	✓ S
	Barite		R	✓ S	✓
	Corundum			R	
*	Pyrite				✓ RX3

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.
	Pyrite bottled + left in sample.	CA1183	

Comments .....

B.H.P. EXPLORATION * Galena in CA1184 198

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1184-CA1187 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: C Elgar

Job No: F67 Result: Positive ✓

Date Started: 27-7-83 Negative

Date Finished: 28-7-83 Possible ✓ CA1184

Mags + NM not separated

		CA1184	CA1185	CA1186	CA1187
Total Weight					
OBS 119.7 →	-.8+.4	22.9	21.3	26.7	48.5
SCAN 176.9 →	-.4+.25	39.5	34.6	44.9	57.9
TOTAL 296.6		62.4	55.9	71.6	106.5
INDICATORS: Pyrope/Knorringite					
Chrome Diopside (IN SMALL FRACTION →)		√x1			
Chromite					
Picroilmenite					
Other					
.....					
BACKGROUND MINERALS: Almandine Garnet		√R	√R	√S	√S
Amphibole		√R	√R	√R	√R
Ilmenite		√R	√R	√R	√S
Limonite/Hematite		√VC	√VC	√VC	√VC
Pyroxene					
Quartz		√R	√R	√R	√R
Tourmaline		√R	√R	√R	√R
RUTILE		√R	√R	√S	√R
BARYTE		√R	√R	√R	√R
* GALENA *		√Rx1			
KYANITE		√R	√R	√R	√R
* PYRITE *					√Rx1

BOTTLED MINERALS

NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.
* 1 grain of Galena from	CA1184 - left in sample	
1 grain Chrome Diopside	from CA1184 - SEM probe	AS 110 / MK2062
1 grain pyrite from	CA1187 - left in sample	TOURMALINE

Comments .....

B.H.P. EXPLORATION

0199

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1176 - CA1179 Observer: TRUDI

Area: COMMONWEALTH HILL Mineralogist: C. Gh

Job No: F67 Result: Positive

Date Started: 26.7.83 (Negative)

Date Finished: 27.7.83 Possible

		CA1176		CA1177		CA1178		CA1179	
TOTAL 69.4	Fraction	-.8+.4	-.4+.25	-.8+.4	-.4+.25	-.8+.4	-.4+.25	-.8+.4	-.4+.25
	Weight	7.9	11.6	6.0	7.5	5.0	8.5	11.8	11.1
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	S	S	S	S	S	S	S	S
	Amphibole								
	Ilmenite								
	Limonite/Hematite	VC	VC	VC	VC	VC	VC	VC	VC
	Pyroxene	R	S	S	S	R	R	R	S
	Quartz	S	S	S		S	S	S	S
	Tourmaline GREEN/BROWN	S	C	S	C	S	S	S	S
	RUTILE	S	S	R	S	R	S		S
	STAUROLITE	R		R			R		
	KYANITE (WHITE)	R	R	R	S	R	S		S
	ZIRCON				R		R		
	APATITE					R			
	*GAHNITE ? *						R x1		

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.
	1	GAHNITE ? CA1178	AS113 - GAHNITE
	1	UNKNOWN (BLUE/GREY)	CA1178 AIII ~~GAHNITE~~ CORUNDUM

Comments .....

0200

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1188-91
Area: COMMONWEALTH HILL
Job No: F67
Date Started: 27.7.83
Date Finished: 29.7.83

Observer: TRUDI
Mineralogist: C. Eaglen
Result: Positive / (Negative) / Possible

		CA1188		CA1189		CA1190 (CHRIS)		CA1191 (CHRIS)	
TOTAL 314.4	Fraction	-8+25	-8+25	-8+4	-4+25	-8+4	-4+25	-8+4	-4+25
	Weight	22.5	69.6	41.1	51.5	22.3	62.0	24.8	40.6
		N	M						
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	S	C	C	C	S	S	R	
	Amphibole						R		
	Ilmenite		R						
	Limonite/Hematite	VC	VC	VC	VC	VC	VC	VC	VC
	Pyroxene	R			S				
	Quartz	S	S	S	S	S	S	R	R
	Tourmaline	S		R	S	R	R		R
	RUTILE	S	R	S	S		R		
	ALUMINIUM. SILICATE	S	S						
	APATITE	S	S						
	ZIRCON	R			R	R	R		R
	KYANITE (BLUE + WHITE)	S		R	R		R	R	R
	PSEUDOMORPHS		R						
	MONAZITE				R		R		
	BARITE					R	S	R	S
	DASPORE						R		

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0201

Sample No: CA1192 - CA1195 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: [signature]

Job No: F67 Result: Positive

Date Started: 10-8-83 Negative ✓

Date Finished: 11-8-83 Possible

			CA1192		CA1193		CA1194		CA1195	
Total Weight										
OBS 88.9 →	-.8+.4		20.6		18.6		34.4		15.4	
SCAN 125.5 →	-.4+.25		36.2		23.6		32.5		33.2	
TOTAL 214.4 g			56.8		42.2		66.9		48.6	
INDICATORS	Pyrope/Knorringite									
	Chrome Diopside									
	Chromite									
	Picroilmenite									
	Other									
	.....									
BACKGROUND MINERALS	Almandine Garnet		√R		√R		√R		√R	
	Amphibole						√R		√R	
	Ilmenite									
	Limonite/Hematite		√vc		√vc		√vc		√vc	
	Pyroxene									
	Quartz		√R		√R		√R		√R	
	Tourmaline								√R	
	KYANITE		√R		√R		√R		√R	
	RUTILE		√R		√R		√R		√R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

0202

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA 1196 → CA 1199.
Area: COMMONWEALTH HILL
Job No: F67
Date Started: 10-8-83
Date Finished: 12-8-83

Observer: ROB
Mineralogist: C. Eby
Result: Positive / (Negative) / Possible

		CA1196		CA1197		CA1198		CA1199	
TOTAL 186.1 gm	Fraction	-8+.25		-8+.25		-8+.25		-8+.25	
	Weight	58.3 g		37.4 g		57.5 g		32.9 g	
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	✓ R		✓ R					
	Amphibole								
	Ilmenite								
	Limonite/Hematite	VC		VC		VC		VC	
	Pyroxene								
	Quartz	✓ S		✓ S		✓ S			
	Tourmaline			✓ R		✓ R			
	Kyanite	✓ S		✓ S		✓ S		✓ S	
	Rutile	✓ R		S		✓ S		✓ R	
	Andalusite	✓ R				R			
	Barite							R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
.....

B.H.P.-EXPLORATION

0203

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1200 - CA1203
Area: Commonwealth Hill
Job No: F67
Date Started: 11-8-83
Date Finished: 12-8-83

Observer: CAROLYN
Mineralogist: C Edgar
Result: Positive
Negative
Possible

		CA1200		CA1201		CA1202		CA1203	
Total Weight									
OBS 99.2 →	-.8+.4	11.0		12.1		44.3		32.0	
SCAN 149.8 →	-.4+.25	17.4		26.0		54.0		52.8	
TOTAL 249.0 →		28.4		38.1		98.3		84.8	
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	√R		√R		√R		√R	
	Amphibole	√R		√R		√R		√R	
	Ilmenite								
	Limonite/Hematite	√Vc		√Vc		√Vc		√Vc	
	Pyroxene								
	Quartz	√R		√R		√R		√R	
	Tourmaline	√R		√R		√R		√R	
	KYANITE	√R		√R		√R		√R	
	RUTILE	√R		√R		√R		√R	
	STAUROLITE			√R		√R			
	ZIRCON			√R		√R		√R	
	BARYTE			√R		√R		√R	
	EPIDOTE					√R			

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1204 - CA1207 ...
Area: ..COMMONWEALTH HILL...
Job No: .....F67.....
Date Started: ....12.8.83.....
Date Finished: ...17.8.83.....

Observer: ...TRUDI.....
Mineralogist: C. Elsgaard.....
Result: Positive .....
Negative .....
Possible .....

		CA1204	CA1205	CA1206	CA1207				
TOTAL 367.2	Fraction	-8+.25	-8+.25	-8+.25	-8+.25				
	Weight	84.1	97.4	116.5	69.02				
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	R	R	R					
	Amphibole								
	Ilmenite								
	Limonite/Hematite	VC	VC	VC	VC				
	Pyroxene	R	R	R	R				
	Quartz	R	R	S	S				
	Tourmaline GREEN/BROWN	S	S	R	S				
	KYANITE	S	S	S	R				
	RUTILE	S	S	S	S				
	ZIRCON	S	S		R				
	STAUROLITE	S		S					
	BARITE				S				

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

0205

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA.1208/09/10/11.....
Area: .....Chalk Hill.....
Job No: .....F67.....
Date Started: 12-8-83.....
Date Finished: 15-8-83.....

Observer: .....Irene.....
Mineralogist: C. Eastman.....
Result: Positive .....
Negative .....
~~Possible~~ .....

Total weight. Obs: - 115.1 gms. Scan: - 174.5 gms Total 289.6		CA1208	CA1209	CA1210	CA1211				
	Fraction	-8+4	-8+4	-8+4	-8+4				
	Weight	32.9	33.0	28.4	20.8				
INDICATORS: Pyrope/Knorringite									
Chrome Diopside									
Chromite									
Picroilmenite									
Other									
.....									
BACKGROUND MINERALS: Almandine Garnet			R ✓		R ✓				
Amphibole									
Ilmenite			R ✓	R ✓	R ✓				
Limonite/Hematite		V.C ✓	V.C ✓	V.C ✓	V.C ✓				
Pyroxene				R ✓					
Quartz		R ✓	R ✓	R ✓	R ✓				
Tourmaline			R ✓						
Kyanite		R ✓	S ✓	R ✓	R ✓				
Baiite		R ✓	R ✓	R ✓	R ✓				
Rutile			R ✓	R ✓					
Monazite			R ✓	R ✓	R ✓				
Zircon			R ✓						

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
.....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0206

Sample No: CA1212 — CA1214
Area: COMMONWEALTH HILL
Job No: F67
Date Started: 12-8-83
Date Finished: 15-8-83

Observer: R.O.B.
Mineralogist: [signature]
Result: Positive / (Negative) / Possible

		CA1212		CA1213		CA1214			
TOTAL 116.2 gm	Fraction	-8+25		-8+25		-8+25			
	Weight	60.4g		26.8g		29.0g			
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	/ R							
	Amphibole					R			
	Ilmenite								
	Limonite/Hematite	VC		VC		VC			
	Pyroxene								
	Quartz	/ S		S		/ S			
	Tourmaline					/ R			
	Kyanite	/ R		/ R		/ S			
	Rutile	/ S		/ S		/ S			
	Barite					/ R			

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....
.....

B.H.P. - EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0207

Sample No: CA1215 - CA1218
Area: Commonwealth Hill F67
Job No:
Date Started: 15-8-83
Date Finished: 15-8-83

Observer: CAROLYN
Mineralogist: C.E.Lyon
Result: Positive
Negative ✓
Possible

Total Weight			CA1215		CA1216		CA1217		CA1218	
OBS 21.4 →		-.8+.4	3.1		4.5		6.0		7.5	
SCAN 65.7 →		-.4+.25	8.8		18.4		16.2		22.2	
TOTAL 87.1			11.9		22.9		22.2		29.7	
INDICATORS	Pyrope/Knorringite									
	Chrome Diopside									
	Chromite									
	Picroilmenite									
	Other									
	.....									
BACKGROUND MINERALS	Almandine Garnet		√R		√R		√R		√R	
	Amphibole				√R		√R			
	Ilmenite		√S		√S		√R		√R	
	Limonite/Hematite		√VC		√VC		√VC		√VC	
	Pyroxene									
	Quartz		√R		√R		√R		√R	
	Tourmaline				√R				√R	
	KYANITE		√R		√R		√R		√R	
	BARYTE		√R		√R		√R		√R	
	RUTILE		√R		√R		√R		√R	
	ZIRCON				√R		√R		√R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P.-EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA.1219 → 1222
Area: C' HILL LOAM
Job No: F67
Date Started: 15/8/83
Date Finished: 17/8/83

Observer: CHRIS T
Mineralogist: C. Pop
Result: Positive
Negative
~~Possible~~

NOT IMAGE SEPARATED
SCANNED & OBSERVED
TOTAL WEIGHT = 314.1 gm

	SAMPLE NO	1219		1220		1221		1222	
	FRACTION	-8+25		-8+25		-8+25		-8+25	
	WEIGHT	45.1		66.9		126.2		75.9	
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet					✓R			
	Amphibole	✓R		✓R		✓R		✓R	
	Ilmenite	✓R							
	Limonite/Hematite	✓V.C		✓V.C		✓VC		✓V.C	
	Pyroxene	✓R		✓R				✓R	
	Quartz			✓R				✓R	
	Tourmaline (GREEN/BROWN)	✓R		✓R					
	ZIRCON	✓R				✓S		✓R	
	RARITE	✓S		✓S		✓S		✓S	
	RUTILE	✓R		✓R		✓R		✓R	
	KYANITE	✓R		✓S		✓S		✓R	
	DIASPORE			✓R		✓R		✓R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION * PSEUDOMORPHS PRESENT

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

0209

Sample No: CA1223 —> CA1226
Area: c/xhill
Job No: F67
Date Started: 16-8-83
Date Finished: 18-8-83

Observer: Greene
Mineralogist: C. Eckstrand
Result: Positive / (Negative) / Possible

Total weight:		CA1223	CA1224	CA1225	CA1226	Non Mags.			
Obs: 200.8 gms	Fraction	-8+4	-8+4	-8+4	-8+4	+1.0	+0.8	+0.5	+0.4
Scan: 278.7 gms	Weight	51.4	66.0	65.5	17.9				
479.5									
INDICATORS: Pyrope/Knorringite									
Chrome Diopside									
Chromite									
Picroilmenite									
Other									
.....									
BACKGROUND MINERALS: Almandine Garnet									
Amphibole		R ✓	R ✓	R ✓					
Ilmenite		R ✓	R ✓	R ✓	R ✓				
Limonite/Hematite		V.C ✓	V.C ✓	V C ✓	V C ✓				
Pyroxene		R ✓	R ✓	R ✓	R ✓				
Quartz		S ✓	S ✓	C ✓	S ✓				
Tourmaline		R ✓	R ✓						
Kyanite		S ✓	S ✓	S ✓	R ✓				
Barite		R ✓	R ✓		R ✓				
Zircon		R ✓	S ✓	R ✓					
Pseudomorphs ✓		R ✓							
Monazite		R ✓	R ✓	R ✓					
Rutile				R ✓					

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

0210

B.H.P.-EXPLORATION * Cubic Pseudomorphs in CA1229

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1227 - CA1230
Area: Commonwealth Hill
Job No: F67
Date Started: 15-8-83
Date Finished: 17-8-83

Observer: CAROLYN
Mineralogist: C Elsyn
Result: Positive
Negative ✓
Possible

			CA1227		CA1228		CA1229		CA1230	
Total Weight										
OBS 94.5 →		-8+4	24.9		34.5		25.7		9.3	
SCAN 157.1 →		-4+25	33.6		54.6		41.0		28.0	
TOTAL 251.6			58.5		89.1		66.8		37.2	
INDICATORS	Pyrope/Knorringite									
	Chrome Diopside									
	Chromite									
	Picroilmenite									
	Other									
	.....									
BACKGROUND MINERALS	Almandine Garnet		√R		√R		√R		√R	
	Amphibole		√R		√R		√R			
	Ilmenite		√R		√R		√R		√R	
	Limonite/Hematite		√vc		√vc		√vc		√vc	
	Pyroxene		√R		√R		√R			
	Quartz		√s		√s		√s		√s	
	Tourmaline		√R		√R		√R		√R	
	KYANITE		√R		√R		√R		√R	
	RUTILE		√R		√R		√R		√R	
	ZIRCON		√L		√R		√R		√R	
	BARYTE		√R				√R		√R	
	STAUROLITE						√R			
*	CUBIC PSEUDOMORPHS *						√R			

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

B.H.P. EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA1231 → CA1234 Observer: ROB

Area: COMMONWEALTH HILL Mineralogist: CE Sylvester

Job No: F67 Result: Positive

Date Started: 17-8-83 (Negative)

Date Finished: 18:8:83 Possible

* Pyrite Total - 157.3		CA1231		CA1232		CA1233		CA1234	
	Fraction	-8+25		-8+25		2+25		-8+25	
	Weight	53.1g		11.1g		52.8g		40.3g	
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet	✓ R				R		/ R	
	Amphibole	/		/ R					
	Ilmenite								
	Limonite/Hematite	VC		VC		VC		VC	
	Pyroxene			/ R					
	Quartz	✓ S		/ S		/ C		/ S	
	Tourmaline			R					
	Rutile	✓ S		✓ R		✓ S		/ S	
	Zircon	✓ R				/			
	Kyanite	✓ S		/ R		✓ S			
	Barite							/ R	
	* Pyrite ✓							R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.
	1 x Yellow gold grain Metallic lustre	Pyrite - Left in sample	

Comments .....

0212

B.H.P.-EXPLORATION * Cubic Pseudomorphs in 1236

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET * Pyrite in 1237

Sample No: CA1235 - CA1238 Observer: CAROLYN

Area: Commonwealth Hill Mineralogist: C.E. Joyner

Job No: F67 Result: Positive ✓

Date Started: 17-8-83 Negative (circled)

Date Finished: 17-8-83 Possible

			CA1235		CA1236		CA1237		CA1238	
Total Weight										
OBS 35.5 →		-.8+.4	15.6		14.9		0.7		4.3	
SCAN 77.5 →		-.4+.25	33.3		22.7		1.1		20.4	
TOTAL 113.0			48.9		37.6		1.8		24.7	
INDICATORS	Pyrope/Knorringite									
	Chrome Diopside									
	Chromite									
	Picroilmenite									
	Other									
	.....									
BACKGROUND MINERALS	Almandine Garnet		√R		√R		√R		√R	
	Amphibole						√R		√R	
	Ilmenite		√R		√R		√S		√R	
	Limonite/Hematite		√VC		√VC		√VC		√VC	
	Pyroxene						√R		√R	
	Quartz		√R		√R		√R		√R	
	Tourmaline				√R		√R			
	KYANITE		√R		√R		√R		√R	
	GOETHITE		√S		√S		√R		√R	
	RUTILE		√R		√R		√R		√R	
*	CUBIC PSEUDOMORPHS *				√R					
	BARYTE		√R		√R		√R		√R	
*	PYRITE *						√R			
	APATITE								√R	

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.
	1 x Pyrite from CA1237	- remain with sample.	

Comments .....

B.H.P.-EXPLORATION

KIMBERLITIC INDICATOR MINERALS - RESULT SHEET

Sample No: CA.1239.⇒.1241..
Area: .....C.HILL...LOAM...
Job No: ....F67.....
Date Started: ....17/8/83.....
Date Finished: ...19/8/83.....

Observer: ..CBell...T.....
Mineralogist: .....
Result: Positive .....
(Negative) .....
Possible .....

NOT MAG SEPARATED
SCANNED & OBSERVED
TOTAL WEIGHT = 72.7 gms.

		SAMPLE NO	1239		1240		1241			
		FRACTION	-8+14		-8+14		-8+14			
		WEIGHT	26.8		18.9		27.0			
INDICATORS	Pyrope/Knorringite									
	Chrome Diopside									
	Chromite									
	Picroilmenite									
	Other									
	.....									
BACKGROUND MINERALS	Almandine Garnet		✓R							
	Amphibole		✓R		✓R					
	Ilmenite									
	Limonite/Hematite		✓VC		✓VC		✓VC			
	Pyroxene				✓R					
	Quartz									
	Tourmaline									
	KYANITE		✓S		✓S		✓S			
	RUTILE		✓S		✓R		✓R			
	ZIRCON		✓S		✓R		✓S			
	DIASPORE		✓R		✓R					
	BARITE		✓R		✓S		✓R			

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

APPENDIX II

RESULTS OF GROUND MAGNETICS

Sample No: CA1252 – 1257, PCH7,9 Observer: .....

Area: SOMMERVILLE SOIL SAMPLES Mineralogist: .....
CORE CUTTINGS (HAND GRAVITATED)

Job No: F.670 Result: Positive .....

Date Started: 6/6/83 p.m. Negative .....

Date Finished: 6/6/83 p.m. Possible .....

-10 +14 SIEVE SIZE

HAND GRAVITATED NOT MAG SEPARATED		NOT MAG SEPARATED				NOT MAG SEPARATED			
	Fraction	+1	+1	+1	+1	+1	+1	+1	+1
TOTAL WEIGHT 630.8	Weight gm	62.5	67.5	59.3	54.0	68.3	69.2	129.6	120.4
	SAMPLE NO	1252	1253	1254	1255	1256	1257	PCH7	PCH9
INDICATORS	Pyrope/Knorringite								
	Chrome Diopside								
	Chromite								
	Picroilmenite								
	Other								
	.....								
BACKGROUND MINERALS	Almandine Garnet ? ...								✓S
	Amphibole								
	Ilmenite								
	Limonite/Hematite	✓ V.C	✓VC	✓VC	✓VC	✓VC	✓VC	✓C	
	Pyroxene								
	Quartz (SUBANGULAR, SUB ROUNDED + IRON STAINING)	✓VC	✓VC	✓VC	✓VC	✓VC	✓VC	✓C	✓VC
	Tourmaline								
	CALCITE / CARBONATE		✓S						✓S
	MICA / BIOTITE / MUSCOVITE							✓C	✓S
	ROCK FRAGMENTS (MICA +							✓VC	✓C
	PYROCLASTIC FRAGMENTS							✓C	✓VC
	GYPSUM								✓C

BOTTLED MINERALS	NUMBER OF GRAINS	IDENTIFICATION	PROBE NO.

Comments .....

APPENDIX 3

PETROGRAPHY

Mineralogical Report No 3984
Pontifex Pty. Ltd

Pontifex & Associates Pty. Ltd.

TEL. 332 6744
A.H. 31 3816

26 KENSINGTON ROAD, ROSE PARK
SOUTH AUSTRALIA

P.O. BOX 91, NORWOOD
SOUTH AUSTRALIA 5067

0217

MINERALOGICAL REPORT NO. 3984

18th March, 1983

TO: Erica Smyth,
B.H.P. Ltd.,
Exploration Division
G.P.O. Box 1818,
ADELAIDE, S.A. 5001

YOUR REFERENCE: BHP Order No. AE2367

MATERIAL: Weather percussion chip samples

IDENTIFICATION: DEA 6932, 6938, 6939,
DEA 6945, 6957, 6963

WORK REQUESTED: Preparation of thin section,
examination and report

SAMPLES & SECTIONS: Returned to you
with this report

PONTIFEX & ASSOCIATES PTY. LTD.

SUMMARY COMMENTS

Two or three chips from each of these percussion cuttings were examined in thin section, except for DEA6932 which consisted of only one large chip. The extensive alteration to extremely fine talc and possible sericite (which are virtually impossible to distinguish between optically), also to "chloritic" clays; commonly followed by leaching and intense impregnation by limonite, all make it difficult to positively identify.

The collective petrographic evidence does indicate however, that the suite consists mainly of retrograde metamorphic rocks derived from "pyroxenites". Two samples may be interpreted as altered and retrograded basaltic to aluminous ultramafic rocks; or indeed as altered but not necessarily metamorphosed lamprophyric rocks, as follows:-

DEA6932 and 6938 consist of granular hornblende, talc-tremolite aggregate, imterpreted as retrograded and altered pyroxenite

DEA6939 two chips consist of plagioclase biotite aggregate + altered pyroxene : one chip of altered biotite + pyroxene? olivine? and possible garnet. These may be altered, metamorphosed basalts or aluminous ultramafics; alternatively they have lamprophyric affinities

DEA6945 these chips are completely altered to clays and limonite, with relict textures to suggest a metapyroxenite

DEA6957 is a mass of limonitic clays and probable hydro-talc; relict textures suggest a metamorphic talc-olivine rock derived from an ultramafic

DEA6963 is an extensively altered biotite garnet rock : probably a meta-basic or ultramafic, possibly a lamprophyre with kimberlitic affinities.

Selected trace element geochemistry may be used to help confirm (or deny) some of these interpretations.

**

DEA 6932 : coarse granular (?cumulus-textured) aggregate, of very pale hornblende and apparent talc-tremolite pseudomorphs after pyroxene (altered, retrograded, pyroxenite)

This rock has a primary coarse granular texture on a scale of 2 to 4 mm. This aggregate gas a vaguely cumulus texture. Subhedral to euhedral very pale brown hornblende forms about 50% of the rock, and is fairly extensively invaded along cleavages and micro-fractures by extremely fine chloritic-clays and talc (or sericite ?). They also contain numerous minute inclusions of rutile.

These amphibole crystals are aggregated with a similar abundance of a former granular mineral of the same size, which have been completely replaced by extremely fine fibrous tremolite and/or extremely fine decussate talc (? or sericite). This mineral seems most likely to have been a pyroxene although if sericite is present some plagioclase may have been present.

Minor patches of clouded uralite (? after pyroxene), and accessory apatite are scattered.

This sample is interpreted as an altered, retrograde-metamorphosed, two pyroxene pyroxenitic rock, in which the granulose texture may reflect a layered cumulus (sill-like) origin; or a new granuloblastic/metamorphic fabric.

DEA 6938 :

(1) aggregate of pale hornblende in matrix of fine tremolite altered to talc, accessory biotite (altered, retrograded, 2 pyroxene pyroxenite, cf. 6932)

(2) granular talc-tremolite rock with minor biotite (retrograded and altered pyroxenite)

Two chips in this sample consist of medium grained (1 mm) granular aggregate of extremely pale brown hornblende and a subequal abundance of ultrafine compact talc ± fine fibrous tremolite, which apparently replaces pyroxene. It is therefore essentially a finer grained equivalent of 6932.

This talc pervasively invades microfractures in the hornblende together with minor uralitic and extremely fine Fe and/or Ti grains. Accessory small flakes of altered biotite, and trace apatite are scattered.

One chip consists of a random compact aggregate of fibro-lamellar form tremolite ± talc, replacing granular pyroxene, with a grain size of about 2 mm. Minor altered biotite (5%), and lesser much smaller black opaque oxides are scattered including octahedral crystals which may be oxidised magnetite or chromite.

DEA 6939 : (1) fine granular aggregate of plagioclase biotite and minor, altered ?pyroxene

(2) more extensively altered biotite-mafic-mineral aggregate

(original rocks may be metamorphosed aluminous ultramafic or basalt; or possibly one of the lamprophyre family)

Two chips examined are basically the same, although the degree of alteration of plagioclase varies between and within them. They have a rather irregular fine granular texture, on a scale of about 1 mm. Between 35% and 50% of these consists of plagioclase which is essentially unaltered, except in one vague band of one chip where plagioclase is totally altered to clays.

Brown, and quite distinctly pleochroic biotite forms about 30% of one chip and 40% of the other, as random and partly poikiloblastic flakes to 10 mm across.

A third but minor component (? to 15%) consists of ultrafine ?talc ± tremolite ± "chloritic clays" which appear to pseudomorphically replace former ?pyroxene (or possibly olivine).

The original rock represented by these two altered chips is uncertain. A "lamprophyre" of kersantite type is a possibility, although it lacks a characteristic porphyritic texture.

One chip in this sample consists of the same orange to tan biotite (35%), altered, and randomly disposed through a boxwork/replica fabric of "chloritic-clays" and possible talc. This material may be partly after plagioclase as seen in the two chips above, but much of it could be after pyroxene, ?olivine, or even garnet as is more clearly manifest in 6963.

The interpretation of the original rock type may be metamorphosed basic or aluminous ultramafic, or possibly a lamprophyre.

DEA 6945 : extensively ferruginised aggregate of clay pseudomorphs after granular to fibro-lamellar crystals, trace oxidised magnetite or chromite? (in context of this suite interpreted as a deeply weathered meta-pyroxenite)

The two chips forming this sample consist of clay replicas after an aggregate of granular to fibro-lamellar-form crystals. Optically the clays cannot be identified.

This clay aggregate has been deeply weathered, involving leaching and extensive permeation by limonite. Rare relicts of apparently octahedral black opaque oxides (magnetite or chromite) are scattered. Minor secondary quartz occurs locally as discontinuous stringers and patches.

In the context of this suite this sample seems most appropriately interpreted as a meta-pyroxenite.

Geochemical analysis, notably for Cu,. Ni, Cr, may help confirm the proposed ultramafic origin.

DEA 6957 : massive aggregate of limonitic clays, and probable hydrotalc, with relict textures to indicate a former metamorphic talc-olivine rock derived from an ultramafic

The two chips comprising this sample consist of limonitic clay pseudomorphs after blotchy to prismatic grains, set in a matrix of a clear micaceous mineral, possibly hydrated talc or apparently less likely of leached muscovite.

The texture in one of the chips is typical of metamorphic, olivine-talc rocks, which are formed by prograde metamorphism of serpentinites (serpentine = olivine + talc + water).

In the context of this suite therefore, the chips are interpreted to represent a metamorphic talc-olivine rock, derived from an original ultramafic which most likely had a peridotitic or dunitic composition.

DEA 6963 : extensively altered garnet-biotite-rock (possibly with kimberlitic affinities)

The three chips examined consist of fractured grains of garnet (40 - 50%), up to 5 mm across, and flakes of extensively altered "biotite" (30%) up to 3 mm across, loosely and randomly aggregated in a matrix of turbid, extremely fine "chloritic-clays" of optically indeterminate composition.

This same matrix alteration material occurs as extensive fine networks through the fractured garnet.

The garnet has a pale pink colour and its RI was checked in oils and found to be less than, but close to a value of 1.78, which indicates a probable pyrope-almandine composition.

In the context of this suite these chips seem most likely to represent a metamorphosed aluminous ultramafic; they may be interpreted to have kimberlitic affinities.

REPORT ON A GRAVITY SURVEY AT WIRRIDA, SOUTH AUSTRALIA FOR AFMECO PTY. LTD.

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1. INTRODUCTION

A combined gravity and level survey was carried out between 13th and 28th April, 1981, by Geoex Pty. Ltd. for Afmeco Pty. Ltd., over an area near Wirrida, South Australia. The party leader was P. McSkimming.

2. EQUIPMENT

(a) Worden Gravimeter Serial No. W708
(b) Wilde T16 Theodolite
(c) AGA Geodimeter (E.D.M.) Model 14A
(d) Zeiss NI025 Optical Level

3. SURVEY DETAILS

The survey area is located near Wirrida and Commonwealth Hill, about 100 kilometres south of Coober Pedy. Survey lines were located along a group of roads running approximately east-west and north-south, with slight deviations at several points. Table 1 lists the survey lines and corresponding profiles. Survey directions are indicated on the map sheets.

TABLE 1 : GRID DETAILS

N/S Line at east of area	Line 0
N/S Extension (to north of above)	Line 0A
E/W Road (most northerly)	Line 1
Mid E/W Road	Line 2
Mid E/W Extension (west of Line 2)	Line 3
Western N/S Road (between Lines 1 and 2)	Line 4
Blue Bore Road (between Line 2 and Commonwealth Hill Road)	Line 5
Commonwealth Hill Road	Line 6
South from No. 53 Bore	Line 7

Thus, there were two main north-south traverses and three east-west traverses, divided as outlined and illustrated in detail in the map sheets and plates.

Lines of pegs were put in by the client, Afmeco, at approximately 200 metre intervals and relative elevations were determined by automatic compensating optical level and stadia rod. Gravity readings were then taken using standard looping procedures with a maximum duration of 1½ hours.

After preliminary data reduction in the field to ensure accuracy, results were processed in the computer centre of Geoex Pty. Ltd. at Adelaide. Calibration constant for the gravimeter was 0.10083.

4. DATA PROCESSING AND PRESENTATION

A computer listing is presented for the gravity data. This gives survey details, and, for each station, the northing, easting, gravity reading, relative elevation, Bouguer correction, latitude correction and final Bouguer anomaly. Preliminary profiles were produced containing a range of Bouguer densities from 2.0 to 3.0 gm/cc in 0.2 gm/cc steps. These were shown only with the elevation profile so the best density, which shows the least elevation effect, could be chosen. The profile of line 2 (Plate 5) illustrates this method, and a value of 2.2 gm/cc was chosen throughout the area.

Profiles of Bouguer Gravity Anomaly (Plates 1-10) are shown at a horizontal scale of 1:40,000 and a vertical scale of 1 cm. to 1 milligal. Also shown are the relative elevation profiles at a vertical scale of 1:500.

A contour map (Sheets 1 - 6) at a scale of 1:25,000 has been produced for the Bouguer Gravity Anomaly. A density of 2.2 mg/cc has been assumed and contour intervals are at 1 milligal.

5. INTERPRETATION

This survey was a more detailed gravimetric survey based on a high outlined on the regional 1:250,000 Bouguer Anomaly map. Although results appear to be broadly similar, several trends show differences from the regional survey.

The main feature seen from the survey is a large high anomaly which, in general, appears to be flat-topped with the exception of increased values and corresponding gradient in the east of the area. Up to four individual highs could possibly be interpreted over this large high area; two in the north and two in the south. These highs are illustrated on the map and designated A, B, C and D. The south-western high, C, could be centred, just east of the creek, and although the south-eastern high, D, is illustrated by contour closure, more survey results would be necessary to come to this conclusion and prove that there is neither an east-west trend nor elongation of the feature to the east of the road. Similarly more results would be necessary to determine any relation between the north-eastern high, B, and the southern highs, C and D.

Without detailed geological knowledge of the area, two interpretations can be based on the south-eastern high, D. The first is a gradual increase in density of a very shallow (less than a few metres) basement, whereas the model in Figure 1 would indicate that with a density contrast of around 0.4 gm/cc, the causative anomaly would be over 100 metres deep. If dense rocks are outcropping or subcropping, a very dense source rock is thus indicated. The model in Figure 1 was taken from the traverse along Line 0 - the N/S road. In general, lack of data

between the traverses has failed to precisely position the centre of the high, although it does appear to be further east than was indicated on the regional survey map.

Briefly, therefore, the area is dominated by a complex high. Closure within the 30 milligal contour defines it quite well, although the position is subjective between traverses.

From the amount of available data, gradients away from the high are subjective with respect to the contouring. In general, the slopes are similar to those on the regional map, although in this survey, the small high south of Commonwealth Hill is only apparent as a weak ridge protruding south from the main high. Again, lack of density of readings may be responsible. In this southern area the gradient strikes east-west or NE-SW (further east) and is quite high with values up to 5 milligals per kilometre.

To the west of the high, gradients are less steep averaging 1-2 milligals per kilometre, but more features are indicated on this survey's map than are apparent from the regional survey. These flexures may be due to variation in depth to basement, or variation in density of the subcrop. They take the form of slight ridges and troughs and occur over the whole area west of lines 4, 5 and 7. No significant trend or feature can however be inferred.

In the north-east of the survey area, the gradient gradually increases from about 0.5 milligal per kilometre to 3 or 4 milligals per kilometre. The strike appears to be in a NW-SE direction and contains a distinct low trough superimposed upon and concordant with this trend. This feature is not at all apparent on the regional map and appears to be either some form of paleochannel or deeply weathered area. To analyse this feature, a profile was constructed at right angles to the trend and the regional gradient removed. The resultant model is shown in Figure 2. The grid station co-ordinates are arbitrary, although the profile was digitized at an interval corresponding

to 200 metres. As can be seen, a valley of the order of 2.5 kilometres wide by 300 metres deep is given by a density contrast of 0.46 gm/cc. Any increase in density contrast would give a shallower depth and vice versa.

6. CONCLUSIONS AND SUMMARY

This survey, over an apparent high gravity anomaly, has shown that this area is more complex than is illustrated in the regional map. Apart from minor flexures shown by the contours, two features are shown in more detail viz. the complex nature of the high anomaly itself, and the trough which was revealed by the survey. The trough is reasonably well defined with a NW-SE trend. However, the high appears to have possible groups of locally high areas within it; their positions not being exactly located. If their positions are required precisely, a denser grid is necessary with stations located between the existing roads.

A more detailed follow-up of the geology of the area would also be required to ascertain the precise nature and accurate depth of features which cause these anomalies.

Respectfully submitted,
GEOEX PTY. LTD.

I.H. EDWARDS
Senior Geophysicist

No: 81586
12th November, 1981
IHE/pcl

APPENDIX

GRAVITY DATA REDUCTION

The method used for obtaining the difference between the gravity readings of two base stations is shown graphically in Figure (a)., the difference in the gravity readings between the two base stations, B1 and B2, being (A+B)/2. All data reduction is, in fact, done by computer or programmable calculator. If the two differences A and B differ by more than the prescribed survey accuracy, the loop is repeated, as is any intermediate station loop if the base station readings differ excessively. Figure (b) shows the drift correction theory for intermediate stations.

The difference in the readings between the stations are multiplied by the instrument constant to convert the difference into milligals, the instrument having been calibrated in Adelaide using two gravity stations which are part of the Australian standard network.

The values of Δg_{obs} is then Bouguer corrected using the formula:

$$\Delta g_{Bouguer} = (0.3086 - 0.04191\rho)\Delta_h$$

where Δ_h is the elevation difference between the stations and ρ is the density of the surface rocks in the area. The value for ρ is derived from rock samples, from typical values for the rock types in the area, or by comparing the effect of different densities over lines where the elevation varies appreciably but the gravity gradient is small. The last method is generally the most effective.

$$\text{Then } \Delta g = \Delta g_{obs} + \Delta g_{Bouguer}$$

Once the gravity differences between the stations have been corrected in this way, they are then all made relative to the survey area datum point. They are then used to check for loop misclosures, if the grid layout and accessibility permit.

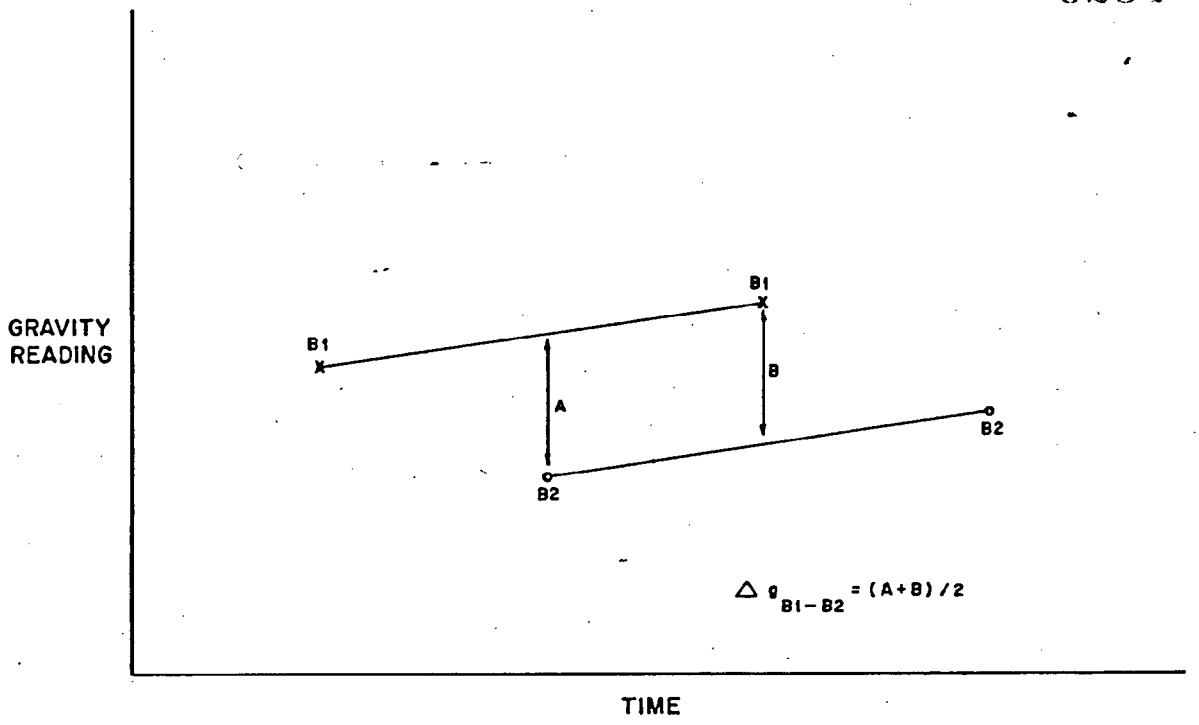
The final correction applied to the data is the latitude correction, which is calculated for each station using the formula (after-Parasnis, 1966).

$$\Delta g_{Lat.} = 5172.3 \ (\sin^2\phi_1 - \sin^2\phi_0)$$

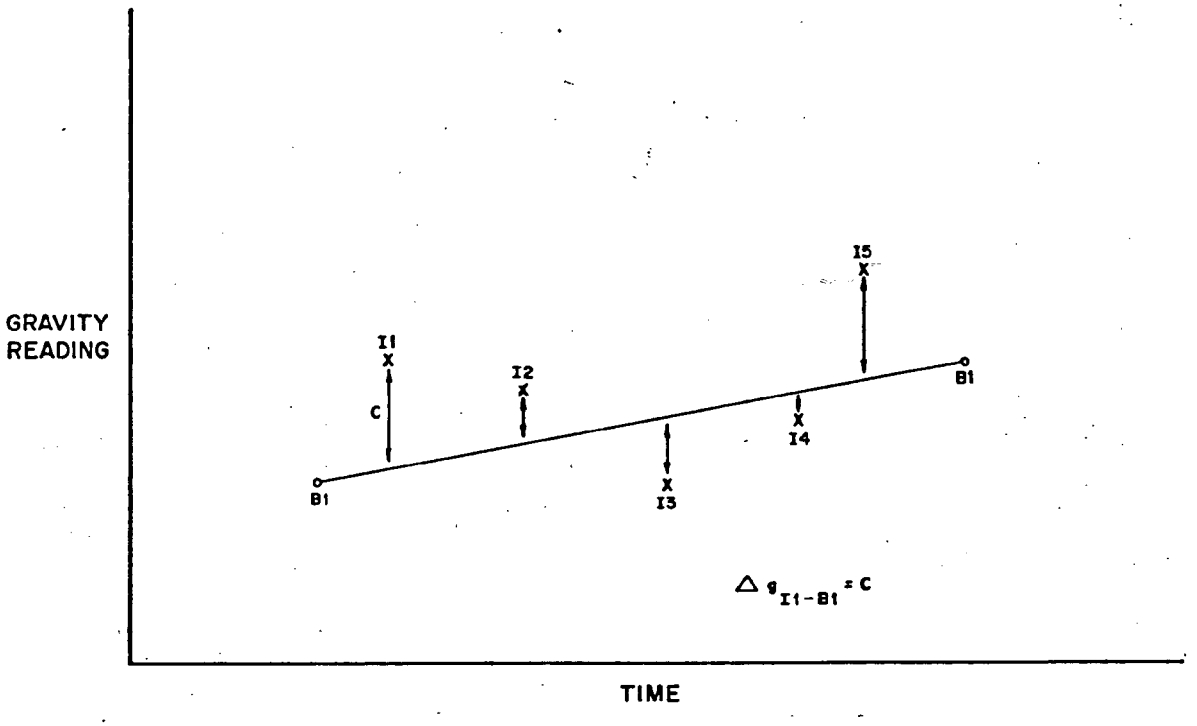
where ϕ_1 is the latitude of the station, and
ϕ_0 is the latitude of the survey datum point.

The latitude of the survey datum is taken from the maps provided. The latitude for each station is then calculated from the northing co-ordinate provided, which is converted from metres into minutes and seconds of latitude and added to the base station latitude to give ϕ_1.

Topographic corrections are not normally applied; firstly because the topography is rarely sufficiently rugged to warrant them; and secondly because the necessary density of elevation data is not available.



(a) BASE STATION DRIFT CORRECTION



(b) INTERMEDIATE STATION DRIFT CORRECTION

FIGURE : 3 DRIFT CORRECTION PROCEDURE

SURVEY NAME : WIRR

SURVEY CONSTANTS:-
INSTRUMENT CONSTANT. = .10083
ROCK DENSITY USED FOR BOUGUER CORRECTIONS= 2.2

0235

DATUM VALUES :
CO-ORDINATES NORTHING = 26450 EASTING = 0 METRES
ELEVATION = 100.28 METRES
LATITUDE = 29.783333 DEGREES
ORIENTATION OF GRID 0 DEGREES EAST OF TRUE NORTH

LINE	STATION	NORTHING	EASTING	GRAVITY READING	ELEVATION	BOUGUER	LATITUDE	FINAL GRAVITY
		METRES	METRES	SCALE DIVS	METRES	MGALS	MGALS	MGALS
0	200	36840	0	72.44	94.65	-1.22	7.30	18.22
0	400	37030	0	70.48	93.45	-1.48	7.44	17.90
0	600	37220	0	65.62	94.17	-1.32	7.57	17.70
0	800	37410	0	63.47	93.16	-1.54	7.70	17.40
0	1000	37600	0	63.21	92.07	-1.78	7.84	17.27
0	1200	37780	0	62.45	91.33	-1.94	7.96	17.16
0	1400	37970	0	58.89	90.24	-2.17	8.10	16.70
0	1600	38160	0	58.73	88.86	-2.47	8.23	16.52
0	1800	38350	0	56.57	88.48	-2.55	8.37	16.35
0	2000	38540	0	52.02	88.31	-2.59	8.50	15.99
0	2200	38730	0	46.98	87.93	-2.67	8.63	15.53
0	2400	38920	0	41.24	88.33	-2.59	8.77	15.17
0	2600	39100	0	37.30	88.68	-2.51	8.89	14.98
0	2800	39290	0	34.64	88.67	-2.51	9.03	14.84
0	3000	39480	0	29.58	89.00	-2.44	9.16	14.54
0	3200	39670	0	25.63	89.46	-2.34	9.29	14.37
0	3400	39860	0	24.97	88.39	-2.57	9.43	14.21
0	3600	40050	0	21.31	88.39	-2.57	9.56	13.97
0	3800	40240	0	16.35	89.10	-2.42	9.70	13.76
0	4000	40425	0	11.69	89.25	-2.39	9.83	13.45
0	25400	36650	0	76.20	94.50	-1.25	7.17	18.44
0	25600	36350	0	77.09	94.72	-1.20	6.96	18.36
0	25800	36150	0	77.81	95.52	-1.03	6.82	18.47
0	26000	35950	0	81.22	95.99	-.93	6.68	18.77
0	26200	35750	0	86.93	95.92	-.94	6.54	19.19
0	26400	35550	0	91.34	95.87	-.95	6.40	19.48
0	26600	35350	0	93.95	96.02	-.92	6.25	19.64
0	26800	35150	0	97.96	96.47	-.82	6.11	20.00
0	27000	34950	0	103.28	96.39	-.84	5.97	20.38
0	27200	34750	0	107.39	95.79	-.97	5.83	20.52
0	27400	34550	0	108.81	94.98	-1.15	5.69	20.35
0	27600	34350	0	102.92	94.84	-1.18	5.55	19.59
0	27800	34150	0	98.53	95.21	-1.10	5.41	19.08
0	28000	33950	0	94.67	95.37	-1.06	5.27	18.59
0	28200	33750	0	92.79	95.35	-1.07	5.13	18.25
0	28400	33550	0	93.90	95.09	-1.12	4.99	18.17
0	28600	33350	0	95.22	95.27	-1.08	4.85	18.20
0	28800	33150	0	99.34	94.98	-1.15	4.71	18.41
0	29000	32950	0	105.45	94.91	-1.16	4.57	18.87
0	29200	32750	0	110.97	94.82	-1.18	4.43	19.27
0	29400	32550	0	114.88	94.95	-1.15	4.29	19.55
0	29600	32350	0	117.70	95.04	-1.13	4.15	19.71
0	29800	32150	0	120.52	95.52	-1.03	4.00	19.96
0	30000	31950	0	121.53	95.39	-1.06	3.86	19.89

0	30200	31750	0	123.55	95.12	-1.12	3.72	19.90
0	30400	31550	0	123.87	95.17	-1.11	3.58	19.80
0	30600	31350	0	125.48	95.34	-1.07	3.44	19.86
0	30800	31150	0	124.20	95.54	-1.03	3.30	19.63
0	31000	30950	0	121.63	96.49	-.82	3.16	19.44
0	31200	30750	0	120.84	97.03	-.70	3.02	19.34
0	31400	30550	0	123.25	96.73	-.77	2.88	19.37
0	31600	30850	0	125.27	97.14	-.68	3.09	19.88
0	31800	30150	0	128.58	98.50	-.39	2.60	20.01
0	32000	29950	0	132.90	98.85	-.31	2.46	20.38
0	32200	29750	0	138.42	98.82	-.32	2.32	20.79
0	32400	29550	0	148.63	97.15	-.68	2.18	21.32
0	32600	29350	0	157.73	97.52	-.60	2.04	22.18
0	32800	29150	0	159.33	98.88	-.30	1.90	22.49
0	33000	28950	0	163.44	98.04	-.48	1.76	22.58
0	33200	28750	0	164.34	98.92	-.29	1.62	22.73
0	33400	28550	0	168.84	98.13	-.47	1.47	22.87
0	33600	28350	0	173.15	97.57	-.59	1.33	23.04
0	33800	28150	0	175.95	97.18	-.67	1.19	23.10
0	34000	27950	0	179.16	97.14	-.68	1.05	23.27
0	34200	27750	0	178.96	97.92	-.51	.91	23.28
0	34400	27550	0	177.57	99.23	-.23	.77	23.28
0	34600	27350	0	178.77	99.50	-.17	.63	23.32
0	34800	27150	0	182.27	99.10	-.26	.49	23.45
0	35000	26950	0	183.78	99.76	-.11	.35	23.60
0	35200	26750	0	187.78	99.93	-.08	.21	23.90
0	35400	26550	0	192.68	99.35	-.20	.07	24.13
0	35500	26450	0	200.00	100.28	.00	.00	25.00
0	35600	26350	0	197.09	99.01	-.27	-.07	24.36
0	35800	26150	0	196.79	100.19	-.02	-.21	24.45
0	36000	25950	0	199.29	100.00	-.06	-.35	24.52
0	36200	25750	0	208.04	99.79	-.11	-.49	25.21
0	36400	25550	0	210.04	99.91	-.08	-.63	25.30
0	36600	25350	0	215.63	99.08	-.26	-.77	25.54
0	36800	25150	0	223.03	98.56	-.37	-.91	26.04
0	37000	24950	0	226.72	99.08	-.26	-1.05	26.38
0	37200	24750	0	231.17	99.76	-.11	-1.19	26.84
0	37400	24550	0	235.36	98.45	-.40	-1.33	26.84
0	37600	24350	0	237.46	98.06	-.48	-1.47	26.82
0	37800	24150	0	239.50	97.69	-.56	-1.61	26.81
0	38000	23950	0	240.60	97.61	-.58	-1.76	26.76
0	38200	23750	0	243.49	97.83	-.53	-1.90	26.96
0	38400	23550	0	246.83	97.83	-.53	-2.04	27.16
0	38600	23350	0	248.93	97.92	-.51	-2.18	27.25
0	38800	23150	0	248.72	98.53	-.38	-2.32	27.22
0	39000	22950	0	252.00	97.92	-.51	-2.46	27.28
0	39200	22750	0	253.79	98.01	-.49	-2.60	27.34
0	39400	22550	0	257.17	98.32	-.42	-2.74	27.60
0	39600	22350	0	259.24	98.23	-.44	-2.88	27.65
0	39800	22150	0	260.83	98.13	-.47	-3.02	27.65
0	40000	21950	0	260.72	98.36	-.42	-3.16	27.55
0	40200	21750	0	263.21	97.87	-.52	-3.30	27.55
0	40400	21550	0	264.70	97.97	-.50	-3.44	27.58
0	40600	21350	0	268.19	98.07	-.48	-3.58	27.82
0	40800	21150	0	269.98	97.76	-.55	-3.72	27.79
0	41000	20950	0	271.66	97.87	-.52	-3.86	27.84
0	41200	20750	0	276.25	96.66	-.78	-4.00	27.90

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2	0	41400	20550	0	276.14	96.68	-.78	-4.14	27.76
3	0	41600	20350	0	276.22	97.08	-.69	-4.28	27.71
4	0	41800	20150	0	276.21	97.40	-.62	-4.42	27.64
5	0	42000	19950	0	278.00	98.57	-.37	-4.56	27.93
6	0	42200	19750	0	282.59	98.74	-.33	-4.70	28.29
7	0	42400	19550	0	284.88	99.34	-.20	-4.84	28.51
8	0	42600	19350	0	287.27	100.23	-.01	-4.98	28.81
9	0	42800	19150	0	292.65	101.01	.16	-5.12	29.38
10	0	43000	18950	0	297.80	100.79	.11	-5.26	29.71
11	0	43200	18750	0	303.79	99.96	-.07	-5.40	29.99
12	0	43400	18550	0	304.46	101.06	.17	-5.54	30.16
13	0	43600	18350	0	310.25	102.35	.45	-5.68	30.88
14	0	43800	18126	0	326.04	100.31	.01	-5.84	31.87
15	0	44000	17908	0	347.83	97.81	-.53	-5.99	33.38
16	0	44200	17690	0	358.82	97.54	-.59	-6.15	34.27
17	0	44400	17472	0	362.20	98.05	-.48	-6.30	34.57
18	0	44600	17254	0	365.79	98.07	-.48	-6.45	34.79
19	0	44800	17036	0	372.37	97.13	-.68	-6.60	35.09
20	0	45000	16818	0	373.86	97.43	-.62	-6.76	35.16
21	0	45200	16600	0	371.64	98.06	-.48	-6.91	34.92
22	0	45400	16402	0	369.63	99.15	-.24	-7.05	34.81
23	0	45600	16200	0	363.82	100.12	-.03	-7.19	34.29
24	0	45800	15998	0	353.41	101.82	.33	-7.33	33.47
25	0	46000	15795	0	348.20	101.87	.34	-7.47	32.81
26	0	46200	15593	0	343.89	101.23	.21	-7.62	32.10
27	0	46400	15390	0	334.38	101.75	.32	-7.76	31.11
28	0	46600	15188	0	322.76	100.07	-.05	-7.90	29.43
29	0	46800	14985	0	312.36	101.47	.26	-8.04	28.54
30	0	47000	14783	0	311.30	99.98	-.06	-8.18	27.97
31	0	47200	14580	0	308.84	99.96	-.07	-8.33	27.58
32	0	47400	14378	0	306.16	99.68	-.13	-8.47	27.11
33	0	47600	14175	0	305.37	98.59	-.37	-8.61	26.65
34	0	47800	13973	0	306.18	97.78	-.54	-8.75	26.41
35	0	48000	13770	0	308.19	96.65	-.79	-8.89	26.23
36	0	48200	13568	0	310.31	96.06	-.91	-9.03	26.17
37	0	48400	13365	0	308.42	96.71	-.77	-9.18	25.98
38	0	48600	13163	0	308.23	96.55	-.81	-9.32	25.79
39	0	48800	12960	0	313.64	96.29	-.86	-9.46	26.13
40	0	49000	12758	0	316.45	96.65	-.79	-9.60	26.35
41	0	49200	12555	0	317.96	96.46	-.83	-9.74	26.32
42	0	49400	12353	0	320.77	95.46	-1.04	-9.89	26.25
43	0	49600	12150	0	319.99	95.57	-1.02	-10.03	26.05
44	0	49800	11948	0	320.40	96.48	-.82	-10.17	26.15
45	0	50000	11745	0	313.92	99.36	-.20	-10.31	25.98
46	0	50200	11543	0	310.43	99.66	-.13	-10.45	25.55
47	0	50400	11340	0	312.26	98.27	-.43	-10.60	25.29
48	0	50600	11138	0	309.87	97.93	-.51	-10.74	24.83
49	0	50800	10935	0	309.69	97.51	-.60	-10.88	24.58
50	0	51000	10733	0	308.90	97.43	-.62	-11.02	24.34
51	0	51200	10530	0	307.81	97.89	-.52	-11.16	24.19
52	0	51400	10328	0	308.22	98.26	-.44	-11.30	24.17
53	0	51600	10125	0	305.96	98.75	-.33	-11.45	23.91
54	0	51800	9931	0	300.50	99.61	-.14	-11.58	23.41
55	0	52000	9715	0	297.66	100.55	.06	-11.73	23.17
56	0	52200	9507	0	293.92	101.60	.29	-11.88	22.88
57	0	52400	9301	0	289.88	102.96	.58	-12.02	22.62
58	0	52600	9095	0	286.44	103.49	.69	-12.17	22.24
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0	52800	8889	0	287.82	102.40	.46	-12.31	22.00
0	53000	8683	0	290.06	102.23	.42	-12.45	22.05
0	53200	8477	0	288.50	101.84	.34	-12.60	21.66
0	53400	8271	0	284.56	101.91	.35	-12.74	21.14
0	53600	8065	0	277.42	103.59	.72	-12.89	20.64
0	53800	7859	0	275.88	102.67	.52	-13.03	20.14
0	54000	7653	0	274.52	102.07	.39	-13.18	19.73
0	54200	7447	0	268.06	103.95	.79	-13.32	19.34
0	54400	7241	0	262.80	104.93	1.01	-13.46	18.87
0	54600	7035	0	263.56	103.22	.64	-13.61	18.44
0	54800	6829	0	262.86	101.32	.23	-13.75	17.81
0	55000	6623	0	262.90	101.00	.16	-13.90	17.60
0	55200	6417	0	258.44	101.78	.32	-14.04	17.18
0	55400	6211	0	257.50	102.74	.53	-14.18	17.15
0	55600	6005	0	259.94	100.45	.04	-14.33	16.75
0	55800	5799	0	257.90	99.39	-.19	-14.47	16.17
0	56000	5593	0	257.06	99.44	-.18	-14.62	15.96
0	56200	5387	0	256.13	98.61	-.36	-14.76	15.54
0	56400	5181	0	254.09	97.74	-.55	-14.91	15.00
0	56600	4975	0	250.05	98.89	-.30	-15.05	14.70
0	56800	4769	0	248.99	100.33	.01	-15.19	14.76
0	57000	4563	0	243.03	100.27	-.00	-15.34	14.00
0	57200	4357	0	239.39	99.64	-.14	-15.48	13.35
0	57400	4151	0	232.75	99.86	-.09	-15.63	12.59
0	57600	3945	0	224.49	100.39	.02	-15.77	11.72
0	57800	3739	0	218.06	100.54	.06	-15.91	10.96
0	58000	3533	0	211.90	100.82	.12	-16.06	10.26
0	58200	3327	0	205.16	100.56	.06	-16.20	9.38
0	58400	3121	0	199.59	99.98	-.06	-16.35	8.55
0	58600	2915	0	191.23	100.45	.04	-16.49	7.66
0	58800	2709	0	182.77	100.56	.06	-16.63	6.69
0	59000	2503	0	179.20	100.91	.14	-16.78	6.26
0	59200	2297	0	178.75	100.50	.05	-16.92	5.98
0	59400	2091	0	178.39	100.14	-.03	-17.07	5.73
0	59600	1885	0	173.62	100.01	-.06	-17.21	5.07
0	59800	1679	0	172.45	99.81	-.10	-17.35	4.77
0	60000	1473	0	173.69	99.63	-.14	-17.50	4.71
0	60200	1267	0	180.12	99.26	-.22	-17.64	5.13
0	60400	1061	0	180.75	99.15	-.24	-17.79	5.03
0	60600	855	0	177.59	99.69	-.13	-17.93	4.68
0	60800	649	0	172.12	100.07	-.05	-18.07	4.07
0	61000	443	0	170.87	99.60	-.15	-18.22	3.70
0	61200	237	0	162.81	98.92	-.29	-18.36	2.59
1	0	32850	0	113.64	94.22	-1.31	4.50	19.48
1	200	32840	0	113.81	94.12	-1.33	4.49	19.47
1	400	32830	0	113.97	93.97	-1.37	4.48	19.44
1	600	32820	0	116.13	93.81	-1.40	4.48	19.62
1	800	32810	0	116.38	93.99	-1.36	4.47	19.68
1	1000	32800	0	121.04	92.33	-1.72	4.46	19.78
1	1200	32790	0	122.59	93.08	-1.56	4.45	20.09
1	1400	32780	0	124.24	93.76	-1.41	4.45	20.40
1	1600	32770	0	124.38	94.10	-1.34	4.44	20.48
1	1800	32760	0	127.01	93.82	-1.40	4.43	20.68
1	2000	32750	0	130.79	93.93	-1.37	4.43	21.07
1	2200	32740	0	137.26	92.98	-1.58	4.42	21.51
1	2400	32730	0	141.06	92.72	-1.64	4.41	21.83
1	2600	32720	0	144.31	93.45	-1.48	4.41	22.31

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2	1	2800	32710	0	148.37	93.94	-1.37	4.40	22.82
3	1	3000	32710	0	150.51	94.29	-1.30	4.40	23.11
4	1	3200	32700	0	151.07	93.58	-1.45	4.39	23.01
5	1	3400	32690	0	153.94	93.25	-1.52	4.38	23.22
6	1	3800	32670	0	154.79	94.13	-1.33	4.37	23.48
7	1	4000	32660	0	157.04	93.18	-1.54	4.36	23.50
8	1	4200	32650	0	154.80	93.58	-1.45	4.36	23.35
9	1	4400	32640	0	154.47	93.96	-1.37	4.35	23.39
10	1	4600	32630	0	156.01	92.78	-1.62	4.34	23.28
11	1	4800	32620	0	155.58	92.99	-1.58	4.33	23.28
12	1	5000	32610	0	154.74	93.53	-1.46	4.33	23.30
13	1	5200	32600	0	154.51	93.60	-1.45	4.32	23.29
14	1	5400	32590	0	150.09	94.43	-1.27	4.31	23.02
15	1	5600	32580	0	149.06	94.22	-1.31	4.31	22.86
16	1	5800	32570	0	148.92	95.29	-1.08	4.30	23.07
17	1	6000	32560	0	146.79	95.82	-.97	4.29	22.96
18	1	6200	32550	0	144.64	96.34	-.85	4.29	22.85
19	1	6400	32540	0	140.51	97.20	-.67	4.28	22.61
20	1	6600	32530	0	140.28	97.66	-.57	4.27	22.68
21	1	6800	32520	0	139.53	98.33	-.42	4.26	22.75
22	1	7000	32510	0	139.30	98.81	-.32	4.26	22.82
23	1	7200	32500	0	138.34	99.45	-.18	4.25	22.85
24	1	7400	32490	0	141.12	99.72	-.12	4.24	23.18
25	1	7600	32480	0	143.07	99.81	-.10	4.24	23.39
26	1	7800	32470	0	146.74	100.12	-.03	4.23	23.82
27	1	8000	32460	0	148.12	100.75	.10	4.22	24.09
28	1	8200	32450	0	146.29	102.47	.47	4.22	24.27
29	1	8400	32440	0	144.86	103.09	.61	4.21	24.26
30	1	8600	32430	0	142.43	103.27	.65	4.20	24.04
31	1	8800	32420	0	142.29	104.03	.81	4.19	24.19
32	1	9000	32410	0	146.64	103.59	.72	4.19	24.52
33	1	9200	32400	0	153.60	102.57	.50	4.18	25.00
34	1	9400	32510	0	161.26	101.22	.20	4.26	25.56
35	1	9600	32619	0	165.50	101.76	.32	4.33	26.18
36	1	9800	32729	0	165.97	102.84	.55	4.41	26.53
37	1	10000	32838	0	165.05	103.63	.72	4.49	26.69
38	1	10200	32948	0	170.22	102.02	.38	4.57	26.94
39	1	10400	33057	0	162.60	103.21	.63	4.64	26.50
40	1	10600	33167	0	171.48	103.63	.72	4.72	27.57
41	1	10800	33276	0	178.86	104.27	.86	4.80	28.53
42	1	11000	33386	0	180.40	104.74	.97	4.87	28.86
43	1	11200	33495	0	176.84	104.46	.90	4.95	28.52
44	1	11400	33605	0	176.49	104.49	.91	5.03	28.57
45	1	11600	33714	0	173.05	104.97	1.01	5.10	28.40
46	1	11800	33824	0	172.51	105.58	1.15	5.18	28.56
47	1	12000	33933	0	176.95	105.13	1.05	5.26	28.98
48	1	12200	34043	0	175.59	105.32	1.09	5.34	28.97
49	1	12400	34152	0	175.44	105.31	1.09	5.41	29.02
50	1	12600	34262	0	175.90	104.77	.97	5.49	29.03
51	1	12800	34371	0	174.82	104.50	.91	5.57	28.94
52	1	13000	34481	0	173.68	102.17	.41	5.64	28.40
53	1	13200	34590	0	173.31	103.43	.68	5.72	28.71
54	1	13400	34700	0	173.77	102.79	.54	5.80	28.70
55	1	13600	34809	0	172.11	103.22	.64	5.87	28.70
56	1	13800	34919	0	166.07	103.70	.74	5.95	28.27
57	1	14000	35028	0	163.10	103.86	.77	6.03	28.08
58	1	14200	35138	0	162.67	103.77	.76	6.11	28.10
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1	14400	35247	0	163.64	103.30	.65	6.18	28.17
1	14600	35357	0	162.81	103.42	.68	6.26	28.19
1	14800	35466	0	159.17	103.44	.68	6.34	27.90
1	15000	35576	0	157.14	103.64	.73	6.41	27.82
1	15200	35685	0	156.20	103.69	.74	6.49	27.81
1	15400	35795	0	156.47	103.51	.70	6.57	27.88
1	15600	35904	0	155.95	103.14	.62	6.64	27.82
1	15800	36014	0	153.00	103.68	.74	6.72	27.72
1	16000	36123	0	151.05	103.46	.69	6.80	27.55
1	16200	36341	0	153.06	102.00	.37	6.95	27.59
1	16400	36350	0	151.65	102.80	.55	6.96	27.63
1	16600	36347	0	151.92	102.99	.59	6.96	27.69
1	16800	36344	0	153.11	102.39	.46	6.95	27.68
1	17000	36338	0	156.50	101.05	.17	6.95	27.73
1	17200	36335	0	160.33	98.79	-.32	6.95	27.63
1	17400	36331	0	161.06	98.40	-.41	6.94	27.61
1	17600	36328	0	158.57	98.32	-.42	6.94	27.34
1	17800	36325	0	159.59	97.57	-.59	6.94	27.28
1	18000	36322	0	158.52	96.29	-.86	6.94	26.89
1	18200	36319	0	148.84	98.56	-.37	6.94	26.41
1	18400	36316	0	146.26	98.20	-.45	6.93	26.07
1	18600	36312	0	144.27	97.94	-.51	6.93	25.81
1	18800	36309	0	140.90	98.05	-.48	6.93	25.49
1	19000	36306	0	141.72	97.88	-.52	6.93	25.53
1	19200	36303	0	139.04	97.64	-.57	6.92	25.21
1	19400	36300	0	139.07	97.01	-.71	6.92	25.07
1	19600	36308	0	138.69	96.47	-.82	6.93	24.92
1	19800	36317	0	137.12	95.87	-.95	6.93	24.64
1	20000	36325	0	136.90	95.13	-1.11	6.94	24.46
1	20200	36334	0	134.20	94.99	-1.14	6.95	24.17
1	20400	36342	0	130.81	95.56	-1.02	6.95	23.95
1	20600	36351	0	126.51	95.25	-1.09	6.96	23.46
1	20800	36359	0	113.92	94.32	-1.29	6.96	21.99
1	21000	36367	0	101.62	93.90	-1.38	6.97	20.67
1	21200	36376	0	93.83	93.43	-1.48	6.98	19.79
1	21400	36384	0	90.33	92.78	-1.62	6.98	19.30
1	21600	36393	0	85.14	93.53	-1.46	6.99	18.95
1	21800	36401	0	80.64	94.81	-1.18	6.99	18.78
1	22000	36410	0	81.65	94.61	-1.23	7.00	18.84
1	22200	36418	0	81.75	94.46	-1.26	7.01	18.82
1	22400	36425	0	83.56	93.88	-1.38	7.01	18.88
1	22600	36440	0	87.36	93.93	-1.37	7.02	19.29
1	22800	36454	0	97.47	94.22	-1.31	7.03	20.38
1	23000	36469	0	110.90	94.17	-1.32	7.04	21.74
1	23200	36483	0	113.41	94.48	-1.26	7.05	22.07
1	23400	36498	0	109.12	94.75	-1.20	7.06	21.70
1	23600	36512	0	103.62	95.68	-1.00	7.07	21.36
1	23800	36527	0	103.43	94.88	-1.17	7.08	21.18
1	24000	36541	0	104.44	93.66	-1.43	7.09	21.02
1	24200	36556	0	98.34	95.02	-1.14	7.10	20.71
1	24400	36570	0	91.55	95.80	-.97	7.11	20.21
1	24600	36585	0	89.35	95.07	-1.13	7.12	19.84
1	24800	36599	0	88.46	94.72	-1.20	7.13	19.68
1	25000	36613	0	82.27	95.24	-1.09	7.14	19.18
1	25200	36625	0	78.48	95.63	-1.01	7.15	18.89
2	100	25800	0	248.27	110.99	2.32	-.46	31.73
2	300	25845	0	244.04	112.31	2.60	-.42	31.62

2	500	25890	0	242.82	113.05	2.76	-.39	31.69	
2	700	25935	0	240.70	113.20	2.80	-.36	31.54	
2	900	25980	0	240.78	112.30	2.60	-.33	31.38	
2	1100	26025	0	244.06	108.57	1.79	-.30	30.94	
2	1300	26070	0	247.44	107.39	1.54	-.27	31.06	
2	1500	26120	0	244.50	107.57	1.58	-.23	30.83	
2	1700	26165	0	245.87	106.29	1.30	-.20	30.73	
2	1900	26210	0	245.65	106.77	1.40	-.17	30.84	
2	2100	26255	0	245.61	107.44	1.55	-.14	31.01	
2	2300	26300	0	248.20	107.82	1.63	-.11	31.39	
2	2500	26345	0	252.27	106.27	1.30	-.07	31.49	
2	2700	26390	0	248.64	107.63	1.59	-.04	31.45	
2	2900	26435	0	246.71	107.56	1.58	-.01	31.27	
2	3100	26480	0	248.89	107.43	1.55	.02	31.50	
2	3300	26525	0	249.58	107.46	1.55	.05	31.61	
2	3500	26570	0	250.26	108.03	1.68	.08	31.83	
2	3700	26615	0	248.53	108.47	1.77	.12	31.78	
2	3900	26660	0	246.02	109.45	1.98	.15	31.77	
2	4100	26710	0	246.30	109.79	2.06	.18	31.91	
2	4300	26755	0	239.78	111.68	2.47	.21	31.69	
2	4500	26800	0	237.45	112.45	2.63	.25	31.66	
2	4700	26840	0	237.23	112.38	2.62	.27	31.65	
2	4900	26875	0	238.60	111.23	2.37	.30	31.56	
2	5100	26930	0	239.98	110.71	2.26	.34	31.63	
2	5300	26985	0	242.06	110.13	2.13	.38	31.75	
2	5500	27040	0	241.12	110.22	2.15	.41	31.71	
2	5700	27095	0	250.97	106.49	1.34	.45	31.94	
2	5900	27150	0	266.12	101.22	.20	.49	32.36	
2	6100	27136	0	269.00	98.68	-.35	.48	32.09	
2	6300	27118	0	267.46	98.03	-.49	.47	31.78	
2	6500	27100	0	260.63	99.61	-.14	.46	31.42	
2	6700	27118	0	255.60	100.20	-.02	.47	31.06	
2	6900	27136	0	254.27	100.33	.01	.48	30.96	
2	7100	27150	0	243.64	101.45	.25	.49	30.14	
2	7300	27175	0	238.30	101.86	.34	.51	29.71	
2	7500	27200	0	232.08	102.06	.39	.53	29.65	
2	7700	27225	0	234.46	101.94	.36	.54	29.38	
2	7900	27250	0	231.90	101.80	.33	.56	29.11	
2	8100	27280	0	231.36	101.69	.31	.58	29.05	
2	8300	27310	0	224.39	102.25	.53	.60	28.60	
2	8500	27340	0	220.81	103.02	.59	.62	28.32	
2	8700	27320	0	215.24	103.84	.77	.65	27.95	
2	8900	27400	0	209.77	103.68	.74	.67	27.39	
2	9100	27430	0	208.00	104.29	.87	.69	27.36	
2	9300	27460	0	208.42	104.05	.82	.71	27.37	
2	9500	27490	0	204.96	105.55	1.14	.73	27.37	
2	9700	27520	0	204.60	105.59	1.15	.75	27.36	
2	9900	27550	0	203.52	105.94	1.22	.77	27.35	
2	10100	27580	0	202.84	106.69	1.39	.79	27.47	
2	10300	27610	0	207.68	104.75	.97	.81	27.56	
2	10500	27640	0	206.40	103.88	.78	.84	27.26	
2	10700	27670	0	199.82	103.83	.77	.86	26.61	
2	10900	27700	0	198.24	103.46	.69	.88	26.39	
2	11100	27730	0	196.08	103.25	.64	.90	26.15	
2	11300	27760	0	198.20	103.41	.68	.92	26.42	
2	11500	27790	0	198.43	102.41	.46	.94	26.24	
2	11700	27820	0	195.67	103.56	.71	.96	26.23	

2	11900	27850	0	193.40	103.61	.72	.98	26.04
2	12100	27880	0	193.26	102.52	.48	1.00	25.81
2	12300	27910	0	191.43	103.58	.71	1.03	25.88
2	12500	27940	0	194.49	102.92	.57	1.05	26.06
2	12700	27970	0	196.97	101.43	.25	1.07	26.01
2	12900	28000	0	197.44	100.06	-.05	1.09	25.78
2	13100	28030	0	199.71	98.71	-.34	1.11	25.74
2	13300	28060	0	197.18	98.54	-.38	1.13	25.47
2	13500	28090	0	192.65	99.03	-.27	1.15	25.14
2	13700	28120	0	193.61	97.56	-.59	1.17	24.94
2	13900	28140	0	186.49	99.00	-.28	1.19	24.55
2	14100	28150	0	179.97	99.58	-.15	1.19	24.02
2	14300	28175	0	179.55	99.22	-.23	1.21	23.92
3	100	25825	0	251.00	109.86	2.07	-.44	31.78
3	300	25775	0	251.47	109.65	2.03	-.47	31.74
3	500	25725	0	256.56	108.32	1.74	-.51	31.93
3	700	25676	0	255.45	108.96	1.88	-.54	31.93
3	900	25625	0	255.05	108.73	1.83	-.58	31.80
3	1100	25575	0	252.04	107.77	1.62	-.61	31.25
3	1300	25525	0	250.74	106.99	1.45	-.65	30.92
3	1500	25475	0	254.53	105.88	1.21	-.68	31.03
3	1700	25425	0	261.82	105.32	1.09	-.72	31.60
3	1900	25375	0	260.70	104.85	.99	-.75	31.35
3	2100	25325	0	254.89	104.94	1.01	-.79	30.75
3	2300	25275	0	254.59	104.70	.96	-.82	30.64
3	2500	25225	0	254.98	103.95	.79	-.86	30.48
3	2700	25175	0	251.57	103.35	.66	-.90	29.97
3	2900	25125	0	247.67	103.48	.69	-.93	29.57
3	3100	25075	0	249.26	102.95	.58	-.97	29.58
3	3300	25025	0	246.66	103.45	.69	-1.00	29.39
3	3500	24975	0	244.45	103.49	.69	-1.04	29.14
3	3700	24925	0	245.65	103.05	.60	-1.07	29.13
3	3900	24875	0	247.84	101.78	.32	-1.11	29.04
3	4100	24825	0	248.74	100.74	.10	-1.14	28.87
3	4300	24775	0	249.93	100.21	-.02	-1.18	28.84
3	4500	24725	0	249.63	100.11	-.04	-1.21	28.76
3	4700	24675	0	249.12	100.11	-.04	-1.25	28.67
3	4900	24625	0	249.40	99.19	-.24	-1.28	28.46
3	5100	24575	0	250.72	98.86	-.31	-1.32	28.49
3	5300	24525	0	248.67	98.97	-.28	-1.35	28.27
3	5500	24475	0	248.45	98.07	-.48	-1.39	28.02
3	5700	24425	0	248.01	97.56	-.59	-1.42	27.83
3	5900	24375	0	263.16	91.78	-1.84	-1.46	28.07
3	6100	24325	0	258.62	93.31	-1.51	-1.49	27.91
3	6300	24275	0	246.56	97.58	-.58	-1.53	27.58
3	6500	24225	0	243.81	98.75	-.33	-1.56	27.52
3	6700	24175	0	247.19	98.20	-.45	-1.60	27.71
3	6900	24125	0	249.34	98.42	-.40	-1.63	27.94
3	7100	24075	0	253.60	97.82	-.53	-1.67	28.20
3	7300	24025	0	256.17	98.82	-.32	-1.70	28.65
3	7500	23975	0	253.84	99.81	-.10	-1.74	28.59
3	7700	23925	0	254.71	100.73	.10	-1.77	28.84
3	7900	23875	0	252.06	101.68	.30	-1.81	28.74
3	8100	23825	0	253.02	102.58	.50	-1.84	29.00
3	8300	23775	0	252.69	103.85	.77	-1.88	29.21
3	8500	23725	0	254.35	104.15	.84	-1.91	29.40
4	200	25900	0	247.40	110.60	2.23	-.39	31.63

4	400	26087	0	243.76	111.90	2.51	-.25	31.67
4	600	26274	0	246.51	110.13	2.13	-.12	31.70
4	800	26461	0	246.67	110.36	2.18	.01	31.90
4	1000	26648	0	246.72	110.44	2.20	.14	32.05
4	1200	26837	0	242.98	110.73	2.26	.27	31.87
4	1400	27024	0	241.24	110.25	2.16	.40	31.72
4	1600	27211	0	240.61	110.47	2.21	.53	31.83
4	1800	27399	0	240.27	109.92	2.09	.67	31.81
4	2000	27586	0	239.10	110.10	2.13	.80	31.87
4	2200	27773	0	239.16	108.95	1.88	.93	31.75
4	2400	27960	0	238.93	108.03	1.68	1.06	31.66
4	2600	28147	0	238.99	106.98	1.45	1.19	31.57
4	2800	28334	0	240.24	106.19	1.28	1.32	31.66
4	3000	28521	0	239.18	105.77	1.19	1.45	31.59
4	3200	28708	0	236.05	106.83	1.42	1.59	31.64
4	3400	28895	0	237.41	105.66	1.16	1.72	31.65
4	3600	29082	0	238.55	104.88	1.00	1.85	31.73
4	3800	29279	0	241.92	104.31	.87	1.99	32.09
4	4000	29466	0	236.80	103.41	.68	2.12	31.51
4	4200	29653	0	222.44	102.75	.53	2.25	30.05
4	4400	29840	0	214.01	102.27	.43	2.38	29.22
4	4600	30037	0	207.68	102.52	.48	2.52	28.78
4	4800	30411	0	195.99	103.37	.67	2.78	28.05
4	5200	30598	0	193.46	102.70	.52	2.91	27.78
4	5400	30785	0	191.13	102.08	.39	3.05	27.54
4	5600	30972	0	190.27	102.09	.39	3.18	27.59
4	5800	31159	0	190.64	101.94	.36	3.31	27.72
4	6000	31346	0	185.18	102.25	.43	3.44	27.37
4	6200	31533	0	181.95	102.47	.47	3.57	27.22
4	6400	31720	0	178.60	102.76	.54	3.70	27.08
4	6600	31907	0	173.76	102.24	.42	3.83	26.61
4	6800	32075	0	170.03	102.33	.44	3.95	26.37
5	200	25595	0	248.32	111.83	2.50	-.60	31.77
5	400	25465	0	245.67	112.45	2.63	-.69	31.55
5	600	25335	0	245.13	112.65	2.68	-.78	31.44
5	800	25205	0	249.17	110.63	2.24	-.87	31.32
5	1000	25075	0	246.80	110.99	2.32	-.97	31.07
5	1200	24945	0	246.69	110.16	2.14	-1.06	30.79
5	1400	24815	0	246.58	110.30	2.17	-1.15	30.72
5	1600	24685	0	250.87	110.00	2.10	-1.24	30.99
5	1800	24555	0	252.07	108.94	1.87	-1.33	30.79
5	2000	24425	0	254.16	108.08	1.69	-1.42	30.73
5	2200	24228	0	251.45	108.37	1.75	-1.56	30.38
5	2400	24030	0	248.54	110.28	2.16	-1.70	30.36
5	2600	23836	0	247.54	111.46	2.42	-1.84	30.38
5	2800	23638	0	250.03	112.02	2.54	-1.97	30.61
5	3000	23442	0	253.50	112.03	2.54	-2.11	30.83
5	3200	23246	0	255.49	111.75	2.48	-2.25	30.83
5	3400	23050	0	254.49	113.05	2.76	-2.39	30.87
5	3600	23130	0	252.48	112.18	2.58	-2.33	30.54
5	3800	23211	0	249.78	112.12	2.56	-2.27	30.31
5	4000	23292	0	252.57	112.30	2.60	-2.22	30.69
5	4200	23372	0	251.87	112.97	2.75	-2.16	30.82
5	4400	23453	0	257.26	110.30	2.17	-2.10	30.84
5	4600	23533	0	259.26	109.04	1.90	-2.05	30.82
5	4800	23614	0	259.25	108.77	1.84	-1.99	30.82
5	5000	23694	0	258.55	109.42	1.98	-1.93	30.95

5	5200	23775	0	259.14	110.64	2.24	-1.88	31.33
5	5400	23580	0	261.44	109.73	2.04	-2.01	31.22
5	5600	23390	0	263.23	108.75	1.83	-2.15	31.06
5	5800	23205	0	269.63	108.00	1.67	-2.28	31.41
5	6000	23020	0	266.40	108.95	1.88	-2.41	31.16
5	6200	22835	0	266.50	109.90	2.08	-2.54	31.25
5	6400	22650	0	262.90	110.67	2.25	-2.67	30.92
5	6600	22465	0	260.70	112.03	2.54	-2.80	30.87
5	6800	22280	0	260.80	112.79	2.71	-2.93	30.91
5	7000	22095	0	260.50	113.93	2.95	-3.06	31.00
5	7200	21910	0	259.80	114.07	2.98	-3.19	30.83
5	7400	21725	0	264.00	113.59	2.88	-3.32	31.02
5	7600	21540	0	267.40	113.59	2.88	-3.45	31.23
5	7800	21355	0	272.70	113.34	2.83	-3.58	31.58
5	8000	21170	0	275.20	112.81	2.71	-3.71	31.59
5	8200	20985	0	277.00	111.87	2.51	-3.84	31.44
5	8400	20800	0	278.70	111.61	2.45	-3.97	31.42
5	8600	20615	0	280.00	111.60	2.45	-4.09	31.42
5	8800	20430	0	285.60	110.54	2.22	-4.22	31.63
5	9000	20245	0	288.83	110.13	2.13	-4.35	31.73
5	9200	20060	0	290.81	109.68	2.03	-4.48	31.71
5	9400	19875	0	292.99	109.42	1.98	-4.61	31.74
5	9600	19690	0	295.07	109.56	2.01	-4.74	31.85
5	9800	19505	0	295.54	109.34	1.96	-4.87	31.72
5	10000	19320	0	298.42	109.24	1.94	-5.00	31.86
5	10200	19145	0	302.10	109.19	1.93	-5.13	32.10
5	10400	18960	0	306.27	107.74	1.61	-5.26	32.07
5	10600	18775	0	303.94	106.76	1.40	-5.39	31.50
5	10800	18590	0	301.89	104.66	.95	-5.52	30.71
5	11000	18405	0	308.31	102.89	.56	-5.64	30.84
5	11200	18220	0	314.46	102.14	.40	-5.77	31.17
5	11400	18035	0	318.71	101.42	.25	-5.90	31.31
5	11600	17850	0	327.56	100.27	-.00	-6.03	31.83
5	11800	17665	0	320.92	106.14	1.27	-6.16	32.30
5	12000	17480	0	319.90	107.99	1.67	-6.29	32.46
5	12200	17295	0	320.25	109.34	1.96	-6.42	32.66
5	12400	17110	0	322.24	109.84	2.07	-6.55	32.84
5	12600	16925	0	317.12	111.46	2.42	-6.68	32.55
5	12800	16740	0	313.71	112.26	2.59	-6.81	32.25
5	13000	16555	0	313.40	110.66	2.25	-6.94	31.74
5	13200	16370	0	309.39	111.05	2.33	-7.07	31.29
5	13400	16185	0	308.28	110.03	2.11	-7.20	30.83
5	13600	16000	0	306.67	107.43	1.55	-7.33	29.97
5	13800	15865	0	306.16	105.65	1.16	-7.43	29.44
5	14000	15725	0	300.45	106.44	1.33	-7.52	28.94
5	14200	15575	0	294.54	107.14	1.48	-7.63	28.39
5	14400	15425	0	285.43	109.05	1.90	-7.73	27.78
5	14600	15275	0	283.62	108.60	1.80	-7.84	27.39
5	14800	15125	0	283.11	106.90	1.43	-7.94	26.87
5	15000	14975	0	280.20	106.07	1.25	-8.05	26.29
5	15200	14842	0	276.24	105.70	1.17	-8.14	25.72
5	15400	14708	0	276.29	104.49	.91	-8.24	25.37
5	15600	14575	0	276.23	103.75	.75	-8.33	25.11
5	16000	14365	0	272.02	104.72	.96	-8.48	24.75
5	16200	14255	0	269.16	106.34	1.31	-8.55	24.73
5	16400	14145	0	271.03	106.41	1.33	-8.63	24.86
5	16600	14035	0	275.85	104.54	.92	-8.71	24.86

5	16800	13925	0	274.60	104.85	.99	-8.78	24.73
5	17000	13699	0	266.86	106.84	1.42	-8.94	24.22
5	17200	13477	0	265.60	106.38	1.32	-9.10	23.84
5	17400	13255	0	261.95	107.12	1.48	-9.25	23.47
5	17600	13033	0	263.29	106.42	1.33	-9.41	23.30
5	17800	12810	0	264.74	105.77	1.19	-9.57	23.15
5	18000	12588	0	266.90	104.75	.97	-9.72	22.99
5	18200	12366	0	267.32	104.47	.91	-9.88	22.82
5	18400	12143	0	263.71	106.72	1.39	-10.03	22.78
5	18600	11920	0	260.88	107.78	1.62	-10.19	22.57
5	18800	11697	0	260.46	108.11	1.69	-10.35	22.45
5	19000	11475	0	261.25	107.42	1.55	-10.50	22.22
5	19200	11193	0	262.62	105.94	1.22	-10.70	21.84
5	19400	10912	0	264.29	104.84	.99	-10.89	21.57
5	19600	10631	0	263.07	104.80	.98	-11.09	21.25
5	19800	10350	0	258.03	107.20	1.50	-11.29	21.06
6	200	10140	0	306.06	99.36	-.20	-11.44	24.06
6	400	10130	0	307.09	99.96	-.07	-11.44	24.29
6	600	10120	0	308.73	100.59	.07	-11.45	24.58
6	800	10110	0	311.16	100.51	.05	-11.46	24.80
6	1000	10100	0	312.89	100.71	.09	-11.46	25.01
6	1200	10090	0	313.03	101.21	.20	-11.47	25.13
6	1400	10080	0	314.85	101.58	.28	-11.48	25.38
6	1600	10070	0	318.68	101.93	.36	-11.48	25.84
6	1800	10060	0	319.14	102.38	.45	-11.49	25.98
6	2000	10050	0	319.08	102.49	.48	-11.50	25.99
6	2200	10040	0	324.82	102.60	.50	-11.51	26.58
6	2400	10030	0	320.26	104.79	.98	-11.51	26.59
6	2600	10020	0	305.70	111.74	2.48	-11.52	26.62
6	2800	10010	0	304.23	109.23	1.94	-11.53	25.92
6	3000	10000	0	310.37	106.75	1.40	-11.53	26.00
6	3200	10030	0	312.51	105.81	1.20	-11.51	26.03
6	3400	10060	0	315.65	106.18	1.28	-11.49	26.45
6	3600	10090	0	316.29	106.55	1.36	-11.47	26.61
6	3800	10120	0	313.63	107.00	1.45	-11.45	26.46
6	4000	10150	0	309.80	108.75	1.83	-11.43	26.49
6	4200	10180	0	302.39	111.67	2.46	-11.41	26.38
6	4400	10210	0	305.72	109.80	2.06	-11.39	26.33
6	4600	10240	0	302.25	109.72	2.04	-11.37	25.99
6	4800	10270	0	300.48	111.63	2.46	-11.34	26.24
6	5000	10300	0	292.03	115.64	3.32	-11.32	26.28
6	5200	10303	0	292.26	117.81	3.79	-11.32	26.77
6	5400	10305	0	291.49	115.60	3.32	-11.32	26.22
6	5600	10308	0	291.43	113.36	2.83	-11.32	25.73
6	5800	10310	0	299.57	110.72	2.26	-11.32	25.98
6	6000	10313	0	299.73	108.97	1.88	-11.31	25.62
6	6200	10315	0	298.86	108.19	1.71	-11.31	25.37
6	6400	10318	0	305.71	107.24	1.51	-11.31	25.85
6	6600	10320	0	298.64	106.97	1.45	-11.31	25.08
6	6800	10323	0	300.27	105.87	1.21	-11.31	25.01
6	7000	10325	0	301.31	104.20	.85	-11.31	24.76
6	7200	10328	0	303.24	103.08	.61	-11.30	24.71
6	7400	10330	0	299.38	103.13	.62	-11.30	24.33
6	7600	10333	0	300.92	101.93	.36	-11.30	24.23
6	7800	10335	0	299.15	102.32	.44	-11.30	24.14
6	8000	10338	0	301.00	101.32	.23	-11.30	24.11
6	8200	10340	0	300.62	100.75	.10	-11.30	23.95

6	8400	10343	0	300.26	99.84	-.10	-11.29	23.72
6	8600	10345	0	299.09	99.94	-.07	-11.29	23.63
6	8800	10348	0	290.85	101.40	.24	-11.29	23.11
6	9000	10350	0	283.87	101.72	.31	-11.29	22.48
6	9200	10353	0	288.32	101.13	.18	-11.29	22.80
6	9400	10353	0	288.77	99.83	-.10	-11.29	22.57
6	9600	10358	0	285.70	99.84	-.10	-11.28	22.26
6	9800	10360	0	282.33	99.91	-.08	-11.28	21.94
6	10000	10363	0	279.67	99.59	-.15	-11.28	21.60
6	10200	10365	0	274.81	100.88	.13	-11.28	21.40
6	10400	10368	0	271.15	101.90	.35	-11.28	21.25
6	10600	10370	0	267.98	103.13	.62	-11.27	21.20
6	10800	10373	0	262.82	104.60	.93	-11.27	21.00
6	11000	10375	0	257.85	107.78	1.62	-11.27	21.18
6	11200	10396	0	252.80	110.24	2.16	-11.26	21.22
6	11400	10417	0	251.11	111.24	2.37	-11.24	21.28
6	11600	10438	0	256.61	109.53	2.00	-11.23	21.48
6	11800	10459	0	260.49	107.87	1.64	-11.21	21.53
6	12000	10480	0	263.87	106.84	1.42	-11.20	21.66
6	12200	10502	0	257.05	105.82	1.20	-11.18	20.77
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6	12600	10544	0	251.92	104.00	.81	-11.15	19.89
6	12800	10565	0	250.40	103.32	.66	-11.14	19.60
6	13000	10586	0	245.38	102.99	.59	-11.12	19.04
6	13200	10607	0	248.06	102.61	.50	-11.11	19.24
6	13400	10628	0	248.94	101.95	.36	-11.09	19.20
6	13600	10650	0	248.14	101.65	.30	-11.08	19.07
6	13800	10671	0	248.02	101.60	.29	-11.06	19.06
6	14000	10692	0	249.10	101.30	.22	-11.05	19.12
6	14200	10713	0	249.68	101.10	.18	-11.03	19.15
6	14400	10734	0	251.76	101.00	.16	-11.02	19.36
6	14600	10755	0	254.75	101.28	.22	-11.00	19.73
6	14800	10776	0	258.43	101.07	.17	-10.99	20.07
6	15000	10797	0	260.80	101.11	.18	-10.98	20.33
6	15200	10818	0	265.18	101.10	.18	-10.96	20.79
6	15400	10840	0	264.17	101.36	.23	-10.95	20.76
6	15600	10861	0	267.55	101.22	.20	-10.93	21.08
6	15800	10882	0	272.04	101.07	.17	-10.92	21.52
6	16000	10903	0	269.32	102.08	.39	-10.90	21.48
6	16200	10924	0	278.54	100.95	.14	-10.89	22.18
6	16400	10945	0	277.55	101.85	.34	-10.87	22.29
6	16600	10966	0	273.73	103.44	.68	-10.86	22.26
6	16800	10987	0	270.92	103.63	.72	-10.84	22.03
6	17000	11008	0	270.70	104.20	.85	-10.83	22.15
6	17200	11029	0	271.05	104.73	.96	-10.81	22.31
6	17400	11050	0	270.10	105.42	1.11	-10.80	22.38
6	17600	11071	0	269.67	106.19	1.28	-10.78	22.52
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6	18000	11113	0	263.48	108.05	1.68	-10.75	22.33
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6	21200	11610	0	218.95	112.64	2.67	-10.41	19.18
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6	21600	11680	0	218.22	112.36	2.61	-10.36	19.09
6	21800	11715	0	215.39	112.79	2.71	-10.33	18.93
6	22000	11750	0	213.28	113.60	2.88	-10.31	18.91
7	200	10125	0	282.21	100.46	.04	-11.45	21.88
7	400	9931	0	282.21	99.96	-.07	-11.58	21.64
7	600	9738	0	282.97	98.96	-.29	-11.72	21.36
7	800	9547	0	279.97	99.17	-.24	-11.85	20.97
7	1000	9355	0	276.77	99.89	-.08	-11.98	20.67
7	1200	9164	0	280.73	98.66	-.35	-12.12	20.67
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7	1800	8589	0	271.84	98.73	-.34	-12.52	19.39
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7	2400	8015	0	273.94	98.42	-.40	-12.92	19.13
7	2600	7842	0	276.41	98.10	-.47	-13.04	19.19
7	2800	7633	0	278.68	97.36	-.63	-13.19	19.11
7	3000	7441	0	277.25	97.04	-.70	-13.32	18.76
7	3200	7250	0	273.22	96.94	-.72	-13.46	18.20
7	3400	7058	0	274.88	97.41	-.62	-13.59	18.34
7	3600	6867	0	271.95	97.35	-.63	-13.73	17.90
7	3800	6674	0	268.71	97.69	-.56	-13.86	17.51
7	4000	6483	0	269.60	97.68	-.56	-13.99	17.46
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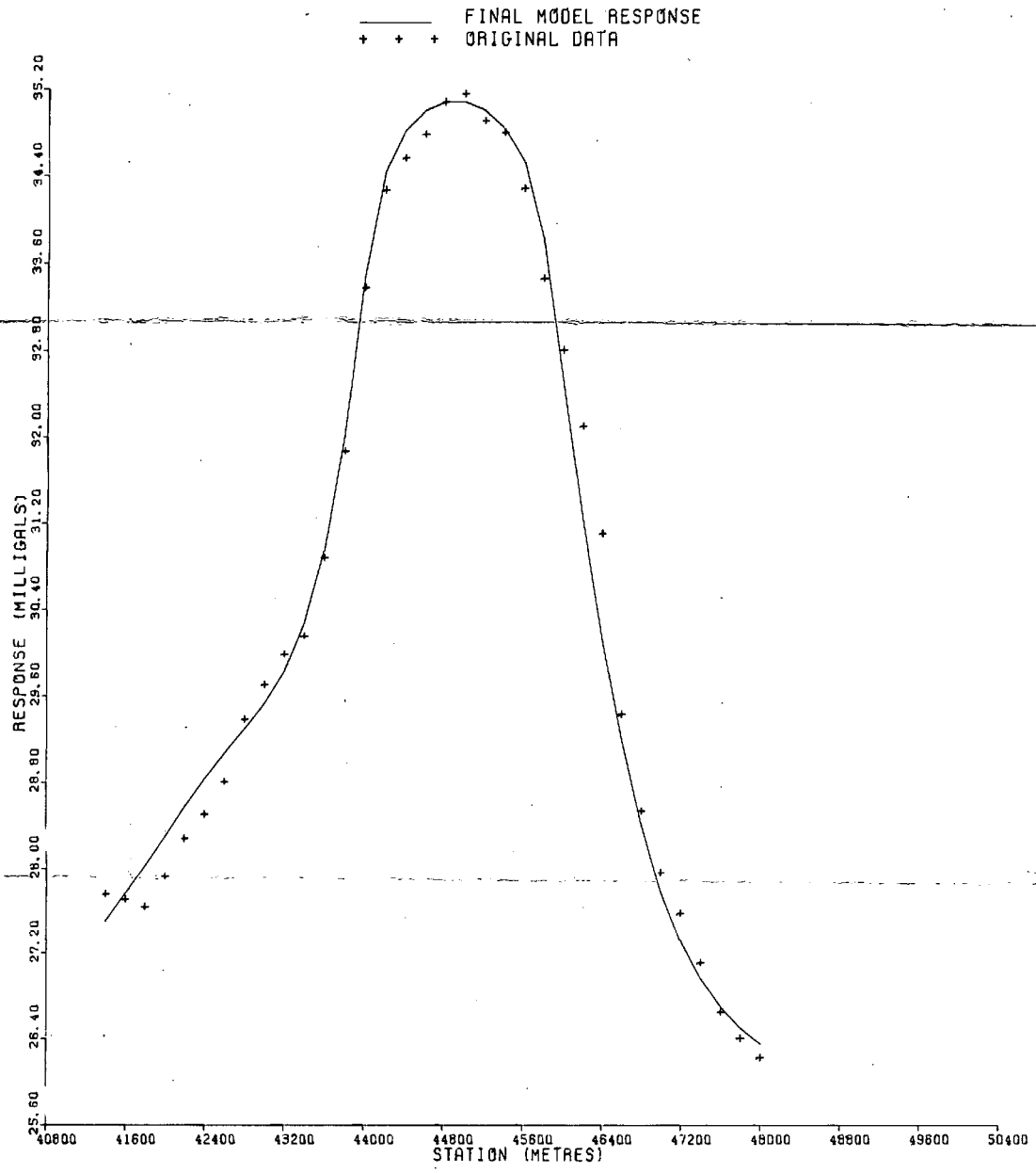
7	4400	6100	0	264.63	98.40	-.41	-14.26	16.85
7	4600	5893	0	263.96	98.55	-.37	-14.41	16.67
7	4800	5683	0	266.20	98.61	-.36	-14.55	16.76
7	5000	5477	0	263.65	98.50	-.39	-14.70	16.34
7	5200	5270	0	261.21	98.96	-.29	-14.84	16.04
7	5400	5063	0	262.68	99.21	-.23	-14.99	16.10
7	5600	4857	0	262.35	99.22	-.23	-15.13	15.93
7	5800	4650	0	261.65	99.06	-.26	-15.28	15.68
7	6000	4443	0	259.90	99.11	-.25	-15.42	15.37
7	6200	4236	0	256.34	99.52	-.16	-15.57	14.95
7	6400	4029	0	252.29	100.08	-.04	-15.71	14.52
7	6600	3822	0	251.23	100.77	.11	-15.86	14.42
7	6800	3615	0	252.88	100.23	-.01	-16.00	14.32
7	7000	3408	0	251.50	100.28	.00	-16.14	14.05
7	7200	3198	0	253.09	100.48	.04	-16.29	14.10
7	7400	2991	0	247.48	101.36	.23	-16.44	13.58
7	7600	2784	0	255.37	97.38	-.63	-16.58	13.37
7	7800	2577	0	247.66	99.63	-.14	-16.73	12.94
7	8000	2372	0	247.95	99.24	-.23	-16.87	12.74
7	8200	2165	0	248.74	99.95	-.07	-17.01	12.83
7	8400	1958	0	246.43	101.95	.36	-17.16	12.88
7	8600	1750	0	246.02	102.69	.52	-17.30	12.86
7	8800	1543	0	250.71	102.57	.50	-17.45	13.16
7	9000	1336	0	257.60	101.92	.35	-17.59	13.57

7	9200	1129	0	258.69	101.75	.32	-17.74	13.50
7	9400	921	0	264.28	101.46	.26	-17.88	13.85
7	9600	714	0	265.07	101.30	.22	-18.03	13.75
7	9800	507	0	266.16	101.37	.24	-18.17	13.73
7	10000	300	0	263.15	101.07	.17	-18.32	13.22

GRAVITY ANOMALY 2-D MODELLING

0249

WIRRIDA MODEL



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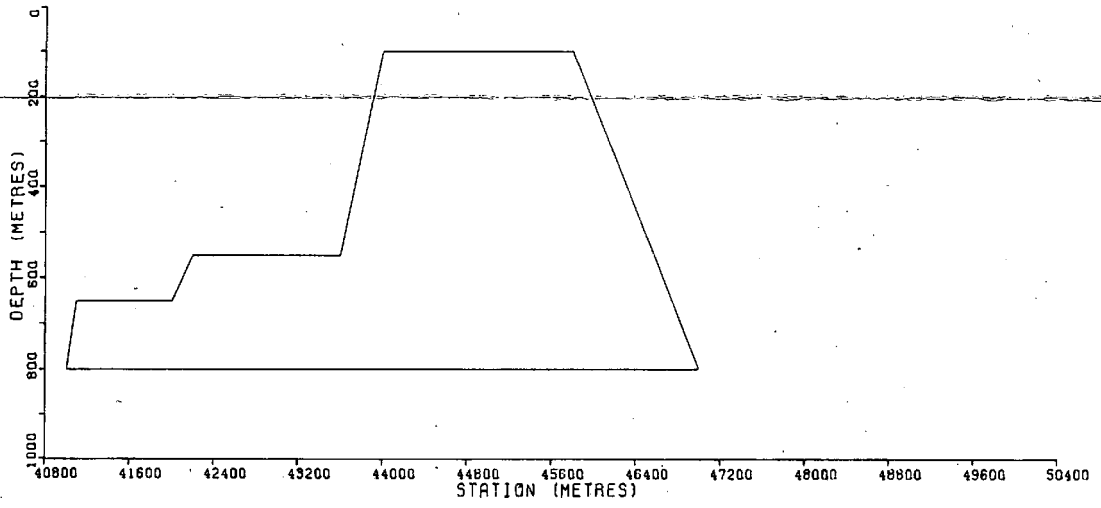


To Accompany Report No. W.Y. 81·17

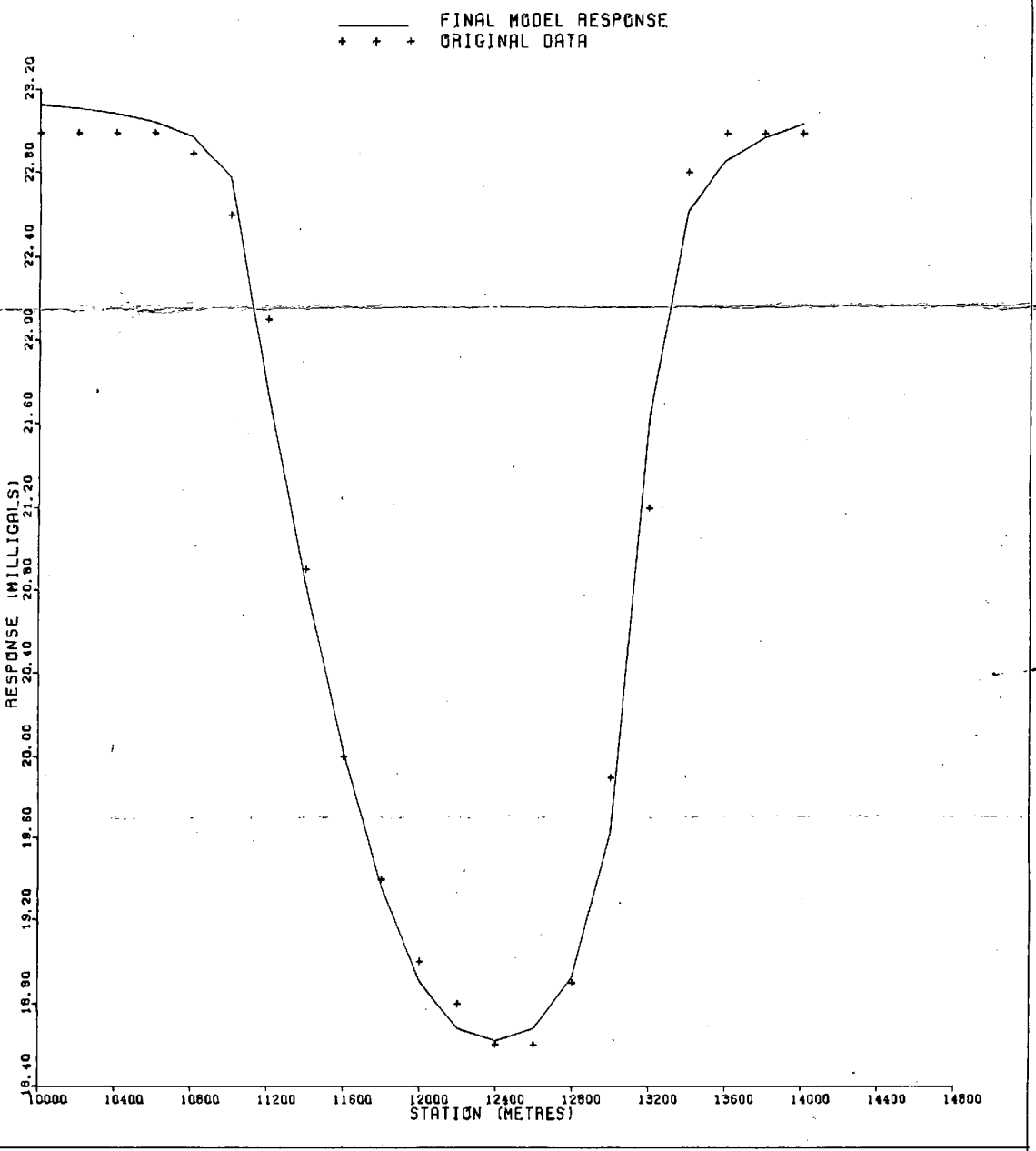
DWG. NO.- SH53-6. 136. 4075

FIGURE 1.

0250

GRAVITY ANOMALY 2-D MODELLING

VALLEY



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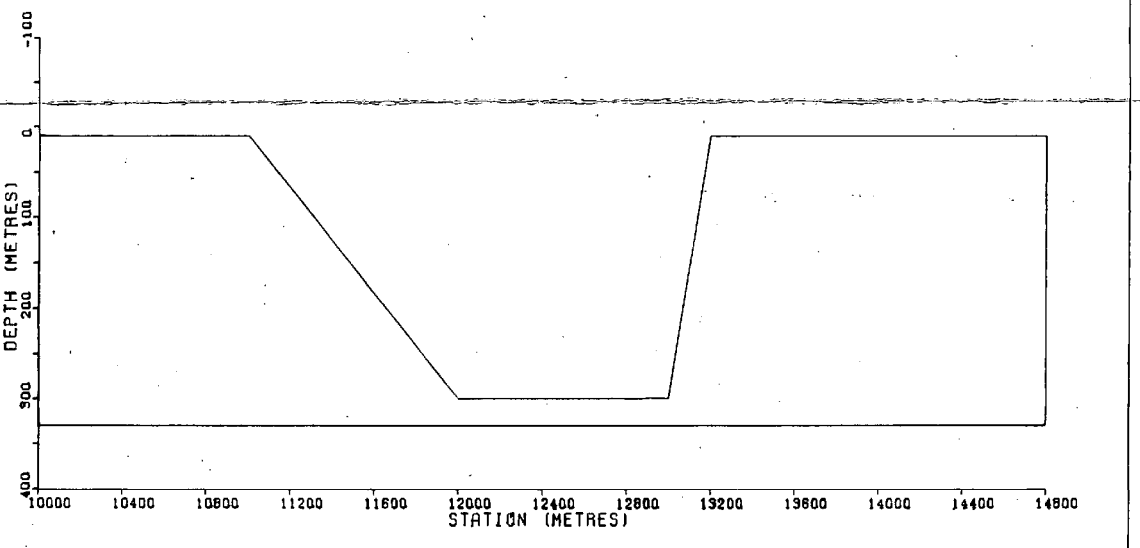


To Accompany Report No.W.Y. 81-17

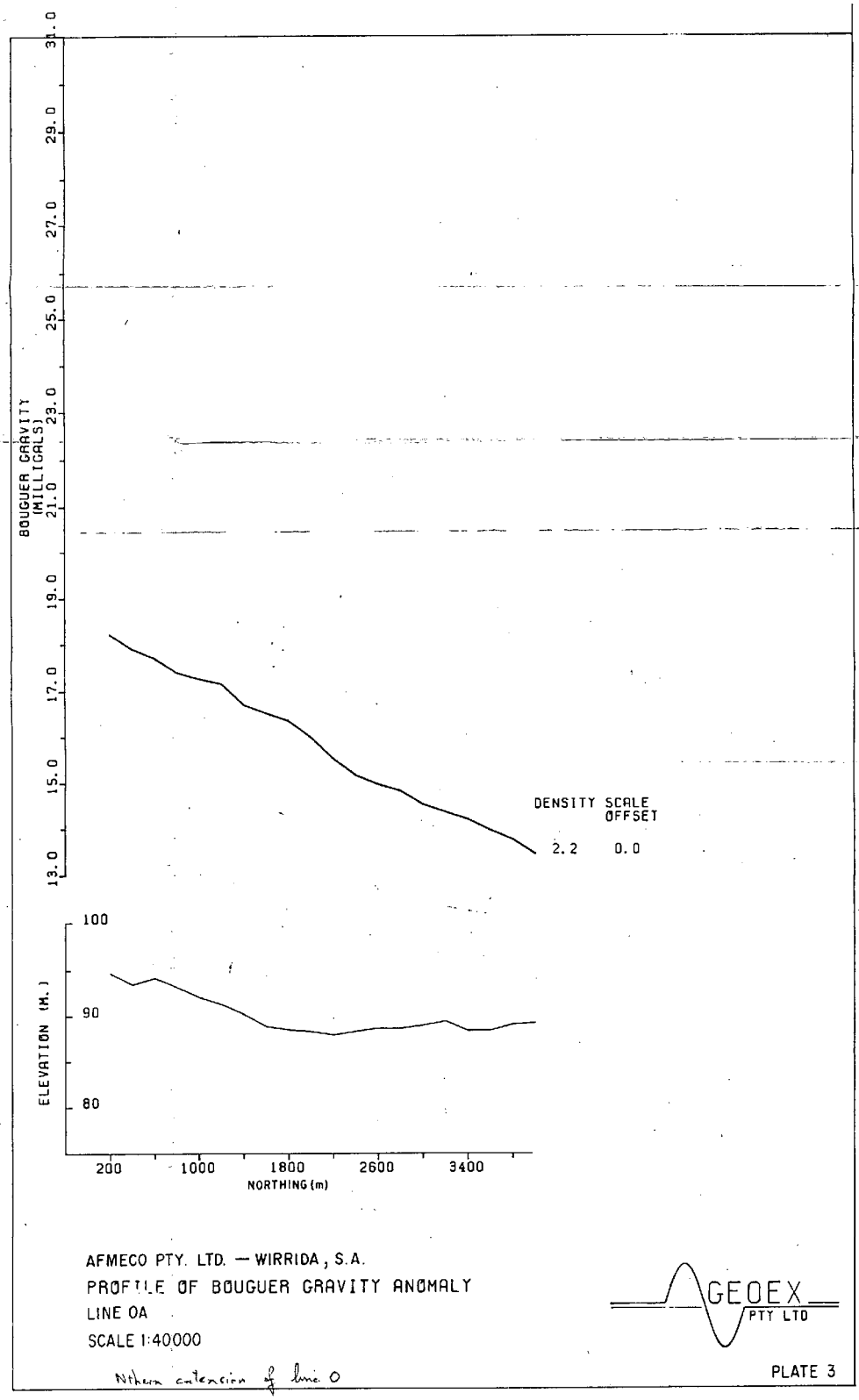
DWG. NO. SH53-6.136.4076

FIGURE 2

SH 53-6

136 -4067

0252



AFMECO PTY. LTD. — WIRRIDA, S.A.

PROFILE OF BOUGUER GRAVITY ANOMALY

LINE OA

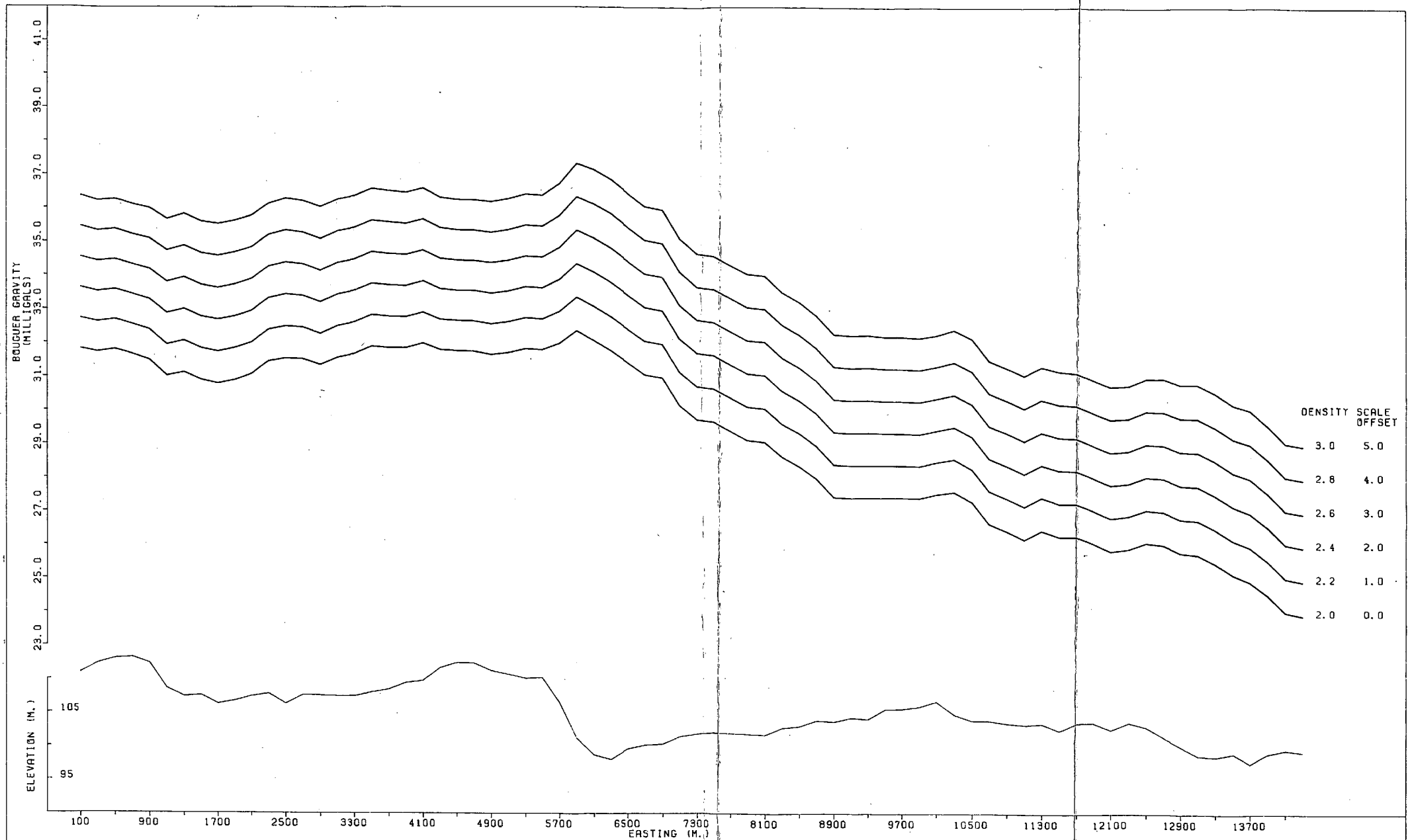
SCALE 1:40000

Nthern extension of line O

GEOEX PTY LTD

PLATE 3

No Plastic Available



AFMECO PTY. LTD. – WIRRIDA, S.A.
PROFILE OF BOUGUER GRAVITY ANOMALY
LINE 2
SCALE 1:40000
DWG. NO. SH53-6. 136. 4069

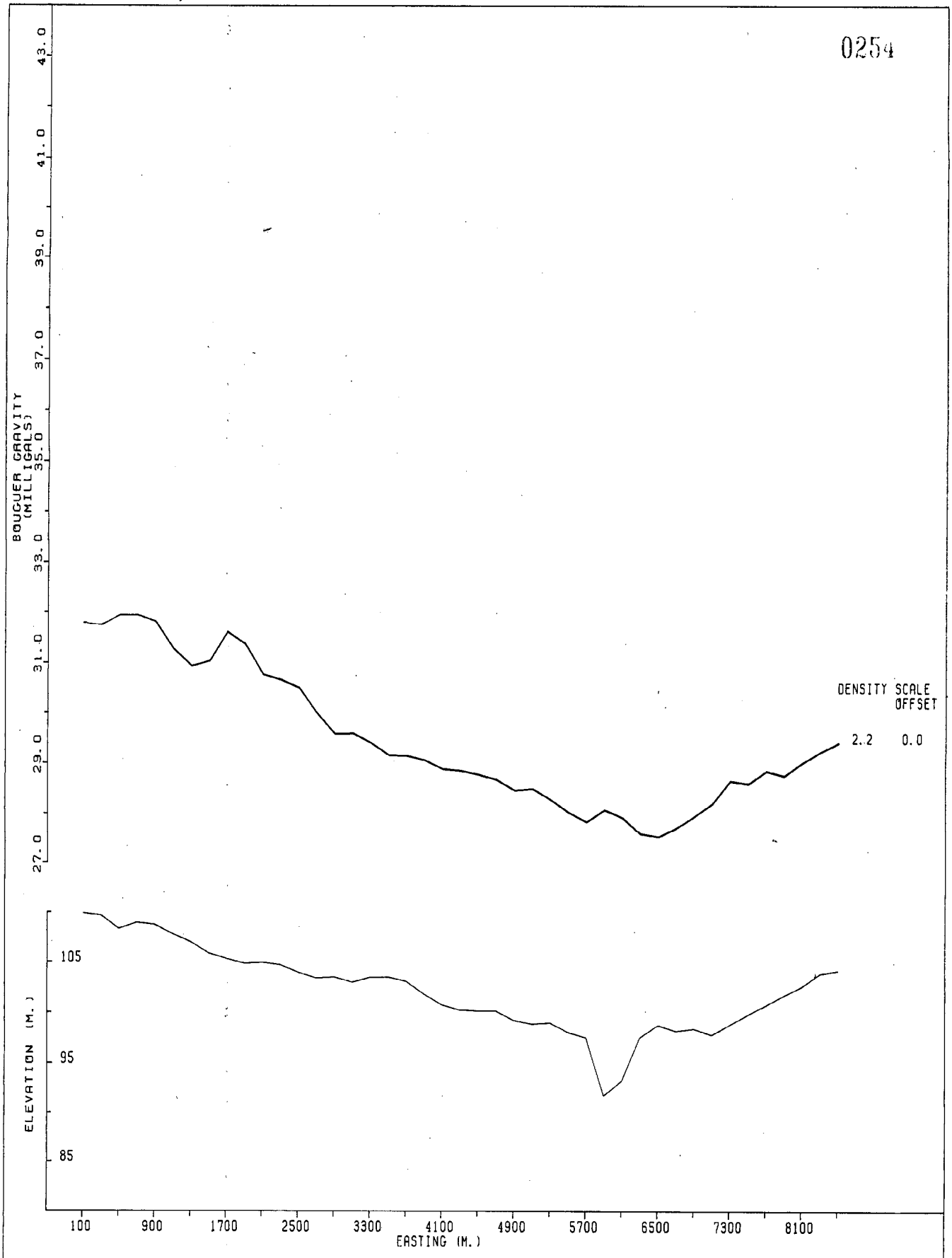
GEOEX PTY LTD

0253

To Accompany Report No. W.Y. 81-17

PLATE 5

0254



AFMECO PTY. LTD. – WIRRIDA, S.A.

PROFILE OF BOUGUER GRAVITY ANOMALY

LINE 3

SCALE 1:40000

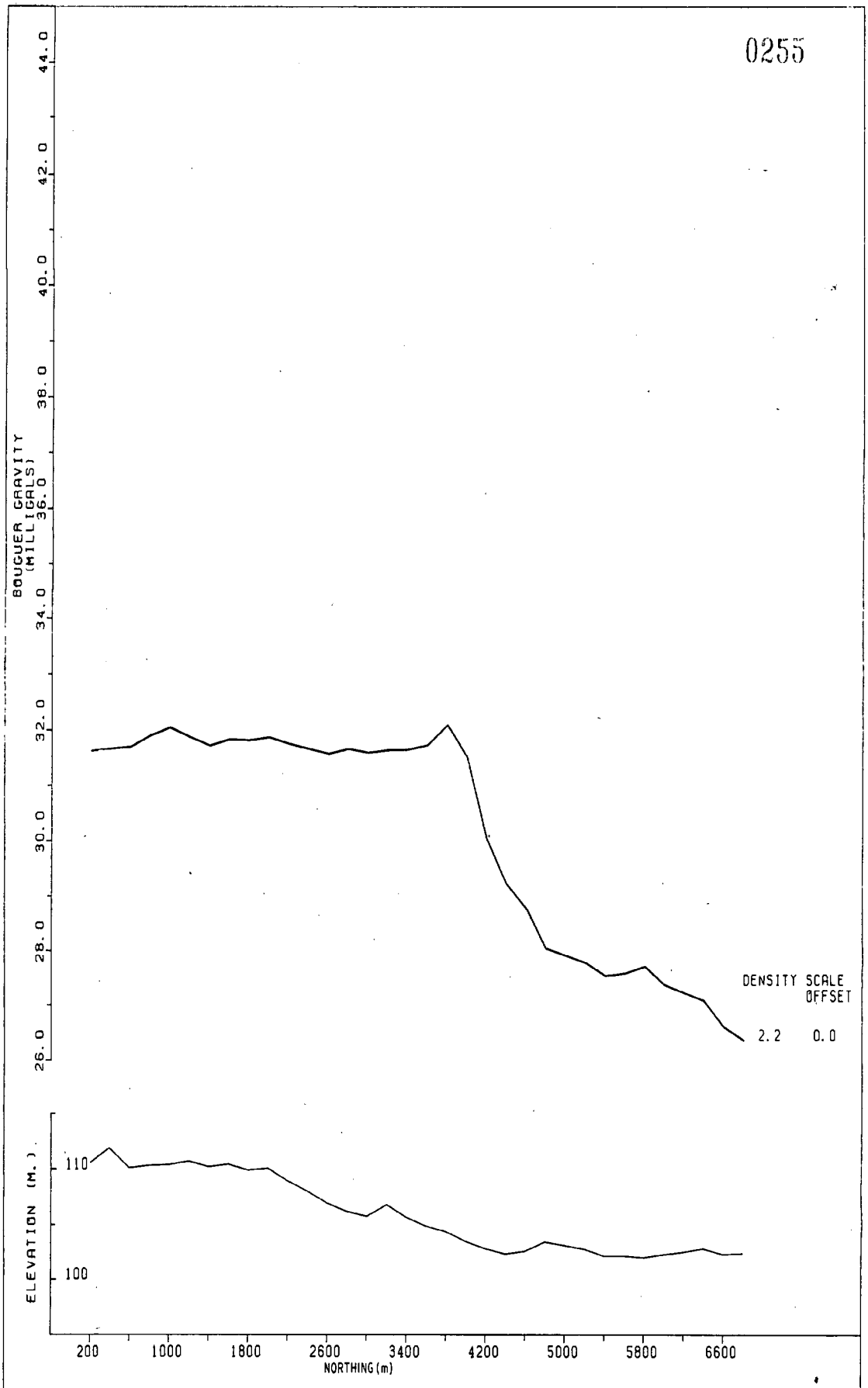
DWG. NO. SH53-6. 136. 4070

GEOEX PTY LTD

To Accompany Report No. W.Y. 81-17

PLATE 6

0255

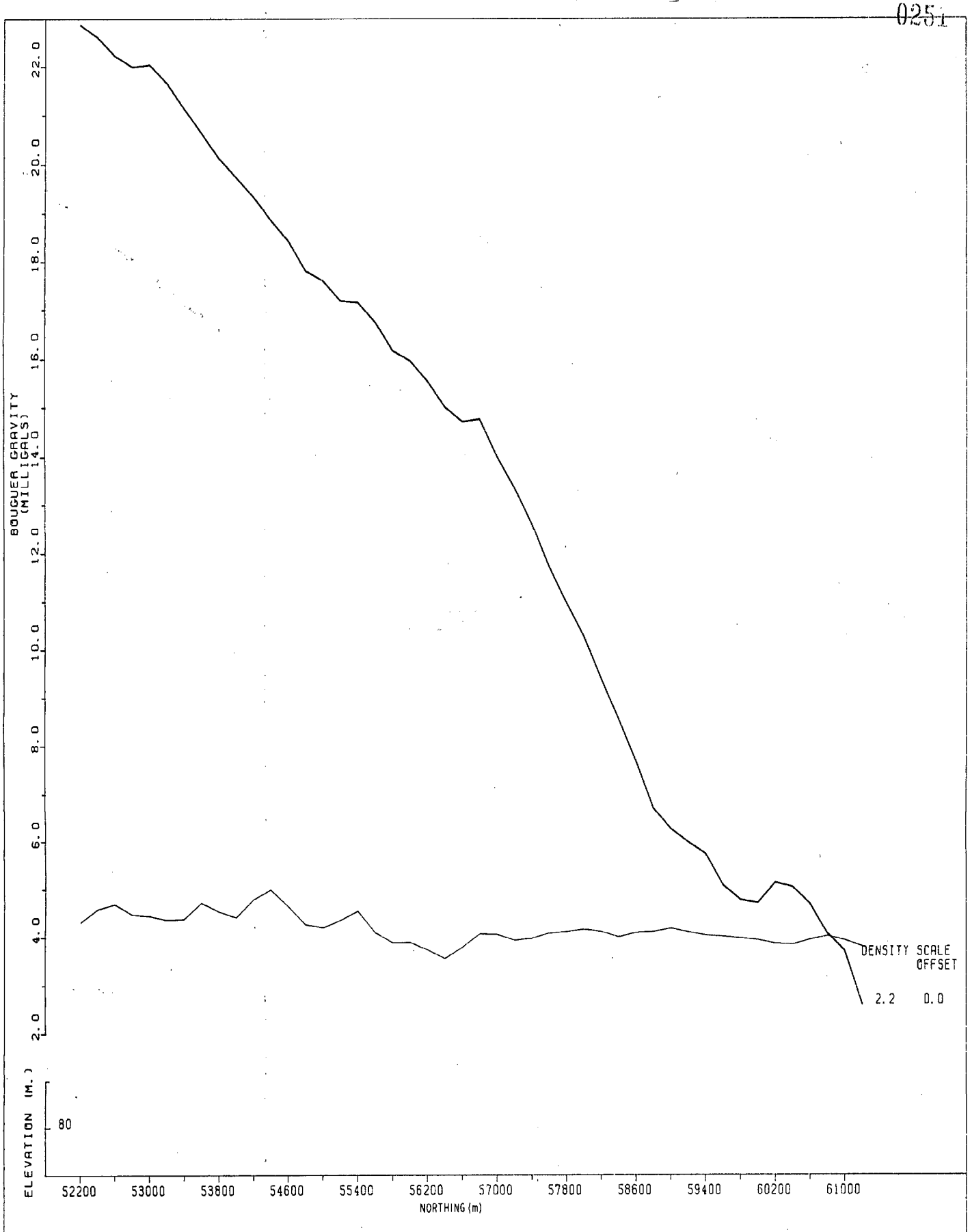


AFMECO PTY. LTD. – WIRRIDA, S.A.
PROFILE OF BOUGUER GRAVITY ANOMALY
LINE 4
SCALE 1:40000
DWG. NO. SH 53-6. 136. 4071

GEOEX PTY LTD

To Accompany Report No. W.Y. 81-17

PLATE 7



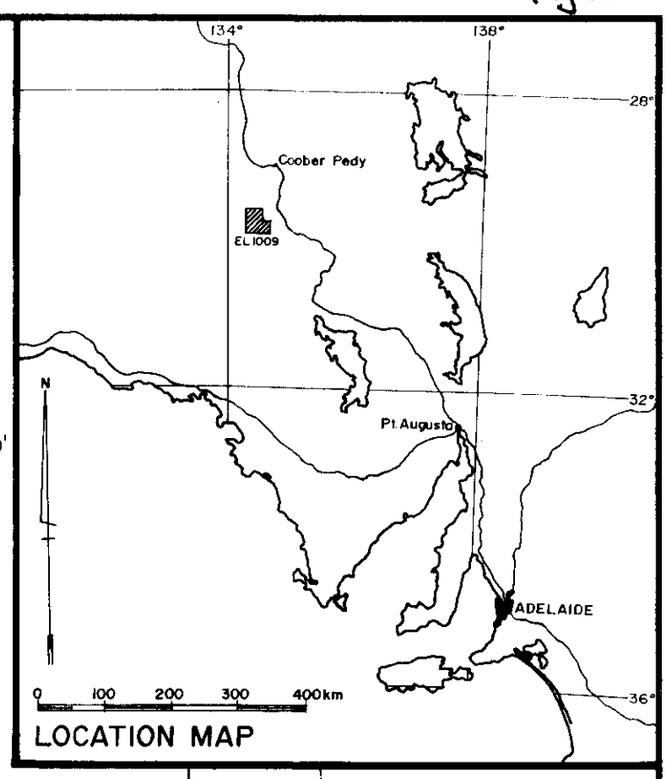
AFMECO PTY. LTD. — WIRRIDA, S.A.
PROFILE OF BOUGUER GRAVITY ANOMALY
LINE 0
SCALE 1:40000
DWG. NO. SH53-6-136.4065

GEOEX PTY LTD

To Accompany Report No. W.Y. 81-17

PLATE 1

Fig 2



134° 15'

134° 30'

29° 40'

30° 00'

E.L.1009

Columba Bores
Surprise Bore
New Surprise Bore
Problem Bore
Webbs Dam
Bon Leigh Bores
Mack Tank
Wirrida Bore
"Wirrida O.S." (old)
Satellite Bores
To "Comet O.S."
Ants Nest Bore
Marmalade Tank
Bundi Bore
Blue Bore
Cross Roads Bore
To "Commonwealth Hill"
Nº 53 Bore
Commonwealth Hill
Gina Siding
To "Gina O.S."
Nelsons Bore

An4 PCH 13-15
An3 PCH 7-9
An2 PCH 10-12
An5 PCH 5,6
An1 PCH 1-4

LEGEND

1141 Loam sample
E.L. boundary
Major track
Minor track
Fence
Watercourse

An4 Aeromagnetic anomaly
PCH 7-9 Percussion drillholes into anomaly

Scale 1:100,000
0 2 4 6 8 10 kilometres

Topography taken from an enlargement of COOBER PEDY 1:250,000 geology map (SH 53-6)

3839-7

3839-7

THE BROKEN HILL PROPRIETARY CO. LTD.
EXPLORATION DEPARTMENT

E.L.1009 WIRRIDA, S.A.
LOCATION OF LOAM SAMPLES, ANOMALIES AND DRILLHOLES

Drawn E.L.S.	Date 28-3-83	Centre Adelaide
Traced S.C.S./A.R.V.	Project Nº 6-F670-2	Drawing Nº A2-355
Checked		

Revisions

/

Envelope No: 3839

2C

Contents-Transparency Cylinder No: 3839/

State:- SOUTH AUSTRALIA

EL 1009 (formerly EL621)

Area Name	Scale	Data Type	International Map Reference	Map Nº	Microfilm S	Microfilm R	Mirco fiche	Sent to SADME
WIRRIDA	1:25,000	Flight Path Plot	SH53-6	136·3421				11/8/83
(Aerodata Services)	" "	" "	" "	136·3422				" "
May 1981	1:25,000	Total Mag. Contour	" "	136·3417				" "
	" "	" "	" "	136·3418				" "
	1:25,000	Total Mag Stack Profile	" "	136·3419				" "
	" "	" "	" "	136·3420				" "
	1:100,000	Summary Total Mag Stack Profiles	" "	136·3307				" "
	1:100,000	Summary Flight Path Plot	" "	136·3308				" "
	1:100,000	Summary Total Mag Contour	" "	136·3306				" "
		Total Nº = 9						
		Transparencies	Only					

Env. No. 3839
EL No. 621/1009

2D

Aerial Geophysical Surveys

Magnetic data tapes covering:

✓ Magnetic -

✓ Radiometric -

~~VLF EM -~~

~~EM -~~

~~INPUT -~~

~~Other -~~

(Delete as necessary)

Surveys conducted by Aerodata Services P/L

in Dec. 1980

are held by Geophysics Section, South Australian Department of Mines and Energy.

Also: Flight logs
Analog charts.
Magnetometer & altimeter data

Env. No. 3839
EL No. 621/1009

2E

Geophysical Surveys

Magnetic data tapes ~~/Basic data~~ covering:

~~Magnetic -~~

~~Radiometric -~~

~~Seismic -~~

✓ Gravity -

~~Electrical -~~

~~Other -~~

(Delete as necessary)

Surveys conducted by ..... Geoex P/L .....

in ..... April, 1981 .....

are held by Geophysics Section, South Australian Department of Mines and Energy.

2F

BIBLIOGRAPHIC DETAILS, ANNOTATIONS AND KEYWORDS FOR ENV. 3839

Env. 3839

EL 621, 1009. Wirrida, S.A. Progress reports from 21-4-80 to 6-6-83. (Afmeco Pty Ltd and BHP Minerals Ltd). 139 pages (including 22 figures, 9 reports) 7 maps, magnetic tapes.

Author: Styles, G.R., Dockery, B.A., Aerodata Services Pty Ltd, Geoex Pty Ltd

Map area: COOBER PEDY (SH/53-06: 5738, 5838)

Investigation in an area 120 km north of Tarcoola, was of gravity-magnetic highs coinciding with shallow basement. Drilling of 28 holes (t.d. 1007 m) revealed schists and gneisses of the Mulgathing Complex and the Gawler Range Volcanics. Further percussion drilling of 16 holes (average depth 28 m, t.d. 266 m) and soil sampling over 5 magnetic anomalies showed negative results for both base metals and kimberlitic indicators.

Keywords: MINERAL EXPLORATION-SA/Uranium/Base metals/Diamonds/ Geophysical surveys/Aerial magnetic surveys/Aerial radioactivity surveys/Gravity surveys/Gravity anomaly/Magnetic anomaly/Magnetic interpretation/Rotary drilling/Diamond drilling/Percussion drilling/Geological logs/Geochemical logs/Assay value/Petrology/ Geochemical exploration/Rock chip sampling/Soil sampling/Water analysis/ Silicate analysis/Archaean/Proterozoic/(s)Mulgathing Complex/ (s) Gawler Range Volcanics/Gawler Craton/Wirrida.

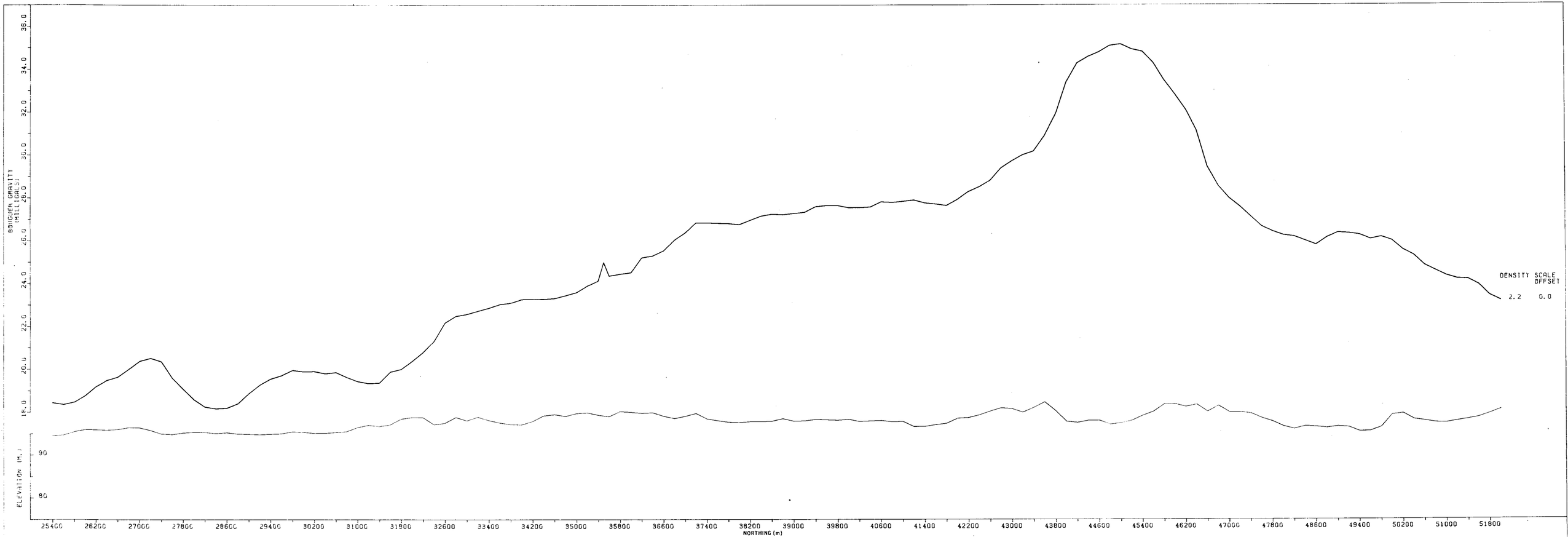
EL No. 621 (1009) Envelope No. 3839

BASIC GEOPHYSICAL DATA RELATING TO THIS EXPLORATION LICENCE IS HELD BY GEOPHYSICS SECTION, SADME as follows:

— located data tape, number A 0003, plus computer print out and flight log (Aerodata Services Pty. Ltd., 1981) ~ Aerial magnetic/radiometric survey

— Analogs from airborne magnetometer survey, Aerodata Services Pty. Ltd. lines 1041-44, 1031-40, 1021-30, 1011-20, 1004-10, 1001-03. Test lines, calibrations, tie lines 1001-03, 1004-10, 1011-20, 1021-30, 1031-40, 1041-44

— EL 620, Analogs, lines 2041-54, 2021-40, 2006-20, tie lines 2001-05;

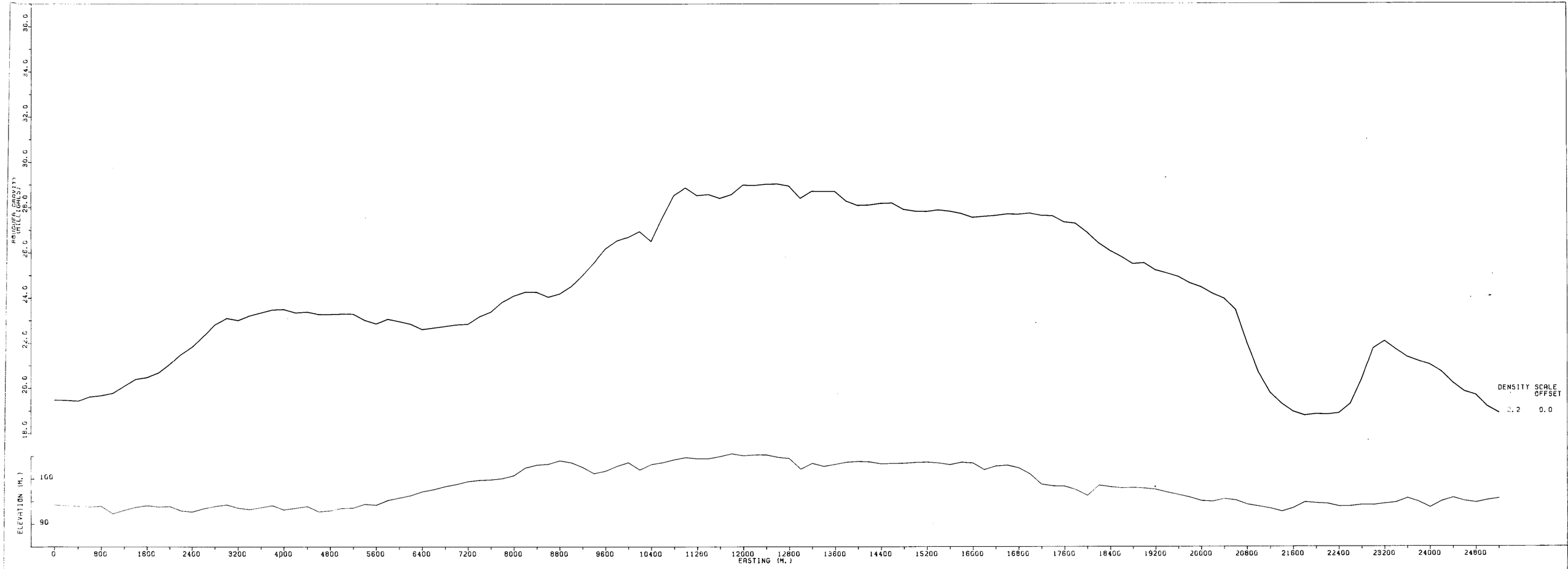


AFMECO PTY. LTD – WIRRIDA, S.A.
PROFILE OF BOUGUER GRAVITY ANOMALY
LINE 0
SCALE 1:40000
DRG. NO. SH. 53 - 6. 136. 4066

GEOEX PTY LTD

To Accompany Report No. W.Y. 81-17
PLATE. 2

3839-8

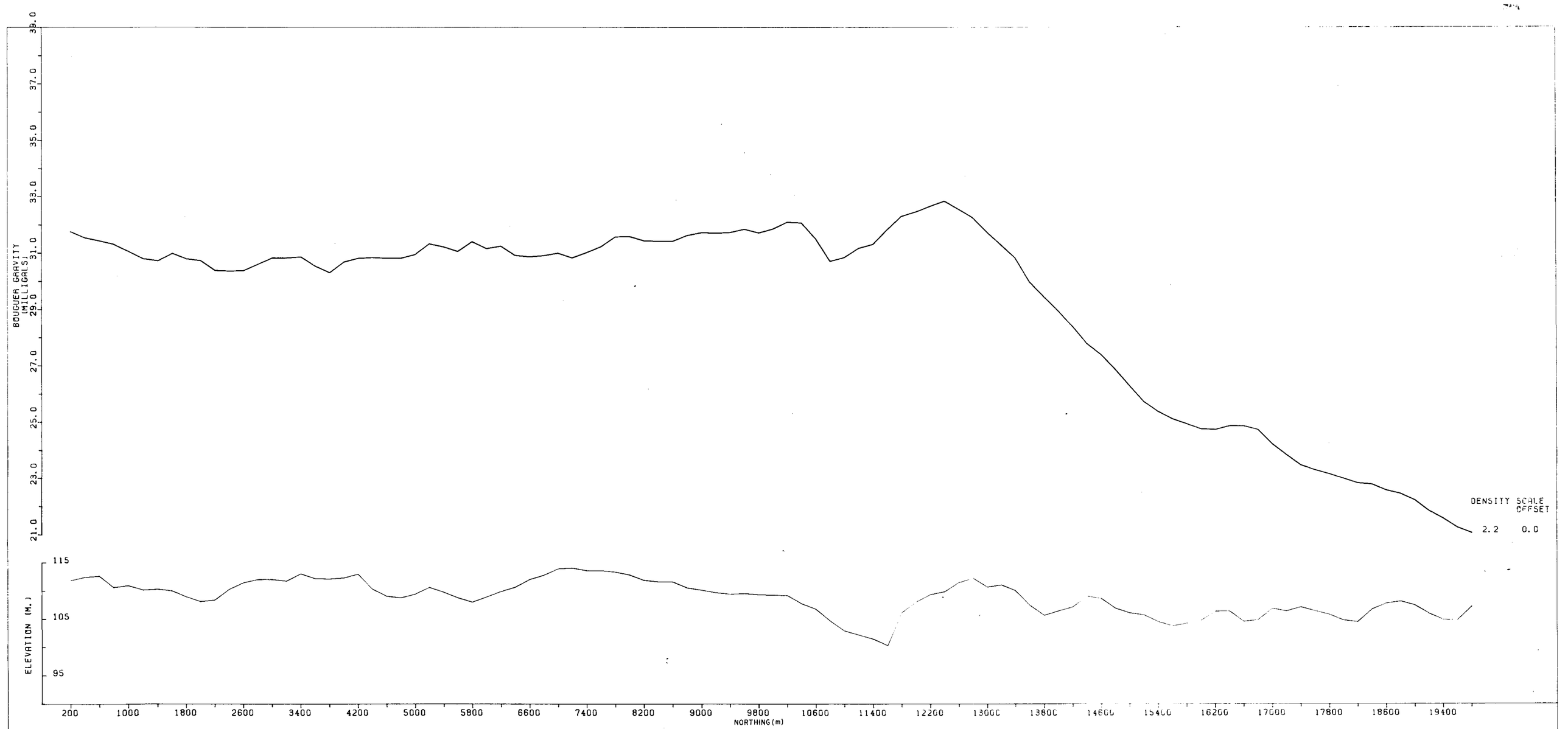


AFMECO PTY. LTD. — WIRRIDA, S.A.
PROFILE OF BOUGUER GRAVITY ANOMALY
LINE 1
SCALE 1:40000
DWG. NO. SH 53-6. 136. 4068

GEOEX PTY LTD

To Accompany Report No. W.Y 81-17
PLATE 4

3839-9



AFMECO PTY. LTD. — WIRRIDA, S.A.
PROFILE OF BOUGUER GRAVITY ANOMALY
LINE 5
SCALE 1:40000
DWG. NO. SH 53-6. 136. 4072

GEOEX PTY LTD

To Accompany Report No. W.Y. 81-17
PLATE 8

3839-10

AFMECO PTY. LTD. — WIRRIDA, S.A.
PROFILE OF BOUGUER GRAVITY ANOMALY
LINE 6
SCALE 1:40000
DWG. NO. SH53-6. 136. 4073

GEOEX PTY LTD

To Accompany Report No. W.Y. 81-17
PLATE 9

3839-11

420000mE

430000mE

6720000mN

N

SHEET INDEX

1	2
3	4
5	6

CONTOUR INTERVAL — 1·0 mgal.

6710000mN

GEOEX PTY. LTD.

AFMECO

WIRRIDA — S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·2 gms/cc

SCALE 1:25000

DWG. NO. SH53-6.136.4101

SURVEYED: APRIL '81	APPROVED: A.R.D.
DRAWN: S.J., R.Z.	PROJECT N° 81532
SHEET 1 OF 6	

To Accompany Report No. W.Y. 81-17

3839-12

Note: See Dwg No. SE53-6.136.4221 for 1:100 000 reduction compilation.

FENCE 4·86

FENCE 7·06
END PEG 6·80

WESTERN N-S ROAD

A

440000mE

450000mE

6720000 mN

6710000mN

FENCE
16·32km

"SURPRISE BORE"

TOP E–W ROAD

FENCE
1·20

CORNER
25·37 km

25·2
170 m West
of corner

ROAD
6·05 km

MID E–W ROAD

GATE
34·33km

END
14·48 km

Note: See Dwg. No. SE53-6.136.4221 for 1:100000 reduction.

N

SHEET INDEX

1	2
3	4
5	6

CONTOUR INTERVAL — 1 0mgal.

GEOEX PTY. LTD.

AFMECO

WIRRIDA — S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·2 gms/cc

SCALE 1:25000

DWG. NO. SH 53-6. 136. 4102

SURVEYED: APRIL '81		APPROVED: A.R.D.
DRAWN: S.J., R.Z.	PROJECT Nº 81532	SHEET 2 OF 6

To Accompany Report No. W.Y. 81-17

3839-13

'COMET BORE'

N

6700000mN

SHEET INDEX

1	2
3	4
5	6

CONTOUR INTERVAL — 1·0 mgal

'SATELLITE BORE'

'BLUE BORE'

MID E-W EXTENSION

SATELLITE ROAD

START PEG 0·02

FENCE 0·09

0·01 START EXTENSION

2·0 BORE FENCE CORNER

3·4 T. JUNCTION

CORNER 15·60

GATE 15·78

GEOEX PTY. LTD.

AFMECO

WIRRIDA — S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·2 gms/cc

SCALE 1:25000

DWG. NO. SH 53-6.136.4103

SURVEYED: APRIL '81		APPROVED: A.R.D.
DRAWN: S.J., R.Z.	PROJECT N° 81532	SHEET 3 OF 6

Note: See Dwg. No. SH53-6.136.4221 for 1:100 000 reduction.

To Accompany Report No. W.Y. 81-17

3839-14

B

C

D

5·2 km
T. JUNCTION

S.W. NORTH SOUTH ROAD

CREEK
11·58 km

GATE
13·7 km

16·8

36·04 km
SOLO BASE
& SURVEY PEG

NORTH SOUTH ROAD

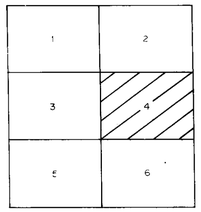
FENCE
40·86 km

GATE
47·10 km

6700000 mN

N

SHEET INDEX



CONTOUR INTERVAL — 1·0 mgal

GEOEX PTY. LTD.

AFMECO

WIRRIDA — S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·2 gms/cc

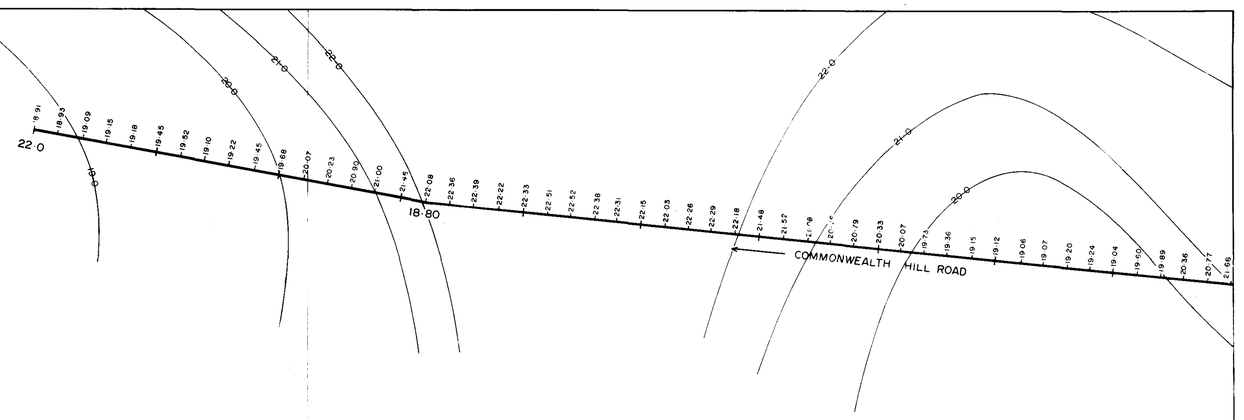
SCALE 1:25000
DWG. NO. SH53-6.136.4104

SURVEYED APRIL '81	APPROVED A.R.D.
DRAWN S.J., R.Z.	PROJECT N° 81532
	SHEET 4 OF 6

Note : See Dwg No. SE53-6.136.4221 for 1:100 000 red.

To Accompany Report No. WY 81-17

3839-15



6690000 mN

N

SHEET INDEX

1	2
3	4
5	6

CONTOUR INTERVAL — 1·0 mgal.

Note : See Dwg No. SE53-6.136.4221 for 1:100 000 reduction.

GEOEX PTY. LTD.

AFMECO

WIRRIDA — S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·2 gms/cc

SCALE 1:25000

DWG. NO. SH53-6.136.4105

SURVEYED: APRIL '81		APPROVED: A.R.D.
DRAWN: S.J., R.Z.	PROJECT Nº 81532	SHEET 5 OF 6

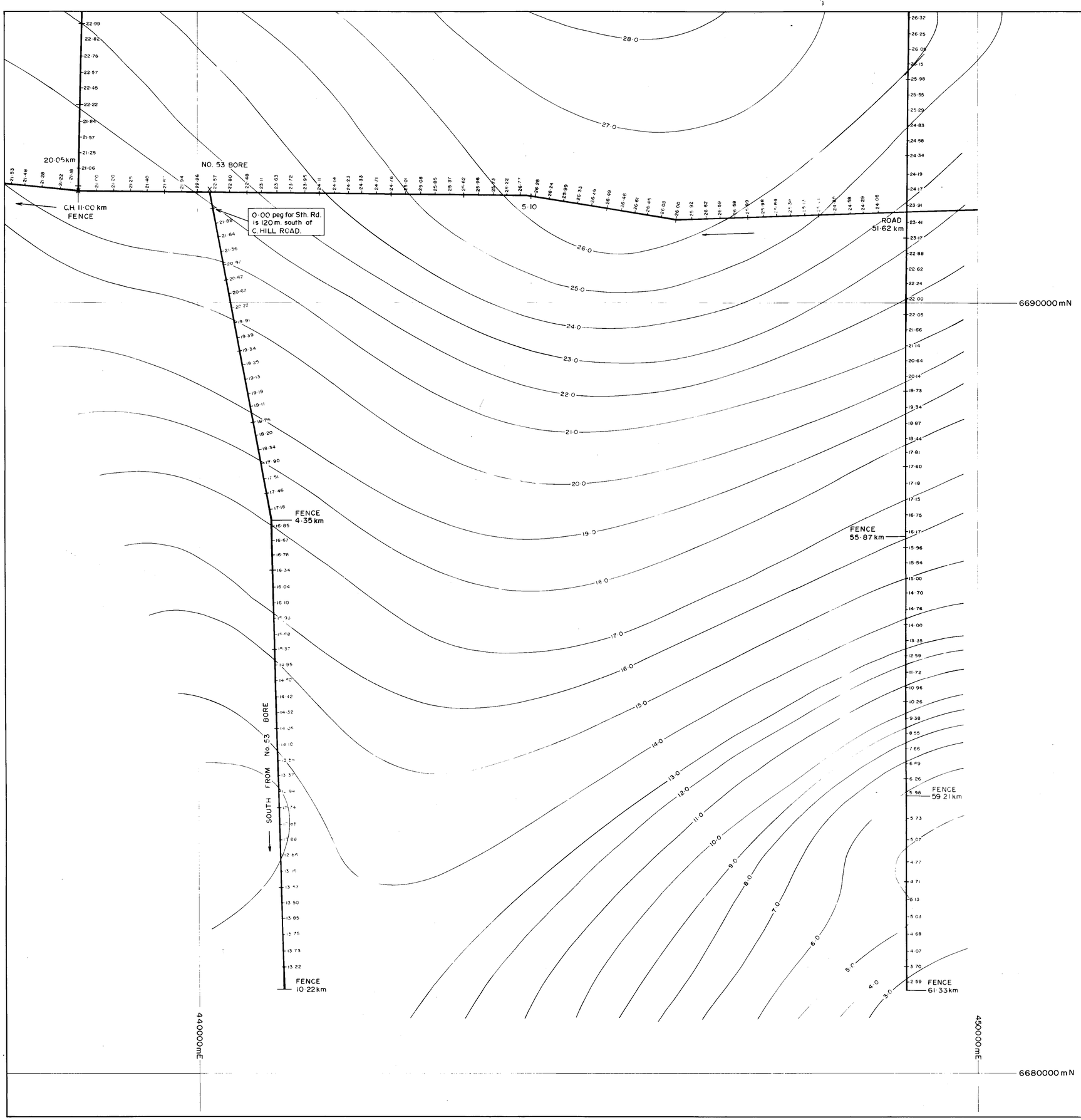
To Accompany Report No. W.Y. 81-17

420000mE

430000mE

6680000 N

3839-16



N

SHEET INDEX

1	2
3	4
5	6

CONTOUR INTERVAL — 1·0 mgal

Note: See Dwg. No. SE53-6.136.4221 for 1:100 000 reduction.

GEOEX PTY. LTD.

AFMECO

WIRRIDA — S.A.

CONTOUR MAP OF BOUGUER GRAVITY ANOMALY

DENSITY 2·2 gms/cc

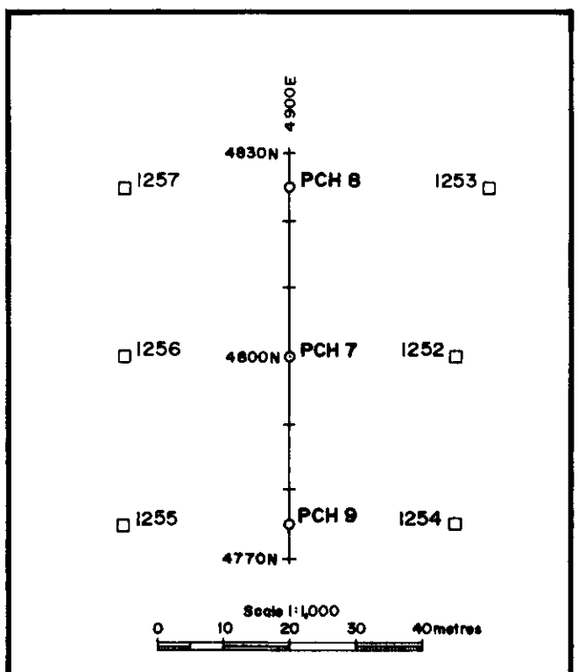
SCALE 1:25000

DWG. NO. SH53-6.136.4106

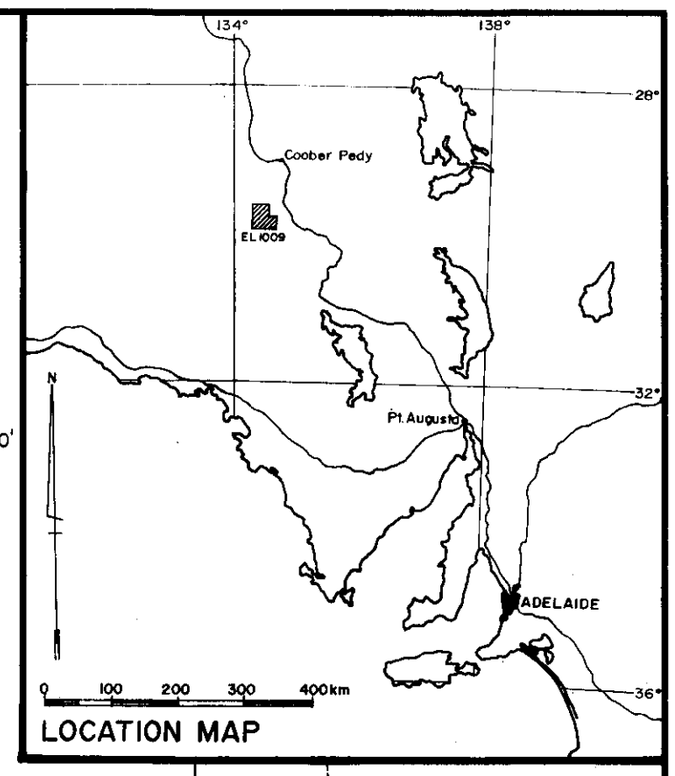
SURVEYED: APRIL '81		APPROVED: A.R.D.
DRAWN: S.J., R.Z.	PROJECT N° 81532	SHEET 6 OF 6

To Accompany Report No. W.Y. 81-17

3839-17



ANOMALY 3
DETAILED LOAM SAMPLING



LOCATION MAP

134° 15'

134° 30'

29° 40'

30° 00'

E.L. 1009

Columba Bores

Surprise Bore

New Surprise Bore

Problem Bore

Satellite Bores

Webbs Dam

Bon Leigh Bores

Mack Tank

Wirrida Bore

"Wirrida O.S." (old)

To "Comet O.S."

To "Commonwealth Hill"

Cross Roads Bore

Blue Bore

No 53 Bore

Commonwealth Hill

Ants Nest Bore

Marmalade Tank

Bundi Bore

Gina Siding

To "Gina O.S."

Nelsons Bore

An4 PCH 13-15

An3 PCH 7-9

Line 4900mE

An2 PCH 10-12

An5 PCH 5,6

An1 PCH 1-4

N

LEGEND

- 1141□ Loam sample-prefixed CA
- E.L. boundary
- Major track
- Minor track
- Fence
- Watercourse
- An4 ○ Aeromagnetic anomaly
- PCH 7-9 Percussion drillholes into anomaly

Scale 1:100,000
0 2 4 6 8 10 kilometres

Topography taken from an enlargement of COOBER PEDY 1:250,000 geology map (SH 53-6)

3839-18

Fig. 1

THE BROKEN HILL PROPRIETARY CO. LTD.
EXPLORATION DEPARTMENT

E.L.1009 WIRRIDA, S.A.
LOCATION OF LOAM SAMPLES, ANOMALIES AND DRILLHOLES

Drawn E.L.S.	Date 28-3-83	Centre Adelaide
Traced S.C.S./A.R.V.	Project No 6-F670-2	Drawing No A2-355
Checked		

Revisions