M.I.M. EXPLORATION PTY LTD

(ACN 009 681 118)

TECHNICAL REPORT

No. 2764

TITLE:	EL 9518 "JERVOIS" NORTHERN TERRITORY Annual Report for the year ending 2nd October 1999
ISSUING DEPARTMENT:	EXPLORATION
AUTHOR:	J. GUNTER
INVESTIGATIONS CONDUCTED BY:	J. GUNTER & D. BURT
SUBMITTED BY:	M. McGEOUGH
DATE:	NOVEMBER 1999

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per **M. McGeough**

District Geologist - South Australia

KEY WORDS

JERVOIS

BONYA SCHIST

PROTEROZOIC

AEROMAGNETICS

PETROLOGY

COPPER

BASE METALS

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MOUNT ISA MINES LIMITED

EL 9518 - JERVOIS

PROPOSED EXPENDITURE FOR 12 MONTHS FROM OCTOBER 3 1999, TO OCTOBER 2 2000

FIXED COSTS	$45,000
CONTRACT AND CONSULTANT	$15,000
DRILLING	$35,000
GEOCHEMISTRY	$20,000
GEOPHYSICS	$35,000
LAND TENURE AND ENVIRONMENT	$12,000
OTHER VARIABLE COSTS	$40,000
TOTAL DIRECT COST	$202,000
ADD: TECHNICAL SUPPORT & ADMINISTRATION	$18,000
TOTAL **PROPOSED**	$220,000

LIST of DRAWINGS

Drawing No.	Title	Scale
50595	Tenement Location Diagram (*Figure 1*)	1:250,000

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M.I.M. EXPLORATION PTY LTD

EL 9518 "JERVOIS"

NORTHERN TERRITORY

Annual Report for the

year ending 2nd October 1999

SUMMARY

AIM

To explore and evaluate the potential for economic base and precious metal mineralisation.

OBJECT of REPORT

To document exploration activities and results achieved on Exploration Licence 9518 "Jervois" and to report these to the Department of Mines and Energy, Northern Territory.

LOCATION

EL 9518 is located 280 kilometres north east of Alice Springs on the Huckitta 1: 250 000 map sheet (SF53 – 11), and surrounds the mineral leases which cover the gossanous outcrop of the Jervois Mine and its extensions (*Figure 1*).

TENURE

EL 9518 "Jervois" was granted to C. Savage on 1st October 1996 for a period of six years. Under compulsory partial surrender provisions, 50% of the tenement was relinquished on the 30th September 1998. The tenement was subsequently transferred to M. Ruane on the 19th July 1999, who applied for a deferment of relinquishment until 2nd October 2000, which was approved by the Department of Mines and Energy, Northern Territory. M. Ruane then entered into an option to acquire agreement with Britannia Gold NL.

On 5th August 1999, M.I.M. Exploration Pty Ltd entered into a Joint Venture agreement with Britannia Gold NL, agreeing to act as manager and operator of the Jervois Project, which incorporates EL 9518 "Jervois."

PRECIS

During this reporting year, MIMEX carried out the following exploration activities:

- a total of 2,439 line km of detailed aeromagnetics and radiometrics was flown over EL 9518, and the adjacent ELA 10419
- five core samples were submitted to Pontifex and Associates Pty Ltd for petrological studies
- 15 core samples were submitted to Systems Exploration for physical properties studies
- previous geophysical data was reviewed and re-interpreted

CONCLUSIONS and RECOMMENDATIONS

A review of all data, including the digitisation of all available drill data, will be ongoing.

Interpretation of detailed aeromagnetics will provide new structural and stratigraphic targets to be ground checked and drilled. Physical properties analysis indicates that the known mineralisation responds well to electrical geophysics, and a ground electrical geophysics survey (MIMDAS – in house system) is planned for February/March 2000.

M.I.M. EXPLORATION PTY LTD

EL 9518 "JERVOIS"

NORTHERN TERRITORY

Annual Report for the

year ending 2nd October 1999

1. INTRODUCTION

Exploration Licence 9518 "Jervois" (EL 9518), is located mainly in Proterozoic terrain of the Arunta inlier. The tenement surrounds the mineral leases which cover the gossanous outcrop of the Jervois Mine and its extensions along strike (MCS 13 – 28, MLS 10, 16, 17, 23, 51 – 57, 61, 62, 90) and the water holdings over Lake Petrocarb (HLDS 19 – 21). EL 9518 has a total area of approximately 58 km² (*Figure 1*).

MIM Exploration Pty Ltd (MIMEX) farmed into the tenement in August 1999 and is both manager and operator of the Joint Venture project. Exploration conducted by MIMEX focussed on finding structurally controlled high grade Isa copper and Broken Hill base metals mineralisation, as well as Fe-oxide associated copper – gold mineralisation.

The purpose of this report is to detail exploration conducted and results achieved by MIMEX on EL 9518 during the year ended 2nd October 1999.

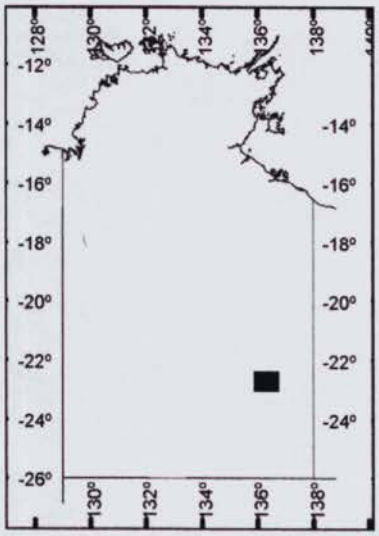
2. LOCATION and ACCESS

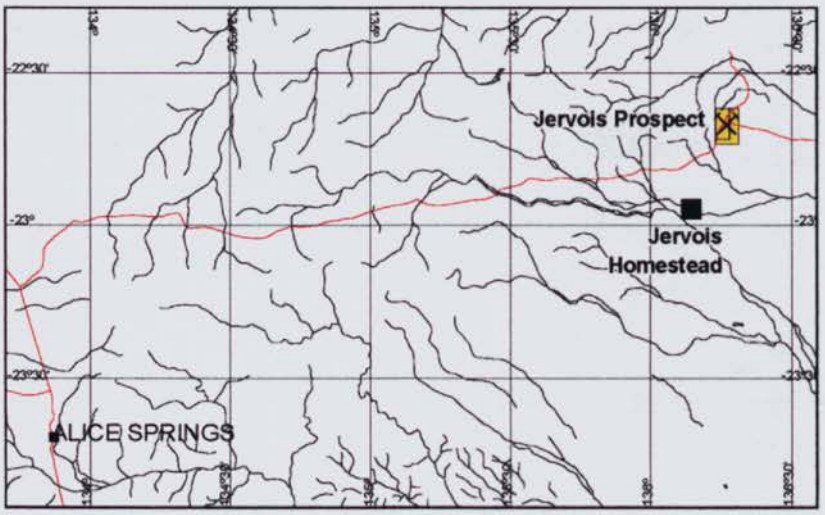
EL 9518 is located 280 kilometres north east of Alice Springs on the Huckitta 1: 250 000 map sheet (SF53 – 11), and surrounds the mineral leases which cover the gossanous outcrop of the Jervois Mine and its extensions (*Figure 1*).

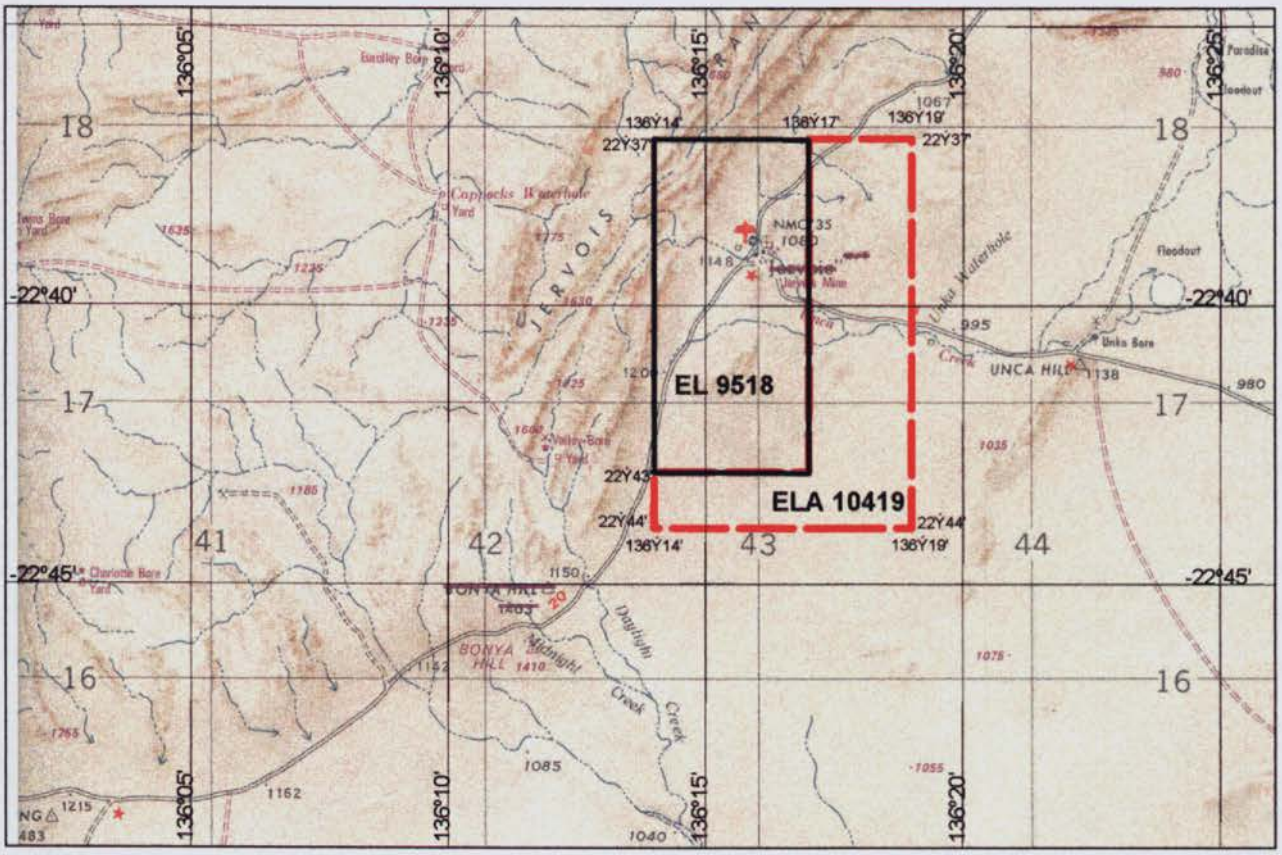
Access is via the Stuart and Plenty River Highways to the turn off to Lucy Creek Station, with the tenement located approximately 20km north of this turn off on the Lucy Creek Road. Historical mine and exploration tracks, as well as limited station tracks, provide local access throughout the tenement which is located over a portion of the Jervois Pastoral Lease.

3. TENURE

EL 9518 "Jervois" was granted to C. Savage on 1st October 1996 for a period of six years. Under compulsory partial surrender provisions, 50% of the tenement was relinquished on the 30th September 1998. The tenement was subsequently transferred to M. Ruane on the 19th







NOTE: Taken from Huckitta SF53-11 - 1:250 000 Topographic Map 1964

N

0 5 10

Kilometres

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A.C.N. 009 681 118

MIM EXPLORATION

LOCATION MAP
EL9518 JERVOIS
ELA 10419 JERVOIS EAST

Region: NT	1:250,000 ref.: SF53-11	Author: K.R.	Scale: 1:250 000
Projection: WGS 84		Drawn: E.I.K.	Date: 4-8-99
Revised By:	Revision Date:	Drawing No: 50595	Fig. No: 1

July 1999, who applied for a deferment of relinquishment until 2nd October 2000, which was approved by the Department of Mines and Energy, Northern Territory. M. Ruane then entered into an option to acquire agreement with Britannia Gold NL.

On 5th August 1999, M.I.M. Exploration Pty Ltd entered into a Joint Venture agreement with Britannia Gold NL, agreeing to act as manager and operator of the Jervois Project, which incorporates EL 9518 "Jervois."

4. GEOLOGICAL SETTING

EL 9518 lies on the Huckitta 1: 250 000 map sheet (SF 53-11), for which geological notes are available. The tenement is located mainly within the Palaeo-proterozoic Bonya Schist on the north eastern boundary of the Arunta Orogenic Domain. The Arunta Orogenic Domain in the north western part of the tenement is overlain unconformably by Neo-proterozoic sediments of the Georgina Basin.

The prospective lithologies within the tenement are considered to be contained within the Bonya Schist, Division 2 of Arunta Orogenic Domain (Freeman, 1986). This unit is made up of quartzo-feldspathic muscovite and sericite schists, ranging from pelitic to psammo-pelitic in composition, and has local occurrences of cordierite, sillimanite, garnet and andalusite. The mine sequence, in addition to these lithologies, also contains chlorite schist, garnet $\pm$ magnetite quartzite, magnetite quartzite, calc-silicates, and impure marbles.

The topography of the tenement is dominated by the Jervois Range, composed of Georgina Basin sediments to the west, and the "J Range," comprised of Bonya Schist, and including the mine sequence. Peters et al (1985) recognised three deformation periods in the Jervois area, with refolded folding of the mine sequence resulting in the "J" shape of the Bonya Schist outcrop in the tenement area. Mineralisation in the area occurs mostly as stratiform/bound copper and/or lead-silver-zinc associated with variable garnet and calc-silicate alteration, although tungsten occurs as disseminated scheelite in calc-silicate rocks.

5. PREVIOUS EXPLORATION *(Extracted from Alcock, 1999)*

Following the discovery of the Jervois mineralisation in the 1920s, some small-scale mining of the oxides took place and concentrates were transported to Mt Isa for treatment.

5.1 1961 – 1965 New Cons Gold

From 1961 – 1965, New Consolidated Goldfields (Australasia) Pty Ltd undertook the first modern exploration program. This involved regional and detailed prospect mapping, geochemistry, magnetic and Turam surveys. Diamond drill holes totalling 1,901 metres were drilled in this period (DDH Series). The program was terminated because it had failed to find ore reserves of the required tonnage and grade. Ore reserves for Reward, Green Parrot and Bellbird were estimated to total 2.4 million tonnes at 2% copper to a depth of 95 metres (Catley, 1965, Wilson and Ward, 1962).

5.2 1969 – 1973 Petrocarb

Apart from some small scale mining of the oxidised zone by Mr K Johansson, no further exploration was undertaken until Petrocarb Mineral Exploration (SA) Pty Ltd acquired certain key leases in 1969–70. During 1971 and 1972 intensive diamond drilling and lesser percussion drilling took place to test the known mineralised horizons. About 110 holes were drilled including some 55 diamond core holes (JR, JA and JG Series) and 22 percussion holes (MP Series) on the Reward, Marshall and Green Parrot prospects.

A smaller number of diamond and percussion holes were drilled at Green Parrot Scheelite (PE2-7, PE1-4), Crystallisation Plant Scheelite (WP1-4), Pioneer A (PA1), Pioneer B Scheelite (PB1-4), Cox's West (PE1), Mineral Lease 613H (Rockface PF1-5) and at Jericho. Costeaning of scheelite prospects also took place in 1972.

In late 1970, McPhar Geophysics carried out a detailed dipole–dipole IP survey of the Reward – Green Parrot mineralised zone and the Bellbird zone together with orientation VHEM and vertical fluxgate magnetometer surveys.

Copper ore reserves for Reward, Marshall and Bellbird defined by the Petrocarb drilling were calculated at 2,295,600 tonnes at 2.5% copper and about 50 g/t silver (Ypma, 1983) to a maximum depth of 130 metres. In addition, a further 300,000 tonnes at 9% lead, 3% zinc, 1.5 % copper and 170g/t silver were estimated for Green Parrot (Holmes, 1972).

5.3 1973 – 1974 Petrocarb Joint Venture

A joint venture agreement between Petrocarb Exploration NL, Wilstone Pty Ltd and Union Corporation (Australia) Pty Ltd was negotiated in late 1973 whereby Union would undertake exploration in the Jervois area. The program which was implemented in 1974, involved colour air photography, geological mapping at 1: 10,000 and 1: 1,000 scale, soil and rock chip geochemistry on selected targets, a review of previous geophysical work and test surveys using a variety of methods by Scintrex, and the drilling of seven diamond core holes totalling 1,723 metres.

A reserve of 2,085,000 tonnes at 3 % copper, 55 g/t silver over an average intercept width of 4.7 metres was estimated for Marshall and Reward. This was short of the objective and Goldner recommended drilling to 600 metres vertically (Goldner et al, 1974).

Union Corporation, about this time, was contemplating withdrawing from Australia and the Joint Venture terminated without this recommendation being implemented.

5.4 1980 – 1983 Plenty River Mining

The Jervois area remained inactive between 1975 and 1980 when Plenty River Mining Company NT Limited negotiated a tribute agreement with Petrocarb whereby Plenty River would be assigned the leases in return for payment of a royalty on production.

In 1980 the PR Series of about 50 percussion holes (PR 1 – 57) were drilled in the Marshall – Green Parrot area for ore definition and open pit planning and grade control.

Other drilling in 1981–83 included 17 percussion holes (R 1 – 17) and four diamond core holes (RWD 1 – 4) at Reward in 1983; 14 percussion holes about 500 metres north of Reward near scheelite costean yeilding narrow low grade copper intersections; 24 percussion holes at HM (Sykes) Lode intersecting narrow low grade copper intercepts; and 11 percussion holes at Killeen Prospect, at the southern end of the "J" east of Bellbird. Costeaning was undertaken at Cox's, Killeen and HM Lode.

A treatment plant designed to treat Green Parrot lead-zinc-copper-silver ore at a rate of 125,000 tonnes per annum was completed in early 1982 together with township and services at a cost of $A15 million. Open pit mining at Green Parrot using company equipment commenced in 1982, and the plant was successfully commissioned in April 1982 and then placed on care and maintenance in June 1982 after having produced about 500 tonnes of concentrate.

The company became public by the issue of shares through a prospectus dated 28th March 1983. In this prospectus, Terence Willsteed and Associates produced ore reserve estimates based on previous drilling plus 50 shallow percussion holes (PR Series) drilled in July-August 1980 for greater ore definition (Willsteed, 1983). These estimates to 100 metres vertical depth were as follows:

Green Parrot

Probable primary resources reserves:
210,000 tonnes at 1.47% Cu, 8.58% Pb, 2.56% Zn, 166 g/t Ag

Possible primary ore:
50,000 tonnes at 1.55% Cu, 8.07% Pb, 2.2% Zn, 135 g/t Ag

Oxidised mineralisation:
70,000 tonnes at 1.57% Cu, 8.14% Pb, 3.17% Zn, 179 g/t Ag

Marshall Reward

Probable primary reserves:
320,000 tonnes at 2.77% Cu, 0.43% Pb, 0.39% Zn, 65 g/t Ag

Possible primary ore:
205,000 tonnes at 2.71% Cu, 0.49% Pb, 0.33% Zn, 70 g/t Ag

Oxidised mineralisation:
180,000 tonnes

The plant was again commissioned in August 1983 and operated on Green Parrot oxidised ore for five months, treating 25,000 tonnes, until it was placed on care and maintenance in December 1983 due to a sharp decline in metal prices and has not been operated since. About 2,000 tonnes of concentrate were sold at a grade of 50.4% Pb, 5.4% Zn, 0.6% Cu, 680 g/t Ag and 0.1% Bi. About 40,000 tonnes of ore were mined from the Green Parrot pit (300 metres long by 25 metres deep).

5.5 1983 – 1984 Plenty River Mining – Anaconda Joint Venture

With the objective of discovering a large stratiform base metals orebody of the Broken Hill type, Anaconda Australia Inc. negotiated a joint venture with Plenty River Mining in September 1983. The Anaconda program primarily centred around the flying of an Input electromagnetic survey in October 1983 and follow up by reconnaissance geology and geochemistry of 26 moderate to low order EM anomalies.

At the same time the Jervois Range 1: 100,000 sheet magnetic data flown by the NT Department of Mines and Energy in 1981 was interpreted. The ground follow up of EM anomalies did not reveal any lode horizon rocks and the geochemical results were discouraging (Marjoribanks, 1983 and Dunnet et al 1984). Anaconda withdrew from the joint venture in May 1984, about the time the parent was contemplating the ultimate shut down of activities in Australia.

Other Exploration and Research Activities

Since 1982 Plenty River Mining Company has explored Exploration Licences 3301, 3202, 3203, 3204, and 3165 in the Jervois area as well as its leases. The results of this work appear in reports by Ypma (1983, 84, 85, 86, 87).

The principal activities during this period have been:

- Geological mapping at 1: 5,000 scale of former EL 3301 and parts of former EL's 3202 and 3204 (including the "J" structure in 1982 – 1983 by students under the supervision of Dr P.J. Ypma of Adelaide University. Emphasis in this work was on structural geology, and the results are documented in a report by Peters et al, 1985.

- Honours Thesis by University of Adelaide students on interpretation of ground magnetic and gravity data in the Jervois mine area, and on results of fluid studies.

- A 250m line spacing, airborne magnetic and gamma ray spectrometer survey by Austirex for Plenty River Mining Company in April – May 1983 of EL 3301, the western part of EL 3202 and the northern part of EL 3204 and their interpretation by T. Whiting of the University of Adelaide as part of a PhD thesis (Whiting, 1984).

- Ore reserve estimation of the Reward – Marshall – Green Parrot zones by students at the School of Mines of Delft University of Technology in Holland under supervision of P. Ypma in 1986. This computer – based study led to the production of graphs permitting estimation of ore reserves at varying grade cut-offs (Lensvelt, 1986).

- An ore-microscopy study of the Jervois Mine, 1987, by a student at the School of Mines of Delft University of Technology, Holland, and a study on Small Scale Mining, with special attention paid to Jervois Mine (Coenan, 1987).

- A major review by Yates, Ypma and Dickson summarised the work done to that time (Yates et al, 1989).

Regional Drilling

Some diamond drilling was completed in the period 1984 – 1987 including four holes (X84 – 1, 2, 3, 5) to test airborne magnetic anomalies in the Bellbird and Green Parrot South areas. No significant mineralisation was intersected an the targeting of further magnetic anomalies was abandoned.

In 1986, accent was on testing geochemical anomalies due to high zinc in biotite. Four core holes were drilled at Pioneer, north of the Marshall – Reward resource (X86 1 – 4) yielding narrow copper intercepts, one at Anaconda, south east of the "J" line of lode (X86-5) and four holes at Killeen, east of Bellbird (X86-6 to 9). One of the Killeen holes showed intersections of 16% Zn over 0.9 metres and 15.1% Zn over 1.15 metres in calc-silicate rocks.

Four core holes were drilled in 1987, three at Van Gils Prospect on the Outer J line of mineralisation (X87-1 to 3) and one (X87-4) at Killeen. Results at Van Gils were not encouraging, while at Killeen, zinc values in the range 2% to 3.65% were intersected over 4.35 metres with one 0.15 metre interval at 12.5% Zn in calc-silicates. A further three diamond drill holes were later completed at Killeen in 1987 (X87-5 to 7) all of which yielded zinc/lead intersections.

5.6 1991 – 1996 Plenty River Mining – Normandy Poseidon Joint Venture

Plenty River Mining reached an agreement with Normandy Poseidon in October 1991, whereby Poseidon Exploration Limited would extend their exploration of the ELs 6993 and 6994 to include the ERLs 67-70.

Exploration activities included a combined airborne magnetometer and EM survey. About 1,894 line kilometres were flown in 1991 for the assessment of Normandy Poseidon's EL 6994 with about 418 line kilometres passing over Plenty River Mining's ERLs 67-70.

A new grid based on AMG was established and a fixed loop EM Survey (Sirotem MK III) was undertaken over the "J" structure. Three diamond holes (JD1, 1A, 2, 3) were drilled east of the Marshall zone to test an EM anomaly coincident with the Sykes zone of mineralisation and its northern extension. One diamond drill hole (JD4) was also drilled at the Bellbird zone on the South East limb of the "J" structure.

5.7 1997 – 1999 Britannia Exploration

In 1997 Britannia Gold NL carried out a survey and RC drilling programme following acquisition of the tenements from Tyson Resources who held an option to purchase from Plenty River Mining.

The RC drilling program was carried out to fill in some gaps in earlier drilling by previous workers, and establishing resource figures for the copper oxide zone extending from surface to approximately 40 metres. A total of 1,618 metres (26 holes) were drilled to depths between 42 and 102 metres (Alcock, 1999).

In early 1999, Britannia Gold NL offered the exploration lease and mine leases as part of a Joint Venture package to MIM Exploration Pty Ltd. MIM Exploration entered the Joint Venture agreement as manager and operator in August 1999.

6. EXPLORATION CONDUCTED by MIMEX during the year ending 2nd October 1999

During the period from 3rd October 1998 to 5th August 1999, Britannia Gold NL operated on EL 9518 "Jervois." No ground exploration was completed, however data was compiled and a Joint Venture offer designed. M.I.M Exploration took over as manager and operator on 5th August 1999, and has completed an Airborne geophysical survey, petrological studies, and physical properties studies in the period from 5th August 1999 to 2nd October 1999.

6.1 Petrological Studies

Five core samples were submitted for petrological studies to Pontifex and Associates Pty Ltd. The mineralogical report is enclosed in *Appendix 1*.

6.2 Airborne Geophysics

Detailed airborne magnetic, radiometric, and digital elevation data was obtained from a survey flown by UTS Geophysics. The survey totalled 2,439 lined kilometres, and was flown at a line spacing of 50m and a tie line spacing of 500m. A detailed report and all data is included in *Appendix 2*.

6.3 Physical Properties Analysis

15 core samples were submitted to Systems Exploration for physical properties analysis for magnetic response, density, IP and EM effect, and gamma radiation. A detailed report and all data are included in *Appendix 3*.

6.4 Review of Previous Geophysics

A detailed review was conducted of previous EM and IP carried out in the area. A number of anomalies were outlined for ground checking, however it was concluded that previous electrical geophysics in the area was unlikely to have been effective at depth. Reports are included in *Appendix 4*.

7. RESULTS and DISCUSSION

Study of petrological samples confirmed hand specimen identification, and will allow consistent core logging in future.

Data from the Airborne survey was extremely high quality, and it appears that it will be extremely useful to map the area. Data is yet to be interpreted.

Physical properties analysis indicated that the known mineralisation shows a strong IP effect and EM response, however is not directly correlated to magnetic character.

8. CONCLUSIONS and RECOMMENDATIONS

A review of all data, including the digitisation of all available drill data, will be ongoing.

Interpretation of detailed aeromagnetics will provide new structural and stratigraphic targets to be ground checked and drilled. Physical properties analysis indicates that the known mineralisation responds well to electrical geophysics, and a ground electrical geophysics survey (MIMDAS – in house system) is planned for February/March 2000.

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MOUNT ISA MINES LIMITED

EL 9518 - JERVOIS

STATEMENT OF EXPENDITURE FOR 12 MONTHS ENDED OCTOBER 2, 1999

LABOUR MEX	12,197	
SUPPLIES & SERVICE - OFFICE FIXED	292	
INFRASTRUCTURE	692	
PERSONNEL COSTS - FIXED	0	
PERSONNEL COSTS - VARIABLE	1,174	
MISC GOVERNMENT CHARGES	0	
SUPPLIES & SERVICE - OFFICE VARIABLE	151	
SUPPLIES & SERVICE - FIELD	1510	
TRAVEL & ACCOMMODATION	3,371	
DRILLING	0	
CONTRACT & CONSULTANT SERVICES	6346	
INTERNAL GEOPHYSICS DIST.	0	
GEOPHYSICS	6297	
GEOCHEMICAL	176	
RESEARCH	0	
LABOUR - EXTERNAL	0	
JOINT VENTURE CONTRIBUTIONS	0	
LAND TENURE & ENVIRONMENT	1,408	
TOTAL DIRECT COST		33,614
ADD: TECHNICAL SUPPORT & ADMINISTRATION		5378
TOTAL CURRENT TERM		38,992
PREVIOUSLY REPORTED		0
TOTAL PROJECT EXPENDITURE TO DATE		**$38,992**

M. Warren.

MUKRIN WARREN
ACCOUNTANT

Appendix 1

Petrological Report

Pontifex & Associates Pty. Ltd.

TELEPHONE (08) 8332 6744
FAX (08) 8332 5062
E-mail: pontifex@olis.net.au

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

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

MINERALOGICAL REPORT No. 7888

by Alan C. Purvis, PhD

September 9th, 1999

TO :

MIM Exploration Pty Ltd
13 Maple Avenue
FORESTVILLE SA 5035

Attention: Jennifer Gunter

YOUR REFERENCE :

Order Nos. A00077, A00081 and A00082

MATERIAL & IDENTIFICATION :

6 Samples, SA107861 to SA107866
8 Samples, SA107867 to SA107874
5 Samples, SA121057 to SA121067

WORK REQUESTED :

Polished thin section preparation, description and report with comments and interpretations as specified.

SAMPLES & SECTIONS :

Returned to you with this report.

DIGITAL COPY :

Enclosed with hard copy of this report.

A C Purvis

PONTIFEX & ASSOCIATES PTY. LTD.

CORE SAMPLES

The core samples include some with strong base-metal sulphide mineralisation, with unusual silicate-oxide assemblages throughout. The metamorphic grade seems to be compatible with the andalusite-staurolite zone as seen in the Kanmantoo Group, as indicated above. Assemblages seen are listed below:

Sample No.	Silicates etc.	Oxides	Sulphides
SA-121057	Quartz-biotite-garnet-andalusite-cordierite	Magnetite	Chalcopyrite-pyrite
SA-121059	Quartz-biotite-garnet and muscovite-garnet-feldspar (sericitised)-(quartz)	Magnetite-hematite	None
SA-121063	Quartz-muscovite-garnet-andalusite-staurolite	Magnetite-ilmenite	None
SA-121064	Quartz-muscovite-(garnet) and muscovite-garnet	Magnetite and hematite	Pyrite-chalcopyrite
SA-121067	Garnet-carbonate	Hematite (rare)	Galena-sphalerite-chalcopyrite-pyrite-chalcocite-covellite.

Two of these samples (SA-121-059 and 064) have garnet associated with magnetite and hematite. As in the chip samples, it is again suggested that almandine will not be stable at fO_2 conditions within the hematite field, and that the garnet is spessartine. Lenses of spessartine-rich metasediments accompany ore in several small deposits hosted by the Kanmantoo Group and are termed "coticules".

Two are more normal pelites with relatively low potassium, resulting in andalusite + cordierite (SA-121057) or andalusite + staurolite (SA-121063), as well as abundant garnet. These samples have ilmenite ± magnetite and may have a more almandine-rich garnet. The sulphides in SA-121057 are layer-parallel, but may be in quartz-rich layers or in layer-parallel veins. There is a close association between sulphides and magnetite in this sample, however, with a paragenesis magnetite ⇒ chalcopyrite ⇒ pyrite.

The final sample seems to be a skarn or calc-silicate with abundant sulphides and an aggregate of altered garnet. The garnet is yellow and may be andradite or grossular. It has been altered to carbonate, and some quartz is also present. Minor pyrite and rare hematite occur in this sample, suggesting high fO_2 and fS_2 conditions.

SA-121057 **Partly altered quartz-biotite-garnet-andalusite-cordierite schist with layers or layer-parallel veins containing quartz, magnetite, chalcopyrite, pyrite, biotite and chlorite.**

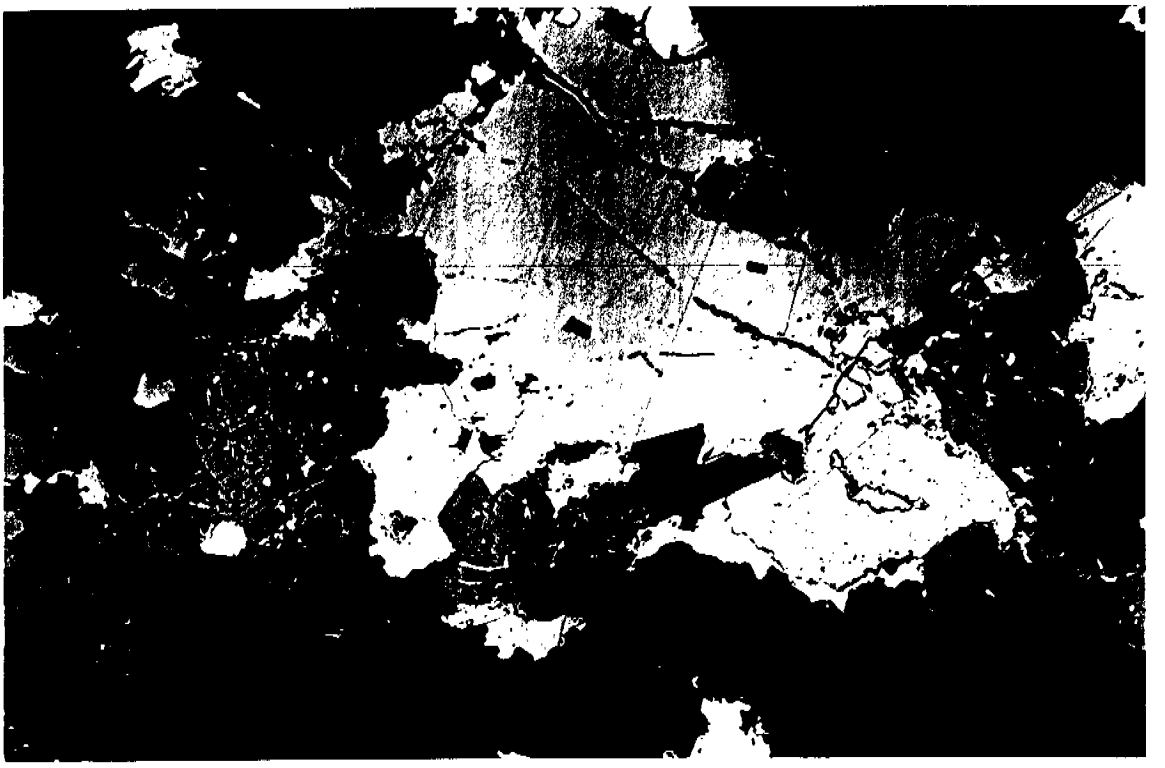
This is a well-foliated and laminated core-segment with lamellae of sulphide, including chalcopyrite, visible in hand-specimen. In thin section the layers are seen to be from 0.5 to 8mm in thickness and seem to include layer-parallel veins rich in quartz and sulphide, as well as a layered metasedimentary host rock.

The host rock is mostly quartz-rich, with the quartz as a micromosaic, and elongate areas of interstitial sericite apparently after poikiloblastic grains of andalusite and/or cordierite. In some layers, small kernels of andalusite occur within sericite but one layer has a small poikiloblastic grain of andalusite and adjacent to this is a very weakly sericitised poikiloblastic grain of cordierite, about 2mm long. Biotite is common as flakes 0.2 to 2mm long. These are mostly elongate parallel to the schistosity, which in layer-parallel, but some flakes have their cleavage planes oriented at a high angle to the schistosity.

There are two types of garnet in this sample: one occurs as rounded grains to 1mm in diameter, usually with inclusion-rich cores and inclusion-poor rims. The second is more dendritic with inclusion-poor cores elongate parallel to the schistosity and inclusion-rich rims. These more elongate garnet grains are up to 2mm long, but are much less abundant than the more rounded grains. Some grains, totally altered to chlorite, also occur, but the original mineral is unknown.

The veins contain minor biotite as well as quartz, magnetite and sulphide. Small aggregates of retrograde chlorite occur as well as veins of chlorite cutting the sulphides and oxides.

Magnetite is the earliest of the opaque components in this sample, as grains to 0.5mm in diameter, commonly fractured and veined by chlorite. Lenses of chalcopyrite occur (~3-5%), partly in the host rock, but mostly in the veins and are up to 2mm long. Some of these enclose magnetite, which has veins of chalcopyrite, and most contain small grains of pyrite. The pyrite seems to have grown into the chalcopyrite, suggesting a paragenesis magnetite $\Rightarrow$ chalcopyrite $\Rightarrow$ pyrite.



Figs 19, 20 **SA-121057** 0.18 mm

PTS. RPL. Early euhedral magnetite crystals, partly fractured and veined by chalcopyrite, are shown here enclosed in lenses of chalcopyrite with pyrite and possible marcasite (Fig 19, right-hand side) apparently growing into the chalcopyrite.

SA-121059

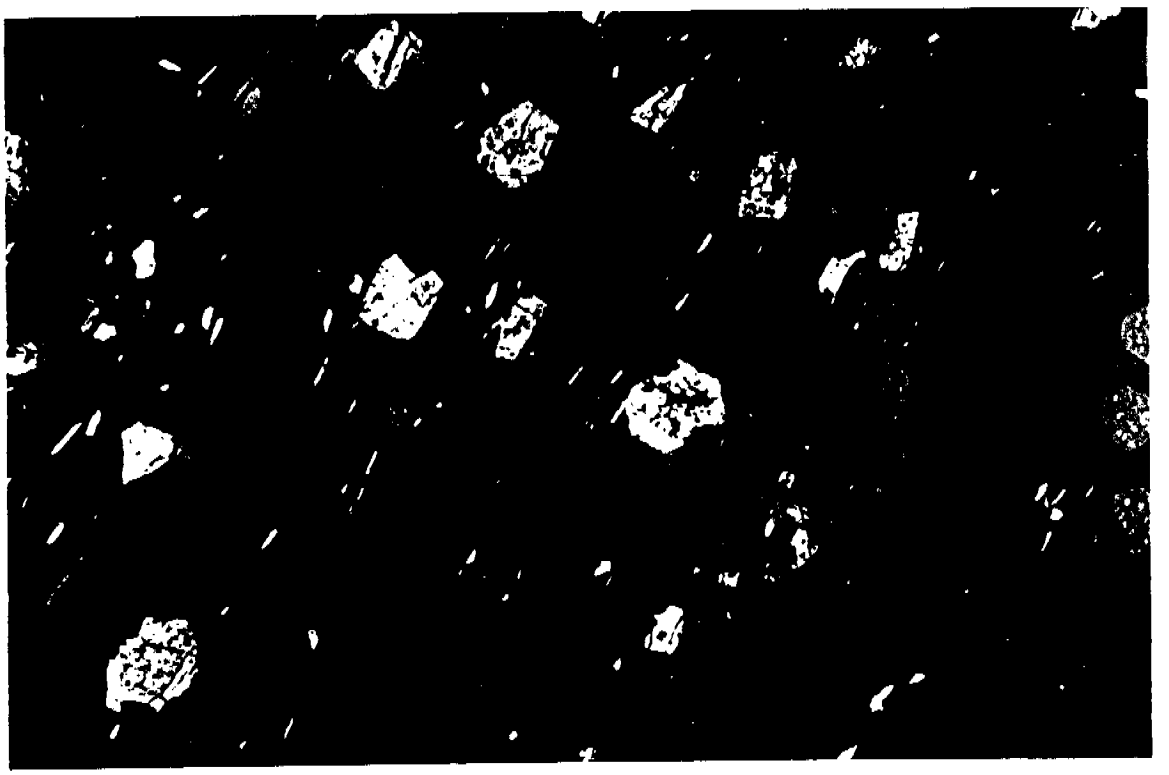
Folded schist with layers rich in sericite (after feldspar), garnet and schistose muscovite, alternating with quartz-biotite schist layers containing opaque oxide, very minor garnet and rare altered feldspar. The schist has been cut by shear zones rich in muscovite, with minor garnet and opaque oxide, parallel to the schistosity and the axial planes of the folds.

In hand-specimen, this is a grey contorted phyllite or fine-grained schist, possibly pelitic. The thin section, when viewed macroscopically, shows folded layers to 10mm wide, rich in sericite, separated by more quartz-rich layers. There are also sericite-rich microshears parallel to the axial planes of the folds, and also to a penetrative schistosity in the host rock.

In thin section, seen microscopically, the sericite seems to have replaced a fine-grained plagioclase micromosaic and occurs in layers that also contain abundant schistose muscovite and disseminated small garnet grains, about 0.1 to 0.25mm in diameter. The garnet has inclusion-rich cores and inclusion-rich rims. Minor opaque oxide is also disseminated. The more quartz-rich layers are composed of fine-grained quartz-biotite schist with very minor garnet, finer-grained than in the more sericite-rich layers, and rare altered very fine-grained feldspar. Opaque oxide is more abundant than in the sericite-rich layers but there is little or no muscovite.

The muscovite-rich shears are up to 8mm or more in width. Some are largely muscovite, but others have quartz-rich lamellae. Garnet is usually less abundant than in the sericite or quartz-rich layers in the host rock, but one shear has abundant garnet, and some have abundant opaque oxide. The widest shear seems to pass gradationally into a sericite-rich layer, but on the whole these are crosscutting and late in the history of the rock.

The oxides are magnetite, altered to granular hematite (2/3 of the opaque oxide) and primary hematite as small laths parallel to the schistosity (1/3 of the oxide).



Figs 21, 22 **SA-121059** 0.18 mm

TS. PPL. [Fig 21]. RPL. [Fig 22]. Most of the area covered by these photos is a schist with muscovite, sericite after plagioclase, garnet and opaque oxide. An area of quartz-biotite schist is seen in the lower right quadrant. In reflected light, the larger opaque oxide grains are oxidised magnetite, with smaller platy hematite aligned parallel to the schistosity. High fO_2 values and Fe-poor garnet are indicated.

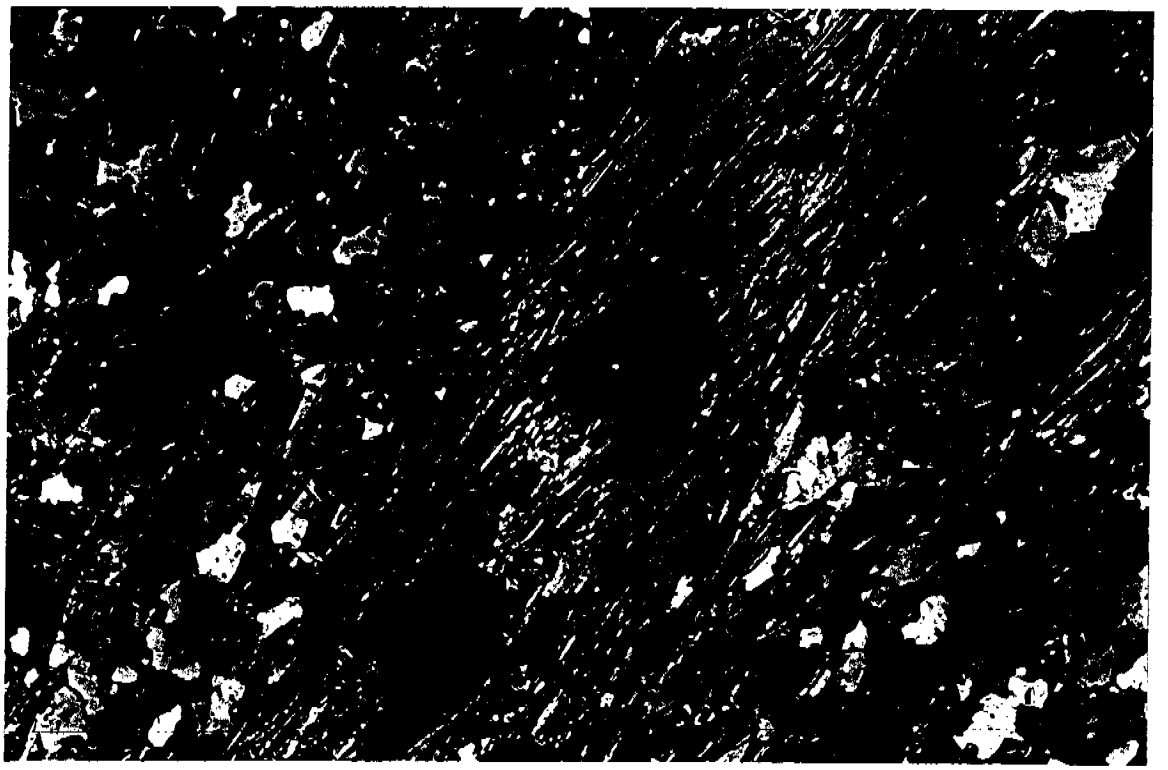


Fig 23 **SA-121059** 0.18 mm

TS. Xnic. The bright band is a muscovite-rich shear zone with quartz-biotite schist on either side. Garnet is present in the shear zone and minor muscovite occurs in the schist.

SA-121063

Quartz-muscovite-garnet schist with porphyroblasts of andalusite, biotite and staurolite: disseminated magnetite and ilmenite occur as well as very minor pyrite and rare chalcopyrite.

There are abundant porphyroblasts to 15 x 10mm in this sample, as seen in hand-specimen. The host rock also has schistose lamellae and spots of possible biotite. In thin section the host rock is a layered quartz-muscovite schist with millimetre to centimetre scale layers alternately rich in quartz and in muscovite. There is also from 2 to 8% disseminated garnet in the different layers. The garnet is mostly less than 0.4mm in grainsize and locally altered to chlorite. It is most abundant in the more muscovite-rich layers. Minor biotite occurs in the more quartz-rich layers. Fine-grained opaque oxide is disseminated throughout, including granular magnetite and fine platy schistose ilmenite. Small grains and aggregates of pyrite are disseminated and there is rare chalcopyrite.

The larger porphyroblasts are of andalusite and are mostly hosted by quartz-rich schist. Where they pass into quartz-rich schist, they are spongy with very abundant small inclusions of quartz. However, where they are adjacent to muscovite-rich layers in the host rock they are free of quartz inclusions, suggesting that they have been superimposed on a previously layered schist. Inclusions of garnet and opaque oxide occur throughout. Scattered porphyroblasts of biotite occur, to 4mm long and there are also less abundant poikiloblastic porphyroblasts of staurolite to 4mm long.

Clay and chlorite-lined fractures are present and one has an alteration-envelope of sericitic clays where it has cut across an andalusite porphyroblast.

Fig 24 **SA-121063** 0.45 mm

TS. Xnic. Most of this photo is occupied by a porphyroblast of andalusite (grey) with an inclusion-rich zone passing into quartz-rich host rock and an inclusion-poor zone largely adjacent to quartz-poor host rock. A porphyroblast of biotite is seen on the right-hand side and a clay vein has an alteration envelope of sericite within the andalusite.

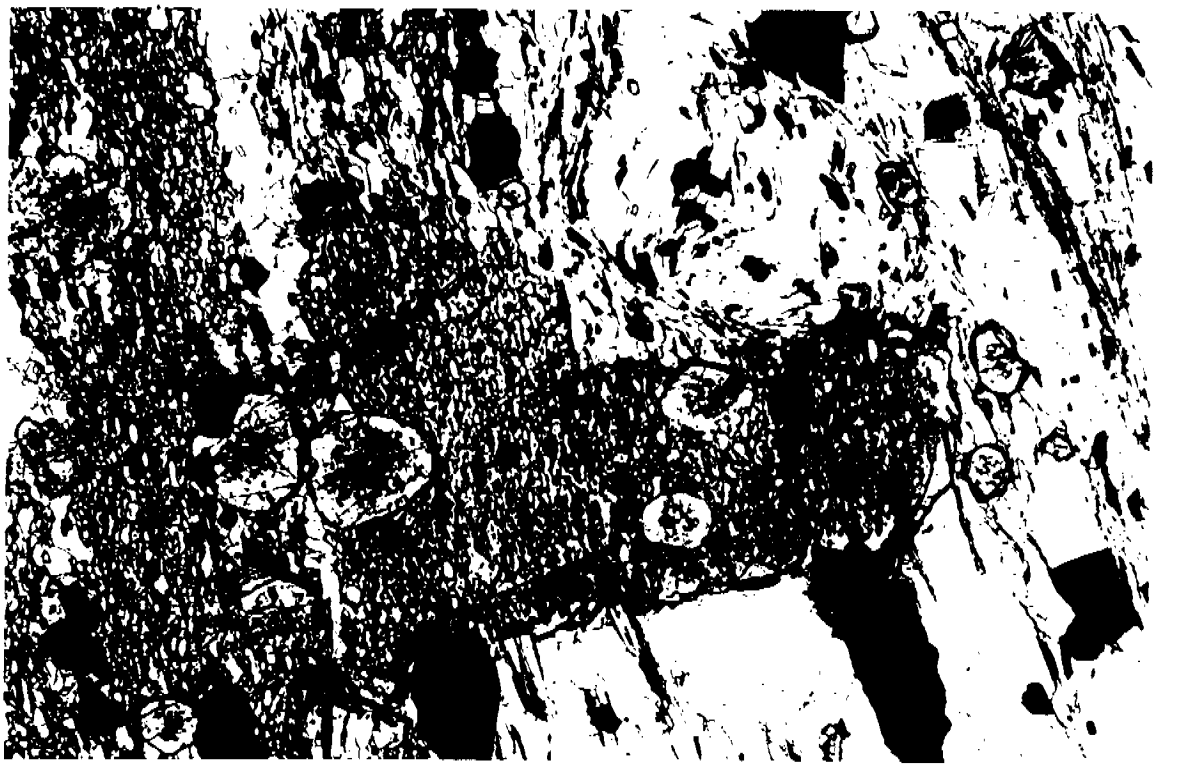


Fig 25 **SA-121063** 0.18 mm

TS. PPL. Staurolite is the main porphyroblast in this photo, with andalusite on the left-hand side and abundant small garnet grains. The host rock is a quartz-muscovite schist with magnetite, ilmenite and pyrite.

SA-121064 **Folded quartz-muscovite and garnet-muscovite-(quartz) schist layers with minor opaque oxide and sulphide.**

In hand-specimen, and in the thin section as viewed macroscopically, this sample is seen to have a complex fold pattern outlined by millimetre to centimetre scale compositional layers. The layers are seen in thin section to be alternately rich in garnet ± muscovite and in quartz. The garnet-rich layers are partly quartz-rich but are mostly composed of 5-75% garnet, the rest being mostly or all schistose muscovite. The quartz-rich layers have very minor muscovite, but also contain disseminated opaque oxide and garnet. The schistosity is axial plane to the folds but is fanned and tends to be parallel to the layering on the limbs of the folds.

Fine-grained magnetite is abundant and, especially in the garnet-muscovite layers, there is minor platy hematite aligned parallel to the schistosity. Poikiloblastic grains and euhedral crystals of pyrite occur randomly and are 0.5 to 1mm long. Minor fine-grained pyrite, locally composite with chalcopyrite, is also disseminated and rare small separate grains of chalcopyrite occur.

SA121067
RWD-4, 62.7m

Garnet-carbonate-galena-(chalcopyrite-sphalerite) rock with minor quartz and secondary copper sulphide (chalcocite, covellite).

This rock is rich in sulphide, mostly galena, and may be rich in garnet with an orange colour (probably Ca-rich rather than almandine). In thin section, there are large areas of yellow garnet veined by clays and limonite, or with interstitial areas of carbonate ± limonite. The carbonate and limonite may have partly replaced the garnet and some areas are largely composed of limonite and carbonate in irregular aggregates. In some areas, the garnet has been reduced to boxworks of carbonate and limonite, or to boxworks of limonite infilled by microcrystalline quartz. Some of the carbonate occurs in a lenticular vein to 7mm wide with scattered quartz grains. Coarser prismatic quartz also occurs, partly in the sulphide as well as in the fresh to altered garnet.

The coarse granular sulphide is mostly galena, but there are areas rich in chalcopyrite or in sphalerite, usually with chalcopyrite 'disease' in the sphalerite. The chalcopyrite commonly has rims of chalcocite and/or covellite and rarely has lamellae of bornite. The sphalerite is also commonly rimmed by chalcocite and irregular veins of chalcocite are common in the host rock. Very irregular fractures in the host rock are also filled by galena. Small patches of microplaty hematite occur, mostly in the galena, but are rare and apparently of late-stage origin.

A large crystal of pyrite 4 x 2mm occurs on the edge of the polished thin section and seems to be late but not as late as the hematite.

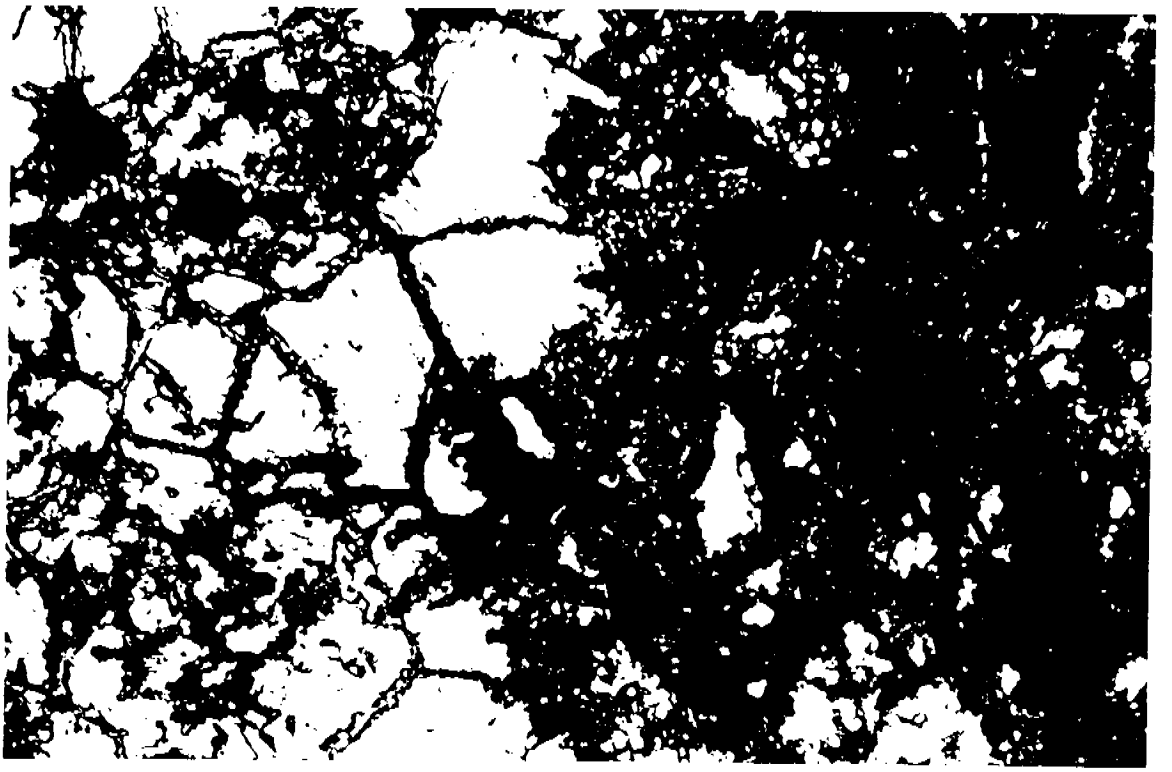


Fig 26 SA-121067 0.45 mm

TS. PPL. The clear areas in this photo are lime garnet, fractured and veined by clays and limonite, with minor sulphide (black areas).

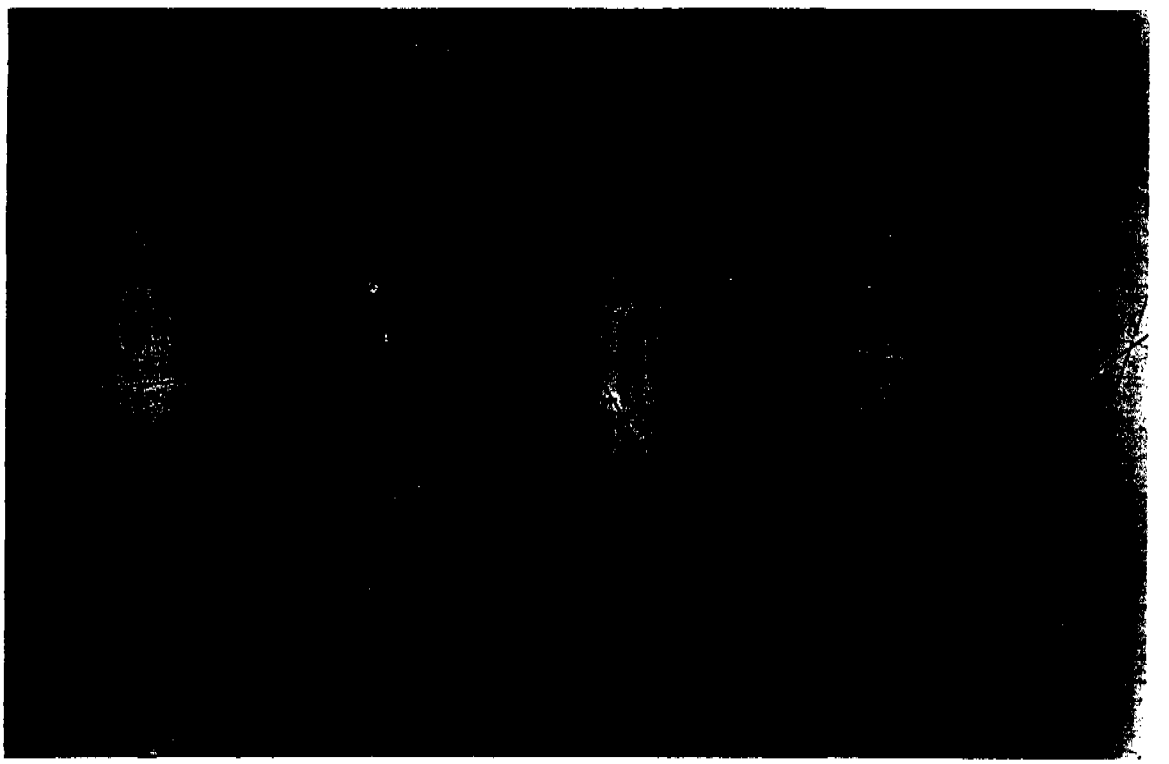


Fig 27 SA-121067 0.09 mm

PTS. RPL. A large area of galena with chalcopyrite partly separated from altered garnet (black) by rims of covellite (dark blue-grey).

Fig 28 **SA-121067** 0.09 mm

PTS. RPL. The main sulphide is sphalerite with parallel lamellae of chalcopyrite and rims of chalcocite. The gangue has been altered to carbonate and limonite.

Fig 29 **SA-121067** 0.09 mm

PTS. RPL. Chalcopyrite is shown here, rimmed by chalcocite. Thin lamellae of bornite occur in the chalcopyrite on the left-hand side, adjacent to galena. Kernels of garnet are seen in the gangue with veins of carbonate and limonite.

Fig 30 **SA-121067** 0.18 mm

PTS. RPL. Coarse pyrite, shown here, has grown in a matrix of galena and sphalerite, with rare chalcocite.

Fig 31 **SA-121067** 0.18 mm

PTS. RPL. Irregular narrow veins of galena are seen in this photo, cutting partly altered garnet.

Appendix 2

Airborne Geophysics

Appendix 2a

Logistics Report

Logistics Report

for a

DETAILED AIRBORNE MAGNETIC, RADIOMETRIC AND DIGITAL ELEVATION SURVEY

for the

JERVOIS PROJECT

carried out on behalf of

MIM EXPLORATION PTY LTD

by

UTS GEOPHYSICS

(UTS Job #A351)

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PO BOX 126, BELMONT WA 6104
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TABLE OF CONTENTS

1 GENERAL SURVEY INFORMATION

In September 1999, UTS Geophysics conducted a low level airborne geophysical survey approximately 250km east-north east of Alice Springs for MIM Exploration Pty Ltd.

This report summarises the logistics, survey parameters and processing details of the survey.

The survey commenced on the 8th September 1999 and was completed on the 12th September 1999.

UTS Geophysics provided the described survey for the following company:

MIM Exploration Pty Ltd
Level 2, Boundary Court
55 Little Edward Street
SPRING HILL, QLD, 4000

2 SURVEY LOCATION

The area surveyed was approximately 250km east-north east of Alice Springs near the Jervois Homestead in the Northern Territory. A survey location map is provided in Appendix C of this report.

The survey was flown using the AMG84 coordinate system (a Universal Transverse Mercator projection) derived from the AGD66 geodetic datum and was contained within zone 53 with a central meridian of 135 degrees. Details of the datum and project system are provided in Appendix B of this report.

3 AIRCRAFT AND SURVEY EQUIPMENT

The UTS navigation flight control computer, data acquisition system and geophysical sensors were installed into a specialised geophysical survey aircraft.

The list of geophysical and navigation equipment used for the survey is as follows:

General Survey Equipment

- FU24-954 fixed wing survey aircraft.
- UTS proprietory flight planning and survey navigation system.
- UTS proprietory high speed digital data acquisition system.
- Novatel 3951R, 12 channel precision navigation GPS.
- Satellite transmitted differential GPS correction receiver.
- UTS LCD pilot navigation display and external track guidance display.
- UTS post mission data verification and processing system.
- Bendix King KRA-405 radar altimeter.

Magnetic Data Acquisition Equipment

- UTS tail stinger magnetometer installation.
- Scintrex Cesium Vapour CS-2 total field magnetometer.
- Develco three component vector magnetometer.
- RMS Aeromagnetic Automatic Digital Compensator (AADC II).
- Diurnal monitoring magnetometer 1 (Geometrics G-856).
- Diurnal monitoring magnetometer 2 (Scintrex Envimag).

Radiometric Data Acquisition Equipment

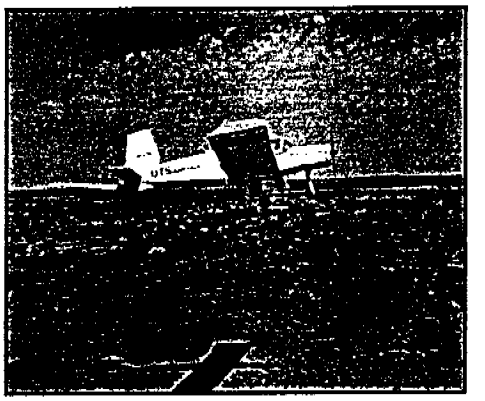
- Exploranium GR-820 gamma ray spectrometer.
- Exploranium gamma ray detectors (2 x 16 litres).
- Barometric altimeter (height and pressure measurements).
- Temperature and humidity sensor.

3.1 Survey Aircraft

The aircraft used was a FU24-954 fixed wing survey aircraft owned by UTS Geophysics, registration VH-CYU.

Power Plant

• Engine Type	Single engine, Lycoming, IO-720
• Brake Horse Power	400 bhp
• Fuel Type	AV-GAS



Performance

• Cruise speed	105 Kn
• Survey speed	100 Kn
• Stall speed	45 Kn
• Range	970 Km
• Endurance (no reserves)	5 hours
• Fuel tank capacity	490 litres

3.2 Data Positioning and Flight Navigation

Survey data positioning and flight line navigation was derived using real-time differential GPS (Global Positioning System).

Navigation was provided through a UTS designed and built electronic pilot navigation system providing computer controlled digital navigation instrumentation mounted in the cockpit as well as an externally mounted track guidance system.

GPS derived positions were used to provide both aircraft navigation and survey data location information.

The GPS systems used for the survey were:

• Aircraft GPS Model	Novatel 3951R
• GPS satellite tracking channels	12 parallel
• Typical differentially corrected accuracy	2-3 metres (horizontal)
• Real-time differential service	RACAL Landstar

3.3 UTS Data Acquisition System and Digital Recording

All geophysical sensor data and positional information measured during the survey was recorded using a UTS developed, high speed, precision data acquisition system. Survey data was downloaded onto magnetic tape on completion of each survey flight.

Instrument synchronisation times were measured and removed in real-time by the UTS data acquisition system.

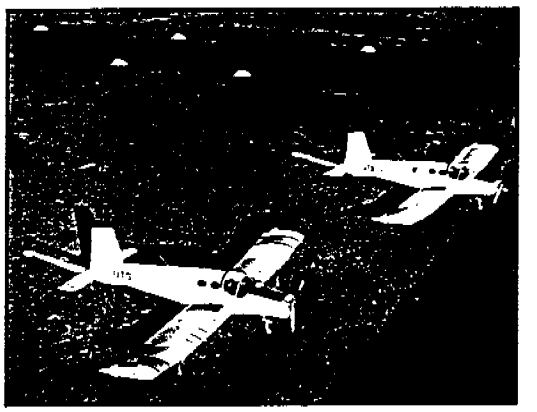
3.4 Altitude Readings

Accurate survey heights above the terrain were measured using a King radar altimeter installed in the aircraft. The height of each survey data point was measured by the radar altimeter and stored by the UTS data acquisition system.

• Radar altimeter model	King KRA-405, twin antenna altimeter
• Accuracy	0.3 metres
• Resolution	0.1 metres
• Range	0 - 500 metres
• Sample rate	0.1 Seconds (10Hz)

3.5 UTS Stinger Mounted Magnetometer System

The installation platform used for the acquisition of magnetic data was a tail mounted stinger. This proprietory stinger system was constructed of carbon fibre and designed for maximum rigidity and stability.



Both the total field magnetometer and three component vector magnetometer were located within the tail stinger.

3.6 Total Field Magnetometer

Total field magnetic data readings for the survey were made using a Scintrex Cesium Vapour CS-2 Magnetometer. This precision sensor has the following specifications:

• Model	Scintrex Cesium Vapour CS-2 Magnetometer
• Sample Rate	0.1 seconds (10Hz)
• Resolution	0.001nT
• Operating Range	15,000nT to 100,000nT
• Temperature Range	-20°C to +50°C

3.7 Aircraft Magnetic Compensation

At the start of the survey, the system was calibrated for reduction of magnetic heading error. The heading and manoeuvre effects of the aircraft on the magnetic data was removed using an RMS Automatic Airborne Digital Compensator (AADC II).

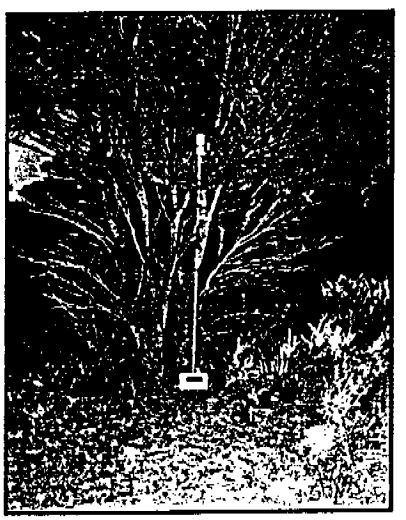
Calibration of the aircraft heading effects were measured by flying a series of pitch, roll and yaw manoeuvres at high altitude while monitoring changes in the three axis magnetometer and the effect on total field readings. A 26 term model of the aircraft magnetic noise covering permanent, induced and eddy current fields was determined. These coefficients were then applied to the data collected during the survey in real-time.

UTS static compensation techniques were also employed to reduce the initial magnetic effects of the aircraft upon the survey data.

3.8 Diurnal Monitoring Magnetometer

Two base station magnetometers were located in a low gradient area beyond the region of influence by any man made interference to monitor diurnal variations during the survey.

The specifications for the magnetometers used are as follows:



- Model — Scintrex Envimag
- Resolution — 0.1 nT
- Sample interval — 5 seconds (0.2Hz)
- Operating range — 20,000nT to 90,000nT
- Temperature — -20°C to +50°C

- Model — Geometrics G-856
- Resolution — 0.1 nT
- Sample interval — 10 seconds (0.1Hz)
- Operating range — 20,000nT to 90,000nT
- Temperature — -20°C to +50°C

3.9 Barometric Altitude

An Air DB barometric altimeter was installed in the aircraft so as to record and monitor barometric height and pressure. The data was recorded at 0.33 second intervals and is used for the reduction of the radiometric data.

- Model — Air DB barometric altimeter
- Accuracy — 2 metres
- Height resolution — 0.1 metres
- Height range — 0 - 3500 metres
- Maximum operating pressure: — 1,300 mb
- Pressure resolution: — 0.01 mb
- Sample rate — 3 Hz

3.10 Temperature and Humidity

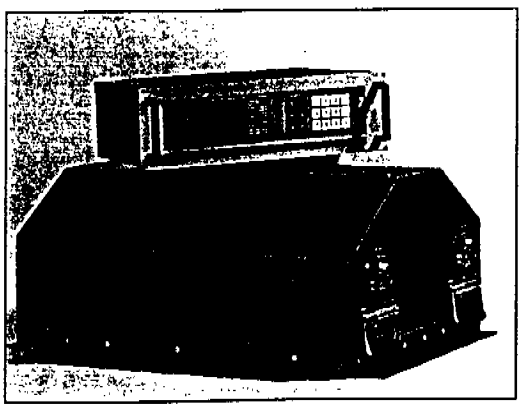
Temperature and humidity measurements were made during the survey at a sample rate of 10Hz. Ambient temperature was measured with a resolution of 0.1 degree Celsius and ambient humidity to a resolution of 0.1 percent.

3.11 Radiometric Data Acquisition

The gamma ray spectrometer used for the survey was capable of recording 256 channels and was self stabilising in order to minimise spectral drift. The detectors used contain thallium activated sodium iodide crystals.

Thorium, cesium and uranium source measurements were made each survey day to monitor system resolution and sensitivity. A calibration line was also flown at the start and end of each survey day to monitor ground moisture levels and system performance.

- Spectrometer model — Exploranium, GR820
- Detector volume — 33 litres



4 PERSONNEL

4.1 *Field Operations*

UTS Geophysics operator and data processor	Steve Whelan
UTS Geophysics Survey Pilot	Mike Officer

4.2 *Project Management*

MIM Exploration Pty Ltd	David Burt
UTS Geophysics Perth Office	Neil Goodey

5 SURVEY PARAMETERS

The survey data acquisition specifications for each area flown are specified in the following table:

PROJECT NAME	LINE SPACING	LINE DIRECTION	TIE LINE SPACING	TIE LINE DIRECTION	SENSOR HEIGHT	TOTAL LINE KM
Jervoise Project	50m	090-270	500m	000-180	25m	2,439
TOTAL						2,439

The total number of line kilometres of survey data collected over the survey areas specified in the above table was 2,439.

The specified sensor height for the magnetic samples is as stated in the above table. This sensor height may be varied where topographic relief or laws pertaining to built up areas do not allow this altitude to be maintained, or where the safety of the aircraft and equipment is endangered.

The coordinate boundaries for the survey area flown is detailed in Appendix C.

6 SURVEY LOGISTICS

The base location used for operating the aircraft and performing in-field quality control and data processing of the survey data was the Jervois Homestead in the Northern Territory. The aircraft was operated from the Jervois Homestead Airstrip.

6.1 *Survey Flight Summary*

The following table summarises the flight logs for the survey area flown:

Flight Date	Area No	Flight No	Area Name / Survey Details	Lines Flown	Line Km Flown
08/09/99			Mobilisation to Jervois	-	-
09/09/99	1	T1	Jervois Project - Tie Lines 01 Lines 190010-190170	17	223
	1	1	Jervois Project - Flight 1 Lines 102540-102590 Lines 102490-102520	10	85
10/09/99	1	2	Jervois Project - Flight 2 Lines 100360-101000	65	554
	1	3	Jervois Project - Flight 3 Lines 101010-101250 Lines 100350-100010	60	514
11/09/99	1	4	Jervois Project - Flight 4 Lines 102530-102530 Lines 101850-102480	65	557
11/09/99	1	5	Jervois Project - Flight 5 Lines 101260-101840	59	506
12/09/99	-	-	Demobilisation	-	-
TOTAL					**2439**

A complete survey kilometre report is contained in Appendix G of this report.

6.2 Diurnal Magnetometer Locations

The following table contains the approximate locations where the diurnal base station magnetometer was located for each survey area.

Area Name	Period	Base Station ID	Location
Jervois Project	09/09/99-11/09/99	01	200m from the Jervois Airstrip

6.3 Spectrometer Calibration Results

Appendix E of this report contains the results of the daily spectrometer resolution and sensitivity tests performed during the survey.

7 DATA PROCESSING PROCEDURES

7.1 Magnetic Data Processing

The raw magnetic survey data was loaded from the field tapes and the recorded data trimmed to the correct survey boundary extents. Any reflight lines required were removed from the data.

The diurnal base station data was loaded, checked and suitably filtered for application to the aircraft magnetic data. The diurnal measurements were then subtracted from a diurnal base field value and the corrections removed from the survey data by synchronising the diurnal data time and the aircraft survey time.

The regional magnetic gradient was subtracted from the data by application of the IGRF model calculated at the date of the survey and interpolated on position and time.

The data was then corrected to remove any residual parallax errors. Tie line levelling was applied to the data by measuring tie line crossover points with the survey traverse line data.

Final microlevelling techniques were then applied to the data to remove minor residual variations in profile intensities.

Located and gridded data were generated for the final processed magnetic data.

7.2 Radiometric Data Processing

The raw radiometric survey data was loaded from the field tapes and the recorded data trimmed to the correct survey boundary extents. Any reflight lines were removed from the data.

Statistical noise reduction of the 256 channel data was performed using the MNF method. The energy spectrum between the potassium and thorium peaks was recalibrated from the 256 channel measurements. The 256 channel data was then reduced to the 5 primary channels of total count, potassium, uranium, thorium and low-uranium. Dead time corrections were then applied to the data.

Cosmic and aircraft background corrections were applied. Radon background removal was performed using the Minty Spectral Ratio method (1992). Spectral stripping was then applied to the windowed data.

The altimeter data was corrected and converted to standard temperature and pressure altitude. Height corrections for the stripped windows was performed to remove any altitude variation effects from the data (refer to Appendix E for stripping ratios and equations).

The corrected count rate data was then converted to ground concentrations for potassium, uranium and thorium.

Final microlevelling of the total count, potassium, uranium and thorium data was then applied to remove minor residual variations in profile intensities.

For further information concerning the survey flown, please contact the following office:

Head Office Address:

UTS Geophysics
Valentine Road, Perth Airport
REDCLIFFE WA 6104

Tel: +61 8 9479 4232
Fax: +61 8 9479 7361

Postal Address:

UTS Geophysics
P.O. Box 126
BELMONT WA 6104

APPENDIX A - LOCATED DATA FORMATS

MAGNETIC LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I6	LINE NUMBER	
2	I5	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I8	DATE	YYMMDD
4	F11.1	TIME	sec
5	I8	FIDUCIAL NUMBER	
6	I3	UTM/AMG ZONE	
7	F10.2	EASTING (AMG84)	metres
8	F11.2	NORTHING (AMG84)	metres
9	F13.7	LATITUDE (WGS84)	degrees
10	F13.7	LONGITUDE (WGS84)	degrees
11	F7.1	RADAR ALTIMETER HEIGHT	metres
12	F7.1	GPS HEIGHT (WGS84)	metres
13	F7.1	TERRAIN HEIGHT (CORRECTED)	metres
14	F10.2	RAW MAGNETIC INTENSITY	nT
15	F10.2	DIURNAL CORRECTION	nT
16	F10.2	LEVELLED MAGNETIC INTENSITY	nT
17	F10.2	IGRF CORRECTION	nT
18	F10.2	LEVELLED, IGRF CORRECTED	nT

RADIOMETRIC LOCATED DATA

FIELD	FORMAT	DESCRIPTION	UNITS
1	I6	LINE NUMBER	
2	I5	FLIGHT/AREA NUMBER	AAFF (Area/Flight)
3	I8	DATE	YYMMDD
4	F11.1	TIME	sec
5	I8	FIDUCIAL NUMBER	
6	I3	UTM/AMG ZONE	
7	F10.2	EASTING (AMG84)	metres
8	F11.2	NORTHING (AMG84)	metres
9	F13.7	LATITUDE (WGS84)	degrees
10	F13.7	LONGITUDE (WGS84)	degrees
11	F7.1	RADAR ALTIMETER HEIGHT	metres
12	F7.1	GPS HEIGHT (WGS84)	metres
13	I5	LIVE TIME	milli sec
14	F7.1	PRESSURE	hPa
15	F5.1	TEMPERATURE	Degrees Celcius
16	F8.1	TOTAL COUNT (RAW)	Counts/sec
17	F7.1	POTASSIUM (RAW)	Counts/sec
18	F7.1	URANIUM (RAW)	Counts/sec
19	F7.1	THORIUM (RAW)	Counts/sec
20	F7.1	COSMIC (RAW)	Counts/sec
21	F7.1	URANIUM LOW (RAW)	Counts/sec
22	F7.1	URANIUM UP (RAW)	Counts/sec
23	F8.1	TOTAL COUNT (CORRECTED)	Counts/sec
24	F7.1	POTASSIUM (CORRECTED)	Counts/sec
25	F7.1	URANIUM (CORRECTED)	Counts/sec
26	F7.1	THORIUM (CORRECTED)	Counts/sec
27	F7.3	POTASSIUM GRND CONCENTRATION	ppm
28	F7.3	URANIUM GRND CONCENTRATION	ppm
29	F7.3	THORIUM GRND CONCENTRATION	ppm

GRIDDED DATASET FORMATS

Gridding was performed using a bicubic spline algorithm.

The following grid formats have been provided:
- ER-Mapper format

LINE NUMBER FORMATS

Line numbers are identified with a six digit composite line number and have the following format - ALLLLB, where:

A	Survey area number
LLLL	Survey line number
	0001-8999 reserved for traverse lines
	9001-9999 reserved for tie lines
B	Line attempt number, 0 is attempt 1, 1 is attempt 2 etc..

UTS FILE NAMING FORMATS

Located and gridded data provided by UTS Geophysics uses the following 8 character file naming convention to be compatible with PC DOS based systems.

File names have the following general format - JJJJAABB.EEE, where:

JJJJ	UTS Job number	
AA	Area number if the survey is broken into blocks	
BB	M	Magnetic data
	R	Radiometric data
	TC	Total count data
	K	Potassium counts
	U	Uranium counts
	Th	Thorium counts
	KC	Potassium concentration
	UC	Uranium concentration
	ThC	Thorium concentration
	DT	Digital terrain data
EEE	File name extension	
	LDT	Located digital data file
	FMT	Located data format definition file
	ERS	Ermapper gridded data header file
		Ermapper data portion has no extension
	GRD	Geosoft gridded data file

APPENDIX B - COORDINATE SYSTEM DETAILS

Locations for the survey data are provided in both geographical latitude and longitude coordinated as well as a Universal Transverse Mercator metric projection coordinate system.

WGS84	World Geodetic System 1984
Height Datum	WGS84
Coordinate Type	Geographical
Semi Major Axis	6378137
Flattening	1/298.257223563
AMG84	Australian Map Grid 1984
Coordinate Type	Universal Transverse Mercator Projection Derived from the AGD66 spheroid
Semi Major Axis	6378160
Flattening	1/298.25

APPENDIX C - SURVEY BOUNDARY DETAILS

COORDINATES REPORT

Job ID code: A3510101

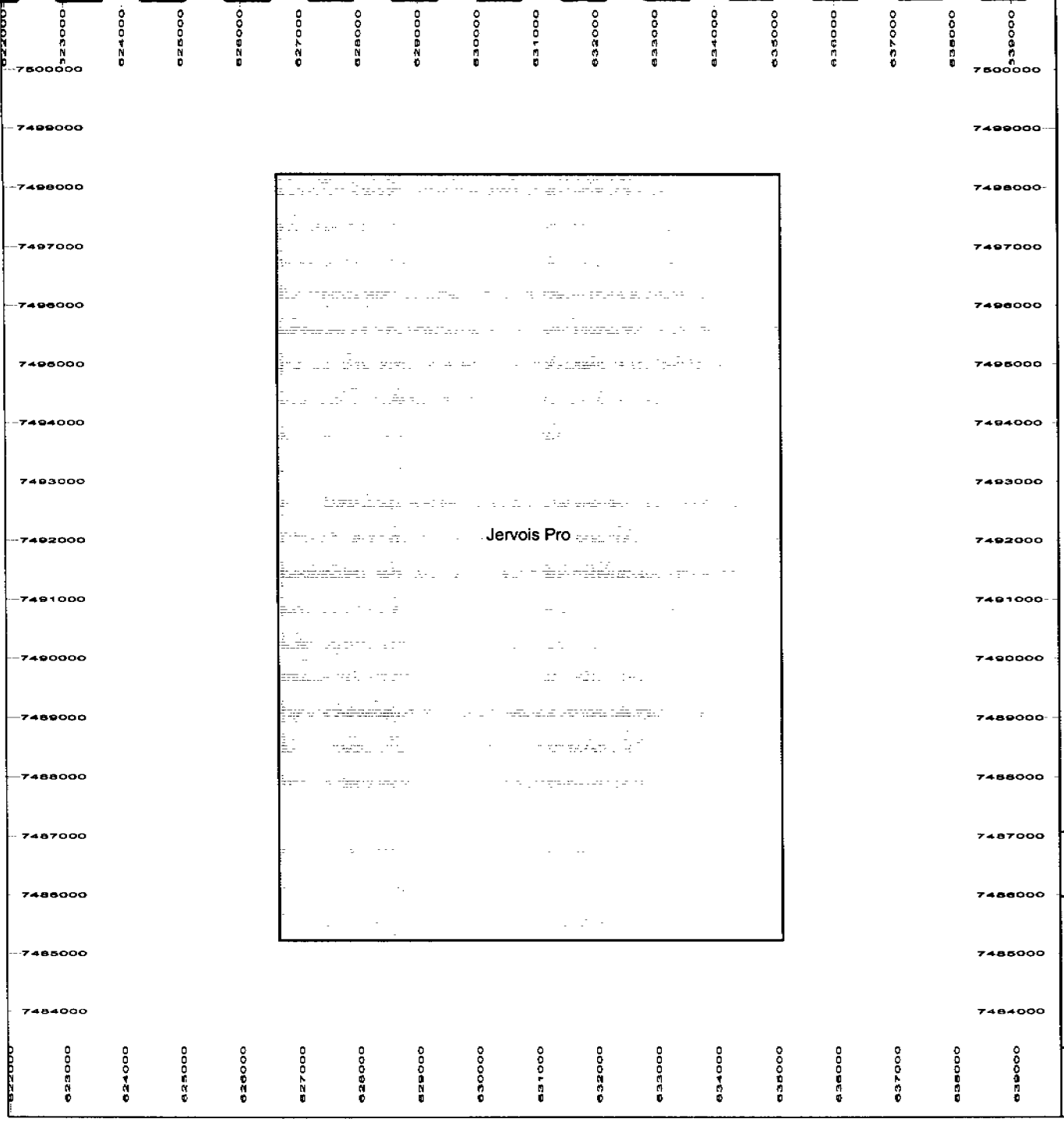
Client: MIM Exploration Pty Ltd

Job: Jervois Project

Grid Zone: 53

Include Point: 0.0 0.00

Surround	Jervois Pro
626625.000	7485230.000
626625.000	7498220.000
635075.000	7498220.000
635075.000	7485230.000



JOB DETAILS

Job Number:	A3510101
Product:	
Aircraft Type:	FU24-950
Aircraft Rego:	VH-CYU
Pilot:	Mike Officer
Operator:	Steve Whelan
Line Spacing	50.0 m
Line Direction	090 - 270 deg
MAP AREA	10976.6 ha
AREA SPRAYED	0.0 ha

MAP DETAILS

Grid North

Projection: AMG84
Sheet 1 of 1
Scale 1:100000

0 1000 2000 3000 4000 5000 6000 7000 8000

Drawn: / /
Checked: / /
Approved: / /

Plotted by Universal Tracking Systems Flight Block Planner v3.99

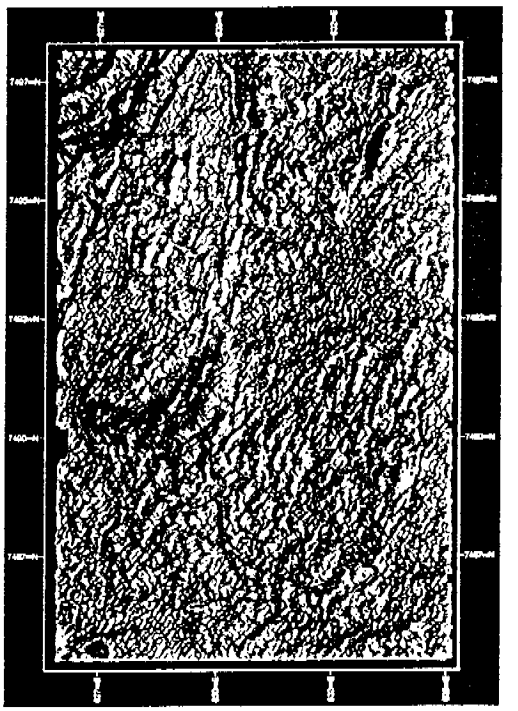
MIM Exploration Pty Ltd

Jervois Project

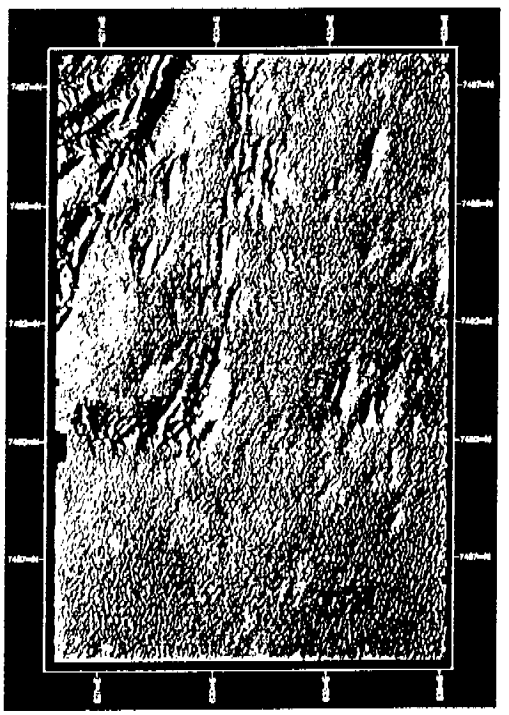
Flown by: UTS Geophysics
Job: Jervois Project
Flight Date:

APPENDIX D - PROJECT DATA OVERVIEW – Jervois Project

Total Magnetic Intensity



Radiometric Total Count



Digital Terrain Model

APPENDIX E – RADIOMETRIC CALIBRATION RESULTS

Source Check Report

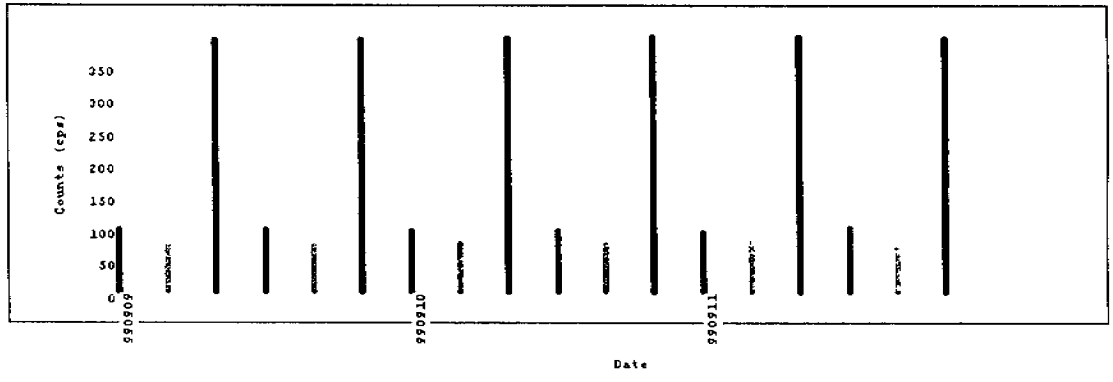
Date	Th.ROI	Th.ROIU	Th.ROIK	U.ROITh	U.ROIU	U.ROIK	B/G.ROI	TB/G.ROI	UB/G.ROIK
9909090	23097	4315	5761	33194	20667	12184	7078	5034	19633
9909095	23062	4412	5751	33209	20517	12223	7070	5109	19625
9909100	23225	4631	5606	33213	20754	12795	7230	5169	19641
9909105	23326	4361	5547	32993	20515	12523	7250	5275	19751
9909110	23278	4542	5410	32918	20771	12434	7309	5120	19792
9909115	23170	4134	5769	33001	20771	12241	7123	5311	19925
Mean	23193	4399	5641	33088	20666	12400	7177	5170	19728

Per Cent Source Check Report

Date	Th.ROITh	Th.ROIU	Th.ROIK	U.ROITh	U.ROIU	U.ROIK	B/G.ROITh	B/G.ROIU	B/G.ROIK
9909090	-0.4	-1.9	2.1	0.3	0.0	-1.7	-1.4	-2.6	-0.5
9909095	-0.6	0.3	2.0	0.4	-0.7	-1.4	-1.5	-1.2	-0.5
9909100	0.1	5.3	-0.6	0.4	0.4	3.2	0.7	-0.0	-0.4
9909105	0.6	-0.9	-1.7	-0.3	-0.7	1.0	1.0	2.0	0.1
9909110	0.4	3.2	-4.1	-0.5	0.5	0.3	1.8	-1.0	0.3
9909115	-0.1	-6.0	2.3	-0.3	0.5	-1.3	-0.7	2.7	1.0

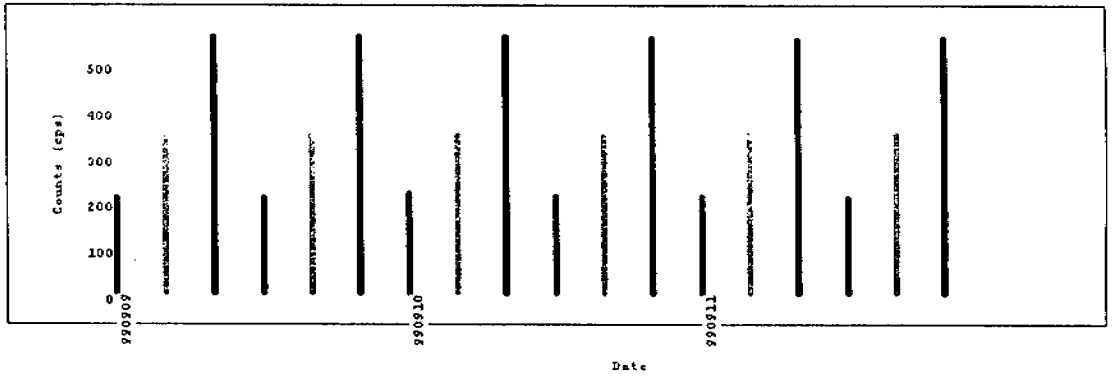
Thorium Source Test (Ground)

Date	K	U	Th	% Error
990909	96.0	71.9	384.9	-0.2
990909	95.8	73.5	384.4	-0.0
990910	93.4	77.2	387.1	0.7
990910	92.5	72.7	388.8	0.0
990911	90.2	75.7	388.0	-0.0
990911	96.2	68.9	386.2	-0.5
Avrg	**94.0**	**73.3**	**386.5**	**0.0**



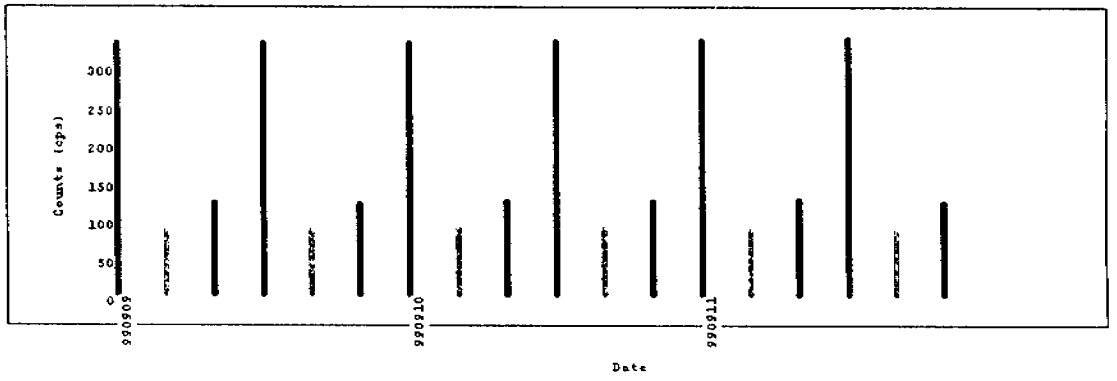
Uranium Source Test (Ground)

Date	K	U	Th	% Error
990909	203.1	344.4	553.2	-0.2
990909	203.7	341.9	553.5	-0.3
990910	213.3	345.9	553.5	0.9
990910	208.7	341.9	549.9	-0.2
990911	207.2	346.2	548.6	-0.0
990911	204.0	346.2	550.0	-0.2
Avrg	**206.7**	**344.4**	**551.5**	**0.0**



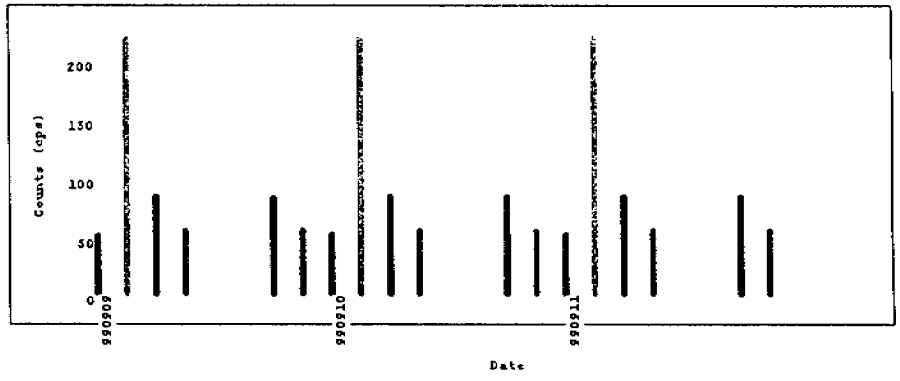
Background Source Test (Ground)

Date	K	U	Th	% Error
990909	327.2	83.9	118.0	-1.0
990909	327.1	85.2	117.8	-0.8
990910	327.4	86.2	120.5	-0.1
990910	329.2	87.9	120.8	0.6
990911	329.9	85.3	121.8	0.5
990911	332.1	88.5	118.7	0.9
Avrg	**328.8**	**86.2**	**119.6**	**0.0**



Spectrometer Calibration (Ground)

Date	Sys Res(Th)	Peak Ch(Th)	Sys Res(Cs)	Peak Ch(Cs)
990909	50.0	218.2	83.0	54.7
990909	0.0	0.0	82.0	54.8
990910	51.0	218.1	83.0	54.7
990910	0.0	0.0	83.0	55.0
990911	51.0	218.2	83.0	55.0
990911	0.0	0.0	83.0	54.8
Avrg	50.7	218.2	82.8	54.8



APPENDIX F – RADIOMETRIC EQUATIONS

Stripping Ratios

alpha	0.224
beta	0.395
gamma	0.722
a	0.047
b	0.000
c	0.000

Height Attenuation Coefficients

Total Count	-0.0060
Potassium	-0.0075
Uranium	-0.0039
Thorium	-0.0062

Height Datum

All data reduced to STP height datum 20m

Stripping Equations

alpha	=	alpha + STPHeight * 0.00049
beta	=	beta + STPHeight * 0.00065
gamma	=	gamma + STPHeight * 0.00069
tho`	=	(tho – (a * ura)) / (1 – (a * alpha)
ura`	=	(ura – (alpha * tho)) / 1 – (a * alpha)
pot`	=	pot – (beta * tho`) – (gamma * ura`)

Conversion to Concentrations

Potassium	=	k.cps / 232.1
Uranium	=	u.cps / 33.0
Thorium	=	th.cps / 9.2

APPENDIX G – SURVEY KILOMETRE REPORT

LINE KM REPORT FOR a35101m.ldt

LINE	FLT	DATE	START COORDINATE		END COORDINATE		LINE KM
190020	101	990909	634849	7485231	634848	7498259	13.0
190030	101	990909	634357	7498255	634352	7485191	13.1
190040	101	990909	633864	7485200	633843	7498309	13.1
190050	101	990909	633359	7498206	633349	7485144	13.1
190060	101	990909	632858	7485225	632854	7498295	13.1
190070	101	990909	632329	7498234	632349	7485195	13.0
190080	101	990909	631843	7485191	631849	7498285	13.1
190090	101	990909	631346	7498248	631349	7485168	13.1
190100	101	990909	630842	7485194	630846	7498278	13.1
190110	101	990909	630336	7498248	630356	7485141	13.1
190120	101	990909	629870	7485222	629883	7498299	13.1
190130	101	990909	629352	7498252	629345	7485178	13.1
190140	101	990909	628846	7485205	628846	7498263	13.1
190150	101	990909	628324	7498249	628352	7485166	13.1
190160	101	990909	627837	7485188	627833	7498294	13.1
190170	101	990909	627371	7498266	627355	7485186	13.1
102590	101	990909	626853	7485210	626861	7498301	13.1
102580	101	990909	626604	7498172	635160	7498172	8.6
102570	101	990909	635083	7498124	626558	7498128	8.5
102560	101	990909	626602	7498079	635128	7498075	8.5
102550	101	990909	626609	7498020	635127	7498030	8.5
102540	101	990909	635106	7497969	626540	7497981	8.6
102520	101	990909	626632	7497919	635156	7497926	8.5
102510	101	990909	635072	7497817	626574	7497824	8.5
102500	101	990909	626639	7497778	635132	7497774	8.5
102490	101	990909	635070	7497719	626538	7497717	8.5
101000	102	990910	626589	7497668	635141	7497672	8.6
100990	102	990910	635114	7490225	626541	7490222	8.6
100980	102	990910	626589	7490169	635161	7490172	8.6
100970	102	990910	635117	7490114	626782	7490117	8.3
100960	102	990910	626826	7490089	635146	7490071	8.3
100950	102	990910	635112	7490015	626777	7490023	8.3
100940	102	990910	626821	7489965	635148	7489979	8.3
100930	102	990910	635111	7489927	626764	7489926	8.3
100920	102	990910	626817	7489879	635160	7489874	8.3
100910	102	990910	635100	7489829	626782	7489821	8.3
100900	102	990910	626844	7489783	635161	7489775	8.3
100890	102	990910	635114	7489726	626774	7489729	8.3
100880	102	990910	626822	7489676	635161	7489676	8.3
100870	102	990910	635095	7489619	626766	7489628	8.3
100860	102	990910	626599	7489563	635165	7489569	8.6
100850	102	990910	635099	7489533	626603	7489537	8.5
100840	102	990910	626568	7489468	635152	7489472	8.6
100830	102	990910	635100	7489424	626567	7489428	8.5
100820	102	990910	626608	7489368	635163	7489376	8.6
100810	102	990910	635118	7489324	626574	7489322	8.5
100800	102	990910	626605	7489271	635166	7489272	8.6
100790	102	990910	635112	7489226	626551	7489225	8.6
100780	102	990910	626589	7489174	635142	7489180	8.6
100770	102	990910	635111	7489105	626544	7489122	8.6
100760	102	990910	626605	7489060	635164	7489078	8.6
100750	102	990910	635105	7489021	626551	7489028	8.6
100740	102	990910	626583	7488962	635144	7488974	8.6
100730	102	990910	635114	7488917	626535	7488923	8.6
100720	102	990910	626587	7488874	635157	7488874	8.6

100710	102	990910	635098	7488823	626561	7488823	8.5
100700	102	990910	626608	7488777	635145	7488774	8.5
100690	102	990910	635103	7488720	626558	7488727	8.5
100680	102	990910	626591	7488666	635143	7488674	8.6
100670	102	990910	635094	7488613	626546	7488628	8.5
100660	102	990910	626588	7488559	635150	7488578	8.6
100650	102	990910	635117	7488554	626558	7488521	8.6
100640	102	990910	626595	7488465	635143	7488481	8.5
100630	102	990910	635106	7488423	626546	7488431	8.6
100620	102	990910	626592	7488374	635153	7488373	8.6
100610	102	990910	635094	7488346	626559	7488321	8.5
100600	102	990910	626593	7488263	635150	7488274	8.6
100590	102	990910	635093	7488244	626551	7488220	8.5
100580	102	990910	626592	7488174	635161	7488175	8.6
100570	102	990910	635117	7488127	626542	7488130	8.6
100560	102	990910	626605	7488068	635150	7488080	8.5
100550	102	990910	635097	7488012	626544	7488024	8.6
100540	102	990910	626578	7487976	635144	7487978	8.6
100530	102	990910	635102	7487922	626538	7487924	8.6
100520	102	990910	626587	7487859	635151	7487876	8.6
100510	102	990910	635096	7487822	626537	7487821	8.6
100500	102	990910	626589	7487778	635165	7487775	8.6
100490	102	990910	635107	7487722	626542	7487720	8.6
100480	102	990910	626595	7487679	635148	7487670	8.6
100470	102	990910	635095	7487620	626545	7487627	8.6
100460	102	990910	626587	7487580	635140	7487573	8.6
100450	102	990910	635107	7487536	626557	7487523	8.6
100440	102	990910	626599	7487471	635145	7487481	8.5
100430	102	990910	635114	7487427	626540	7487427	8.6
100420	102	990910	626603	7487378	635149	7487379	8.5
100410	102	990910	635105	7487315	626552	7487324	8.6
100400	102	990910	626602	7487282	635157	7487278	8.6
100390	102	990910	635087	7487233	626550	7487226	8.5
100380	102	990910	626590	7487181	635145	7487179	8.6
100370	102	990910	635108	7487128	626542	7487126	8.6
100360	102	990910	626599	7487080	635163	7487080	8.6
100350	103	990910	635100	7487034	626534	7487020	8.6
100340	103	990910	635100	7486980	626551	7486977	8.6
100330	103	990910	626606	7486933	635166	7486926	8.6
100320	103	990910	635090	7486873	626554	7486874	8.5
100310	103	990910	626599	7486827	635155	7486830	8.6
100300	103	990910	635111	7486774	626546	7486776	8.6
100290	103	990910	626589	7486725	635147	7486724	8.6
100280	103	990910	635104	7486676	626552	7486674	8.6
100270	103	990910	626587	7486622	635148	7486628	8.6
100260	103	990910	635107	7486572	626533	7486573	8.6
100250	103	990910	626596	7486522	635142	7486526	8.5
100240	103	990910	635108	7486481	626532	7486474	8.6
100230	103	990910	626606	7486426	635148	7486425	8.5
100220	103	990910	635096	7486367	626545	7486371	8.6
100210	103	990910	626596	7486324	635151	7486324	8.6
100200	103	990910	635113	7486270	626547	7486276	8.6
100190	103	990910	626609	7486228	635149	7486224	8.5
100180	103	990910	635101	7486173	626537	7486174	8.6
100170	103	990910	626587	7486128	635143	7486121	8.6
100160	103	990910	635114	7486077	626556	7486075	8.6
100150	103	990910	626607	7486029	635160	7486026	8.6
100140	103	990910	635089	7485972	626561	7485974	8.5
100130	103	990910	626583	7485929	635166	7485925	8.6
100120	103	990910	635094	7485858	626536	7485872	8.6
100110	103	990910	626607	7485824	635141	7485821	8.5
100100	103	990910	635088	7485773	626538	7485775	8.6
100090	103	990910	626585	7485732	635152	7485722	8.6
100080	103	990910	635099	7485675	626535	7485675	8.6
100070	103	990910	626607	7485626	635159	7485625	8.6

100060	103	990910	635109	7485569	626559	7485582	8.6
100050	103	990910	626589	7485523	635155	7485528	8.6
100040	103	990910	635093	7485475	626556	7485467	8.5
100030	103	990910	626593	7485423	635147	7485428	8.6
100020	103	990910	635093	7485370	626536	7485374	8.6
100010	103	990910	626587	7485325	635160	7485327	8.6
101200	103	990910	635085	7485276	626547	7485277	8.5
101190	103	990910	626606	7491211	635154	7491224	8.6
101180	103	990910	635101	7491177	626543	7491171	8.6
101170	103	990910	626606	7491119	635150	7491125	8.5
101160	103	990910	635106	7491074	626554	7491063	8.6
101150	103	990910	626608	7491024	635146	7491028	8.5
101140	103	990910	635116	7490974	626544	7490974	8.6
101130	103	990910	626603	7490924	635145	7490927	8.5
101120	103	990910	635092	7490880	626548	7490874	8.5
101110	103	990910	626596	7490823	635152	7490829	8.6
101100	103	990910	635111	7490766	626544	7490776	8.6
101090	103	990910	626609	7490724	635165	7490731	8.6
101080	103	990910	635085	7490667	626538	7490669	8.5
101070	103	990910	626614	7490615	635163	7490624	8.6
101060	103	990910	635110	7490578	626553	7490569	8.6
101050	103	990910	626591	7490524	635163	7490525	8.6
101040	103	990910	635116	7490467	626557	7490468	8.6
101030	103	990910	626610	7490434	635163	7490417	8.6
101020	103	990910	635094	7490376	626534	7490374	8.6
101010	103	990910	626592	7490307	635167	7490329	8.6
101210	103	990910	635096	7490274	626541	7490284	8.6
101220	103	990910	626588	7491268	635151	7491273	8.6
101230	103	990910	635094	7491324	626539	7491325	8.6
101240	103	990910	626593	7491368	635158	7491387	8.6
101250	103	990910	635088	7491426	626552	7491425	8.5
102530	104	990911	626611	7491473	635147	7491479	8.5
102480	104	990911	635084	7497877	626533	7497884	8.6
102470	104	990911	626580	7497625	635146	7497625	8.6
102460	104	990911	635117	7497571	626535	7497575	8.6
102450	104	990911	626591	7497526	635143	7497521	8.6
102440	104	990911	635098	7497475	626547	7497479	8.6
102430	104	990911	626582	7497432	635167	7497427	8.6
102420	104	990911	635106	7497383	626554	7497374	8.6
102410	104	990911	626585	7497328	635145	7497319	8.6
102400	104	990911	635108	7497274	626543	7497277	8.6
102390	104	990911	626585	7497221	635153	7497220	8.6
102380	104	990911	635102	7497189	626554	7497161	8.5
102370	104	990911	626600	7497116	635160	7497121	8.6
102360	104	990911	635109	7497080	626557	7497078	8.6
102350	104	990911	626583	7497014	635166	7497029	8.6
102340	104	990911	635084	7496977	626544	7496977	8.5
102330	104	990911	626590	7496927	635156	7496930	8.6
102320	104	990911	635091	7496876	626534	7496877	8.6
102310	104	990911	626589	7496824	635156	7496825	8.6
102300	104	990911	635104	7496781	626560	7496773	8.5
102290	104	990911	626578	7496726	635165	7496726	8.6
102280	104	990911	635089	7496677	626547	7496679	8.5
102270	104	990911	626586	7496614	635166	7496626	8.6
102260	104	990911	635102	7496574	626558	7496576	8.5
102250	104	990911	626585	7496529	635149	7496526	8.6
102240	104	990911	635088	7496462	626540	7496485	8.6
102230	104	990911	626589	7496423	635154	7496426	8.6
102220	104	990911	635107	7496371	626543	7496381	8.6
102210	104	990911	626599	7496321	635168	7496327	8.6
102200	104	990911	635106	7496286	626536	7496277	8.6
102190	104	990911	626577	7496221	635147	7496224	8.6
102180	104	990911	635101	7496178	626535	7496181	8.6
102170	104	990911	626588	7496124	635144	7496123	8.6
102160	104	990911	635109	7496092	626537	7496081	8.6

102150	104	990911	626596	7496019	635151	7496016	8.6
102140	104	990911	635083	7495982	626550	7495980	8.5
102130	104	990911	626611	7495922	635152	7495920	8.5
102120	104	990911	635101	7495855	626555	7495882	8.5
102110	104	990911	626594	7495831	635154	7495826	8.6
102100	104	990911	635116	7495773	626544	7495797	8.6
102090	104	990911	626586	7495734	635148	7495723	8.6
102080	104	990911	635103	7495693	626549	7495690	8.6
102070	104	990911	626579	7495622	635161	7495629	8.6
102060	104	990911	635098	7495580	626552	7495581	8.5
102050	104	990911	626597	7495541	635149	7495514	8.6
102040	104	990911	635097	7495492	626536	7495474	8.6
102030	104	990911	626582	7495417	635146	7495429	8.6
102020	104	990911	635107	7495389	626538	7495371	8.6
102010	104	990911	626586	7495325	635158	7495328	8.6
102000	104	990911	635105	7495280	626553	7495273	8.6
101990	104	990911	626583	7495220	635168	7495222	8.6
101980	104	990911	635097	7495173	626532	7495178	8.6
101970	104	990911	626594	7495119	635144	7495126	8.6
101960	104	990911	635111	7495079	626541	7495073	8.6
101950	104	990911	626596	7495031	635162	7495028	8.6
101940	104	990911	635090	7494989	626544	7494985	8.5
101930	104	990911	626585	7494924	635151	7494919	8.6
101920	104	990911	635093	7494877	626543	7494894	8.6
101910	104	990911	626595	7494824	635152	7494824	8.6
101900	104	990911	635094	7494787	626535	7494786	8.6
101890	104	990911	626592	7494723	635166	7494725	8.6
101880	104	990911	635087	7494686	626545	7494688	8.5
101870	104	990911	626604	7494616	635149	7494625	8.5
101860	104	990911	635107	7494571	626547	7494588	8.6
101850	104	990911	626614	7494530	635164	7494521	8.6
101840	105	990911	635093	7494491	626549	7494498	8.5
101830	105	990911	626605	7494422	635146	7494426	8.5
101820	105	990911	635101	7494372	626544	7494376	8.6
101810	105	990911	626596	7494328	635156	7494322	8.6
101800	105	990911	635091	7494276	626532	7494276	8.6
101790	105	990911	626583	7494216	635141	7494226	8.6
101780	105	990911	635109	7494197	626553	7494182	8.6
101770	105	990911	626598	7494125	635150	7494123	8.6
101760	105	990911	635106	7494076	626537	7494081	8.6
101750	105	990911	626594	7494026	635150	7494024	8.6
101740	105	990911	635106	7493973	626540	7493977	8.6
101730	105	990911	626599	7493919	635157	7493924	8.6
101720	105	990911	635105	7493853	626533	7493880	8.6
101710	105	990911	626585	7493821	635162	7493824	8.6
101700	105	990911	635092	7493784	626544	7493781	8.5
101690	105	990911	626587	7493727	635162	7493724	8.6
101680	105	990911	635101	7493677	626547	7493680	8.6
101670	105	990911	626583	7493621	635157	7493621	8.6
101660	105	990911	635096	7493581	626535	7493577	8.6
101650	105	990911	626586	7493522	635158	7493524	8.6
101640	105	990911	635115	7493485	626541	7493486	8.6
101630	105	990911	626596	7493427	635158	7493421	8.6
101620	105	990911	635107	7493374	626536	7493394	8.6
101610	105	990911	626594	7493324	635150	7493327	8.6
101600	105	990911	626601	7493274	635148	7493276	8.5
101590	105	990911	635119	7493215	626547	7493228	8.6
101580	105	990911	626595	7493180	635153	7493175	8.6
101570	105	990911	635089	7493124	626541	7493128	8.5
101560	105	990911	626601	7493077	635164	7493072	8.6
101550	105	990911	635102	7493008	626544	7493025	8.6
101540	105	990911	626594	7492968	635143	7492971	8.6
101530	105	990911	635093	7492923	626537	7492929	8.6
101520	105	990911	626592	7492859	635162	7492871	8.6
101510	105	990911	635101	7492822	626554	7492817	8.5

101500	105	990911	626598	7492771	635164	7492769	8.6
101490	105	990911	635095	7492744	626536	7492724	8.6
101480	105	990911	626593	7492681	635143	7492677	8.6
101470	105	990911	635113	7492629	626545	7492647	8.6
101460	105	990911	626596	7492576	635147	7492574	8.6
101450	105	990911	635092	7492527	626538	7492527	8.6
101440	105	990911	626585	7492475	635142	7492476	8.6
101430	105	990911	635097	7492415	626557	7492420	8.5
101420	105	990911	626593	7492372	635142	7492372	8.6
101410	105	990911	635103	7492326	626533	7492324	8.6
101400	105	990911	626578	7492284	635140	7492276	8.6
101390	105	990911	635096	7492229	626549	7492224	8.5
101380	105	990911	626591	7492184	635156	7492184	8.6
101370	105	990911	635109	7492129	626553	7492128	8.6
101360	105	990911	626589	7492070	635159	7492072	8.6
101350	105	990911	635111	7492032	626534	7492022	8.6
101340	105	990911	626605	7491973	635161	7491981	8.6
101330	105	990911	635104	7491926	626549	7491935	8.6
101320	105	990911	626606	7491880	635158	7491878	8.6
101310	105	990911	635097	7491848	626534	7491826	8.6
101300	105	990911	626588	7491774	635142	7491775	8.6
101290	105	990911	635093	7491727	626542	7491721	8.6
101280	105	990911	626614	7491685	635161	7491675	8.5
101270	105	990911	635106	7491629	626539	7491625	8.6
101260	105	990911	626594	7491568	635147	7491574	8.6
101260	105	990911	635110	7491528	626542	7491517	8.6

TOTALS BY FLIGHT

FLIGHT	LINE KM
1	308
2	554
3	514
4	557
5	506
TOTAL	2439

Appendix 2b

Data on CD

Appendix 3

Physical Properties Report

PETROPHYSICAL RESULTS
MEASURED LABORATORY DATA

Systems Exploration (N.S.W.)
Pty Limited

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STUDY: MIM Exploration — Project No: 9940

DATE: October 1999 — **AREA**: Jervois

REFERENCE: D Burt — P.O. No. 00072

METHODS:

Mass Properties	see Table 1, Figure 1
Magnetic Properties	see Table 2, Figure 2
Conductivity/Resistivity	see Table 3, Figure 3
IP Effect and sat. resist.	see Table 4, Figure 4
	see Phase Spectra Figure P-1

References on Techniques see:

Emerson, DW, 1990. *Notes on mass properties of rocks - density, porosity, permeability.* Explor. Geophys., 21, 209-216.

Emerson, DW & Yang, YP, 1997. *Insights for laboratory mass property crossplots.* ASEG Preview, 70, 10-14.

Clark, DA & Emerson, DW, 1991. *Notes on rock magnetisation characteristics in applied geophysical studies.* Explor. Geophys., 22, 547-555.

Yang, YP & Emerson, DW, 1997. *Electromagnetic conductivities of rock cores: Theory and analog results.* Geophys., 62/6, 1779-1793.

Emerson, DW & Yang, YP, 1998. *Physical Properties of Fractured Rock - Bulk Resistivity.* ASEG Preview, 77, 26-27.

Emerson, DW, 1969. *Laboratory electrical resistivity measurements of rocks.* (incl. water bath IP technique). Proc. Aust. Inst. Min. & Metal., 230, 51-62.

Important Note: These petrophysical data results relate to laboratory measurements on small samples. The extrapolation of these results to large masses of in situ material should take account of sampling statistics, rock texture, structure (e.g. jointing) and other relevant variables e.g. water saturation in electrical studies.

The results contained herein relate only to the material submitted for testing.
No responsibility is accepted for the representivity of the material submitted.

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Table 1

small subsamples used because original samples quite small and most of their bulk required for other tests

Project: 9940

Date 30 September 1999

STUDY MIMEX Jervois

TECHNIQUES mass properties

REFERENCE D Burt P.O. No. 00072

see Table 4 for larger subsamples' WBD's

	SAMPLES			PHYSICAL PROPERTIES - MASS					
				dry bulk density	apparent porosity	voids ratio	SGG (composite)	WBD wet (sat.)	original water sat.
	split core			DBD	P_A	(V_{void}/V_{solid})	grain dens.	bulk dens.	S_w (as received)
Systems #		Mimex #, SA-	lithology	g/cm^3	%	%	g/cm^3	g/cm^3	%
	DDH 1								
1a	45' 4"	121051	And. sericite	2.71	5.8	6.2	2.88	2.77	50
1b			schist	2.69	5.8	6.1	2.85	2.74	55
2a	218' 4"	121055	Chl-carb-gt	2.84	1.6	1.6	2.89	2.86	71
2b			schist	2.78	1.9	1.9	2.84	2.80	63
3a	231' 6"	121052	Qz-Bt-Mag	2.79	0.6	0.6	2.81	2.79	0
3b			rock + cp, py	2.70	2.6	2.6	2.77	2.73	75
4a	345' 8"	121053	Chl-Qz-Carb	2.79	13.7	15.8	3.24	2.93	81
4b			schist	2.75	6.1	6.5	2.93	2.81	37
	DDH 4								
5a	116'	121070	Qz-ser-gt	2.83	3.7	3.8	2.93	2.86	38
5b				2.82	5.7	6.0	2.99	2.87	38
	DDH 10								
6a	164' 6"	121073	Qz-mag-bt rock,	3.03	2.0	2.1	3.09	3.05	67
6b			py, minor cpy	3.02	0.4	0.4	3.03	3.02	150
7a	191' 6"	121072	cpy, py(aspy born)	3.61	4.2	4.4	3.77	3.65	43
7b			in qz-rich breccia	3.33	5.9	6.3	3.54	3.39	25
8a	462'	121071	Qz-ser-mag	2.83	6.8	7.3	3.03	2.89	89
8b			schist/mylon.	2.85	4.6	4.8	2.99	2.89	68
	RWD 1								
9a	68 m	121060	Mag-Py-Ccp-bt	3.78	19.4	24.0	4.69	3.97	5
9b			hem rock, bx	4.93	7.3	7.8	5.32	5.00	15
10a	70 m	121061	QFS musc(-bt)-	2.82	1.5	1.5	2.86	2.84	40
10b			mag schist	3.00	2.2	2.2	3.06	3.02	22
			py, ccp, aspy +						
			py, cpy aspy						
11a	99.7 m	121065	Gt-ser-mag	3.28	0.8	0.8	3.31	3.29	60
11b			gneiss	2.89	2.5	2.5	2.96	2.91	18
	RWD 4								
12a	55 m	121069	Cpy, breccia	2.58	18.7	23.0	3.17	2.76	36
12b			gt rock	3.26	6.0	6.4	3.47	3.32	59
13a	60.8 m	121068	Massive Gt -	3.56	2.0	2.1	3.63	3.58	60
13b			mag, ep	3.37	1.8	1.8	3.43	3.39	56
14a	76 m	121066	QFS bt gneiss	2.95	0.2	0.2	2.96	2.96	100
14b			py, ccp veining	3.75	0.2	0.2	3.76	3.76	0
			py, cpy/veining						
	UC 2								
15a	328 m	121056	Py-cpy min in	3.18	0.0	0.0	3.18	3.18	n.a.
15b			qz-amph-carb-	3.43	0.4	0.4	3.44	3.43	100
			mag rock						

Systems'

#	Sample	Description
1	SA 121051	Retrogressed Andalusite - sericite schist. Andalusites are retrogressed to chlorite, and wrapped by the foliation defined by alignment of sericite/muscovite. Magnetite phenocrysts, which appear to have been retrogressed to hematite are also wrapped by the foliation. Mag Susc 159 x 10-5
3	SA 121052	Qz - Bt - Mag hydrothermal rock with qz veining and associated ccp. Ccp occurs with py deposited as infill in fractures associated with qz veining. Good relationship shows ccp later than py. Mag susc 5,045 x 10-5
4	SA 121053	Chl - Qz - Carbonate schist with phenocrysts of siderite? Overprinting foliation defined by alignment of chl. Mag susc 3,229 x 10-5
2	SA 121055	Chl - carb - gt schist with relict blobs of carbonate?, mostly recrystallised, but with some showing shredding from shearing which gave chlorite foliation and preferred orientation. Mag susc 1,445 x 10-5
15	SA 121056	Py - Ccp copper mineralisation, within qz-amph-carb-mag rock. Ccp is later than py. Both crosscut small hematite filled fractures. Mag susc 7,147x10-5
9	SA 121060	Mag - Py - Ccp - bt - hem rock with euhedral py. Alteration totally overprinting, with some breccia textures. Mag susc 7,099 x 10-5
10	SA 121061	QFS musc (-bt) - mag schist, with foliation defined by elongation of musc and bt. Py, ccp, aspy mineralisation along foliation planes. Mag susc 28,370 x 10-5
11	SA 121065	Gt - ser - mag gneiss, with S1 layer parallel foliation defined by ser, and displaying an S2 crenulation cleavage. Qz vein semi-conformable to S1, but injected during S2, as has filled extensional site in nose of F2 fold. This qz vein is associated with minor py and significant ccp. Mag susc 5,671 x 10-5
14	SA 121066	QFS bt gneiss, qz veined and brecciated, with py and ccp associated with veining and brecciation. No obvious association with foliation. Mag susc 5,787 x 10-5
13	SA 121068	Massive Gt - mag alteration and massive ep alteration. Mag susc 18,690 x 10-5
12	SA 121069	Ccp veining and brecciating gt rock, and also overprinting clay, carbonate and qz. Mag susc 15 x 10-5
5	SA 121070	Qz-ser-gt schist, foliation defined by the alignment of sericite. Mag susc 15 x 10-5
8	SA 121071	Qz-ser-mag (minor bt) schist/protomylonite. (should show sense of shear in thin section). Mag susc 15,560 x 10-5
7	SA 121072	ccp and py (+minor aspy and born) within qz-rich breccia and qz veins in QFS bt gneiss. Mag susc 1,119 x 10-5
6	SA 121073	Gt-qz-mag-bt rock, with significant py, and minor ccp on foliation planes. Mag susc 17,630 x 10-5

SYSTEMS EXPLORATION (NSW) PTY LIMITED									Table 2		
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									revised		
				10 cm^3 SUBSAMPLES MEASURED					(Project #9940)		
STUDY MIMEX JERVOIS									k cgs x 4π = kSI		
TECHNIQUES magnetic induction coil and spinner magnetometer									IμG cgs = ImA/m SI		
REFERENCE D Burt PO No. 00072									F(earth) nominal 0.5G		
									= 50 000 γ (nT)		

	SAMPLES (not oriented)		MAGNETIC PHYSICAL PROPERTIES values rounded								
			suscept	J_{IND}	J_{NRM}	I_{NRM}	D_{NRM}	Qn		saturated	MIMEX
	split core from		k	= kF	intensity	+ down	azimuth	K.ratio	mag k	density	field k
Systems	which subsamples		cgsx10^{-6}	μG	μG	- up	degrees	J_{NRM}	SI x 10^{-5}	g/cm^3	SI x 10^{-5}
#	cut					incl. degrees		J_{IND}		(WBD)	
	DDH 1					(not oriented)					
1	45' 4"	121051									159
1a			102	51	234			4.6	128	2.77	
1b			166	83	915			11.0	209	2.74	
1x			131						165	2.74	
2	218' 4"	121055									1445
2a			3177	1589	93			0.06	3993	2.86	
2b			1430	715	13			0.02	1798	2.80	
2x			2423						3046	2.78	
3	231' 6"	121052									5045
3a			1397	699	24			0.03	1756	2.79	
3b			2884	1442	50			0.03	3625	2.73	
4	345' 8"	121053									3229
4a			3342	1671	789			0.5	4201	2.93	
4b			1038	519	66			0.1	1305	2.81	
4x			4657						5854	2.93	
	DDH 4										
5	116'	121070									15
5a			175	88	94			1.1	220	2.86	
5b			101	51	32			0.6	127	2.87	
5x			107						134	2.91	
	DDH 10										
6	164' 6"	121073									17630
6a			16743	8372	1760			0.2	21099	3.05	
6b			15152	7576	779			0.1	19041	3.02	
6x			8795						11055	2.95	
6xx			10220						12847	3.02	
7	191' 6"	121072									1119?
7a			6327	3164	1470			0.5	7953	3.65	
7b			8500	4250	9355			2.2	10685	3.39	
7x			17515						22016	2.93	
8	462'	121071									15560
8a			19040	9520	7207			0.8	23927	2.89	
8b			14583	7292	3273			0.5	18326	2.89	
8x			18802						23634	2.86	
8xx			15730						19773	2.90	
	RWD 1										
9	68 m	121060									7099?
9a			324	162	70			0.4	407	3.97	
9b			1215	608	222			0.4	1527	5.00	
10	70 m	121061									28370?
10a			11850	5925	750			0.1	14891	2.84	
10b			5000	2500	481			0.2	6285	3.02	
11	99.7 m	121065									5761
11a			5588	2794	1718			0.6	7024	3.29	
11b			6481	3241	96			0.03	8147	2.91	
11x			6516						8191	2.94	
11xx			3833						4818	3.16	
11xxx			8372						10524	3.05	
11xxxx			8283						10412	3.01	
	RWD 4										
12	55 m	121069									15
12a			220	110	78			0.7	277	2.76	
12b			51	26	7			0.3	64	3.32	
12x			26						33	2.66	
13	60.8 m	121068									18690
13a			18877	9439	2622			0.3	23722	3.58	
13b			8550	4275	3258			0.8	10747	3.39	
14	76 m	121066									5787
14a			2243	1122	246			0.2	2819	2.96	
14b			3265	1633	583			0.4	4104	3.76	
	UC 2										
15	328 m	121056									7147
15a			2908	1454	65			0.04	3655	3.18	
15b			19549	9775	1138			0.1	24566	3.43	

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Table 3

Project No: 9940

Date: 4 October 1999
revised

subsample sets 3 & 4
dry "intrinsic" response (metallics)
larger cores - fragmented subsamples in some cases

STUDY MIMEX JERVOIS
TECHNIQUES elec/ EM
REFERENCE D Burt PO No. 00072

for high ρ material see
Emerson & Yang, 1998, on
bulk ρ in macro fract. rock

	SAMPLES		LAB. PHYSICAL PROPERTIES						
						EM		saturated subsamples	
	split core			sat.		cond		MIN ρ_o ohm m	ANISO
Systems		Mimex	lithology	WBD		S/m		(sub)parallel	ρ_{max}
#		#, SA-		g/cm^3		σ		to foliation	ρ_{min}
						[dry, as is]		(galvanic tests 1kHz or DC)	
	DDH 1								
1	45' 4"	121051	And. sericite schist	2.76		->0		161	1.4
2	218' 4"	121055	Chl-carb-gt schist	2.87	high ρ	->0		2507	6.2
3i	231' 6"	121052	Qz-Bt-Mag	3.02		->0		n.a.	n.a.
ii			rock + cp, py	3.00		->0			
4i	345' 8"	121053	Chl-Qz-Carb schist	2.92		->0			
ii				2.92		->0		296	38.7
	DDH 4								
5	116'	121070	Qz-ser-gt	2.90		->0		357	n.a.
	DDH 10								
6i	164' 6"	121073	Qz-mag-bt rock,	3.06	v. high ρ	n.a.		7072	41.1
ii			py, minor cpy	3.07		n.a.			
7i	191' 6"	121072	cpy, py(aspy born)	3.44		21	emσ seems		
ii			in qz-rich breccia	3.36		18	independent	0.9 (DC)	1.6
iii				3.12		n.a.	network		
8	462'	121071	Qz-ser-mag	2.84		n.a.		n.a.	
			schist/mylon.						
	RWD 1								
9	68 m	121060	Mag-Py-Ccp-bt	5.26		~4000	emσ seems	0.2 (DC)	n.a.
			hem rock, bx	dark matrix gal? fair ohm cont.			independent	(matrix	
				py/cpy network in it good ohm cont.			network	mainly)	
10i	70 m	121061	QFS musc(-bt)-mag	2.87		->0			
ii			schist	2.95		18	emσ seems	0.5	16202
iii			py, ccp, aspy +	3.12		15	independent		
			py, cpy aspy				network		
11i	99.7 m	121065	Gt-ser-mag gneiss	3.11	high ρ	->0		452	42.1
ii				2.98		->0			
	RWD 4								
12i	55 m	121069	Cpy, breccia gt rock	3.43		84	emσ seems	n.a.	n.a.
ii				2.58		->0	independent		
							network		
13	60.8 m	121068	Massive Gt - mag, ep	3.55		->0		n.a.	n.a.
14	76 m	121066	QFS bt gneiss	3.39		38		0.2 (DC)	n.a.
			py, ccp veining						
			py, cpy/veining						
	UC 2								
15	328 m	121056	Py-cpy min in qz-amph	3.18	heterogen.	18		2.0 (DC)	n.a.
			carb-mag rock						

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Table 4

Project No: 9940

subsample set 4
relatively large
prepared subsamples

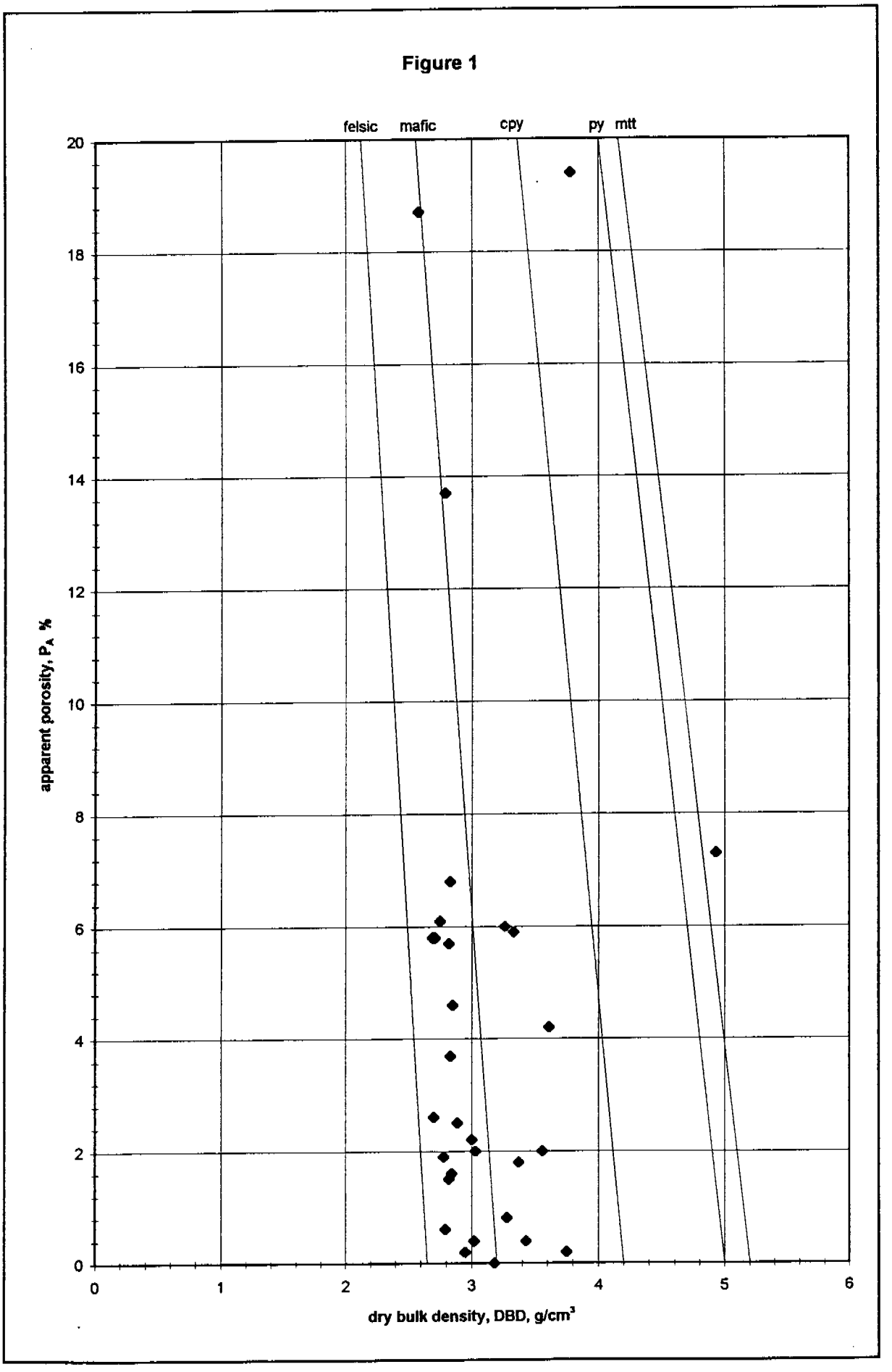
Date 4 October 1999
revised

STUDY MIMEX JERVOIS
TECHNIQUES elec/ IP (see phase spectra)
REFERENCE D Burt PO No. 00072

some of these show term impedance effects in water bath so use preferred intrinsic resistivity based on dry galv/EM meas.

	SAMPLES		LAB. PHYSICAL PROPERTIES freshwater and saturated subsamples						
			preferred	IP subsample		galv resist			IP effect
	split core		bulk galvanic	sat.		1 kHz	0.1 Hz		as 0.1 Hz
Systems		Mimex	resistivity	WBD		ρ_o	ρ_o		phase lag
#		#, SA-	low frequency	g/cm^3		ohm m	ohm m		mrad
			ohm m			(current direction was mostly normal or sub-			
						normal to foliation so ρ_o's are mainly max.)			
	DDH 1								
1a	45' 4"	121051	as given ->	2.77		180	209		8
2a	218' 4"	121055	as given ->	2.85		10157	12289		13
3ia	231' 6"	121052	as given ->	3.08		3881	6241		55
4ii	345' 8"	121053	as given ->	2.92		270	292		3
			but see aniso Table 3			(sub parallel to foliation)			
	DDH 4								
5a	116'	121070	as given ->	2.91		705	758		8
	DDH 10								
6ia	164' 6"	121073	as given ->	3.06		38936	138003		97
						(-> dielectric @ low freq.)			
7ii	191' 6"	121072	1.0 ohm m	3.36		7	65	term. impedance	403
8a	462'	121071	as given ->	2.80		55	65		4
	RWD 1								
9a	68 m	121060	0.2 ohm m	5.33		9	113	term. impedance	757
10ii	70 m	121061	as given ->	2.94		5350	8905		137
			but see aniso Table 3						
11i	99.7 m	121065	as given ->	3.11		5420	8549		40
			but see aniso Table 3						
	RWD 4								
12ia	55 m	121069	as given ->	3.56		22	33		98
13a	60.8 m	121068	as given ->	3.56		262	345		16
14a	76 m	121066	0.2 ohm m	3.19		28	359	term. impedance	818
	UC 2								
15a	328 m	121056	probably ~2.0 ohm m (sample heterogeneous)	3.29		46	850	term. impedance	597

Figure 1



(This is an Excel generated plot and should be regarded as approximate only)

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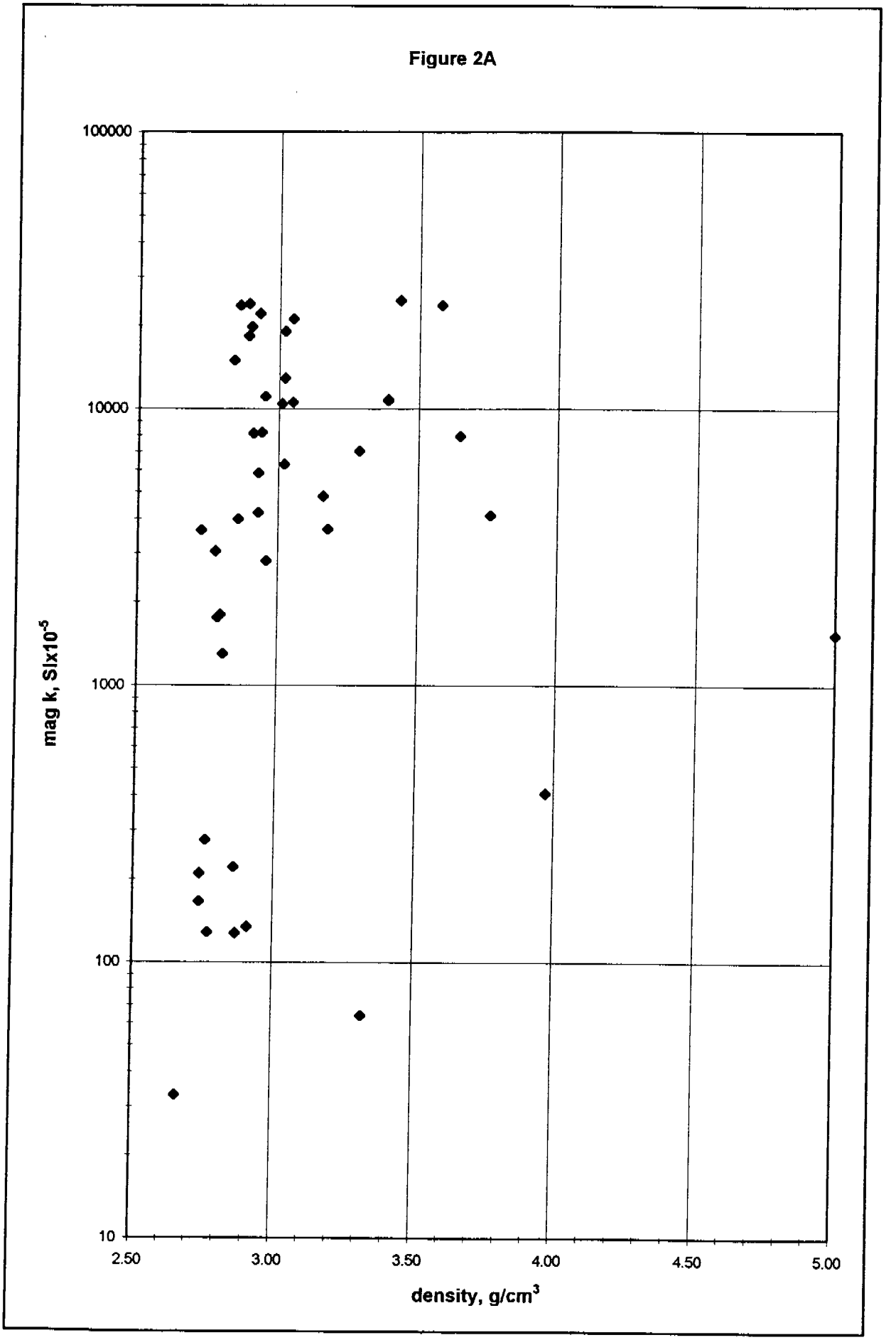
4 October 1999
Project #9940

Figure 2A



(This is an Excel generated plot and should be regarded as approximate only)

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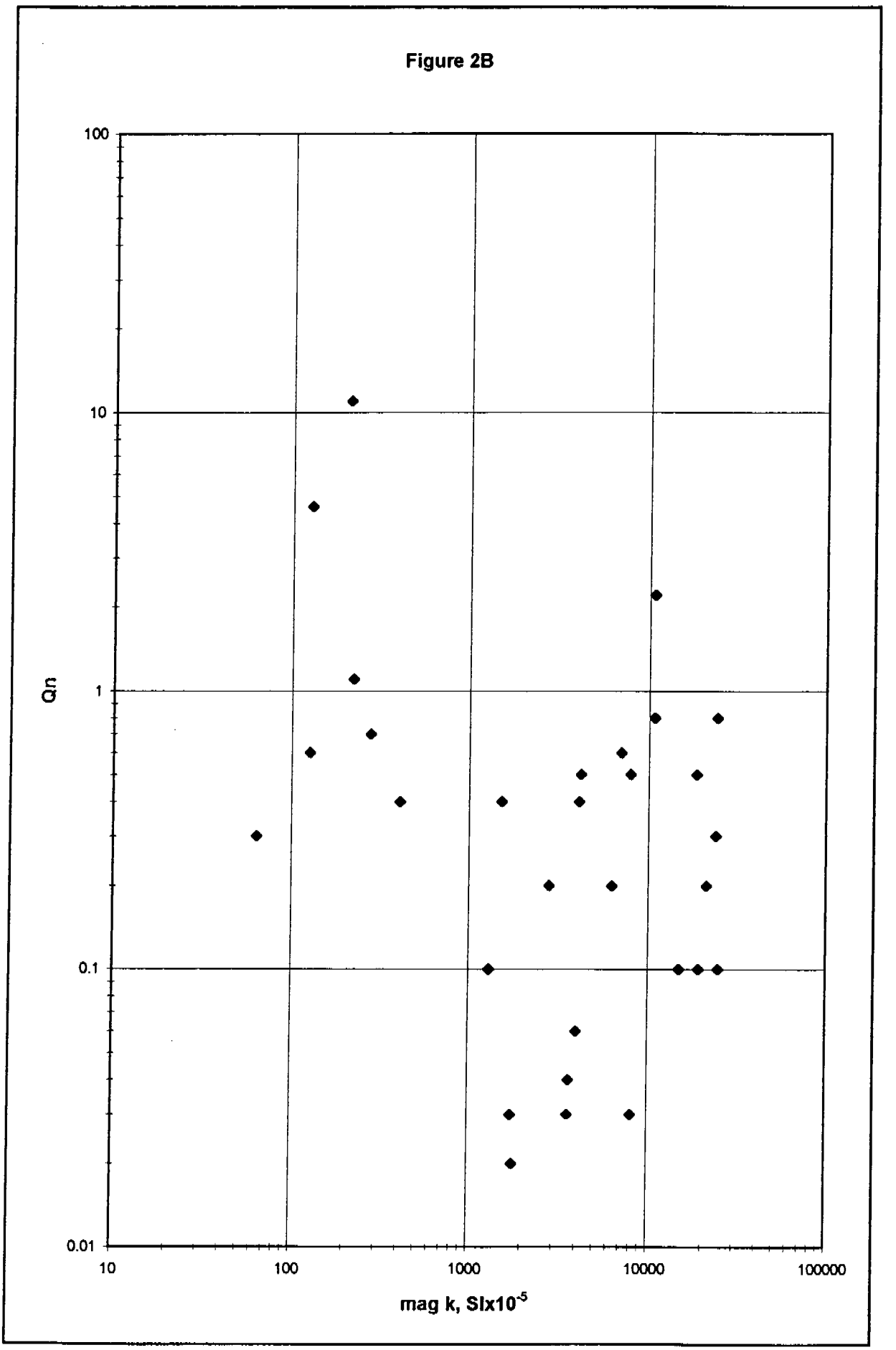
Figure 2B



(This is an Excel generated plot and should be regarded as approximate only)

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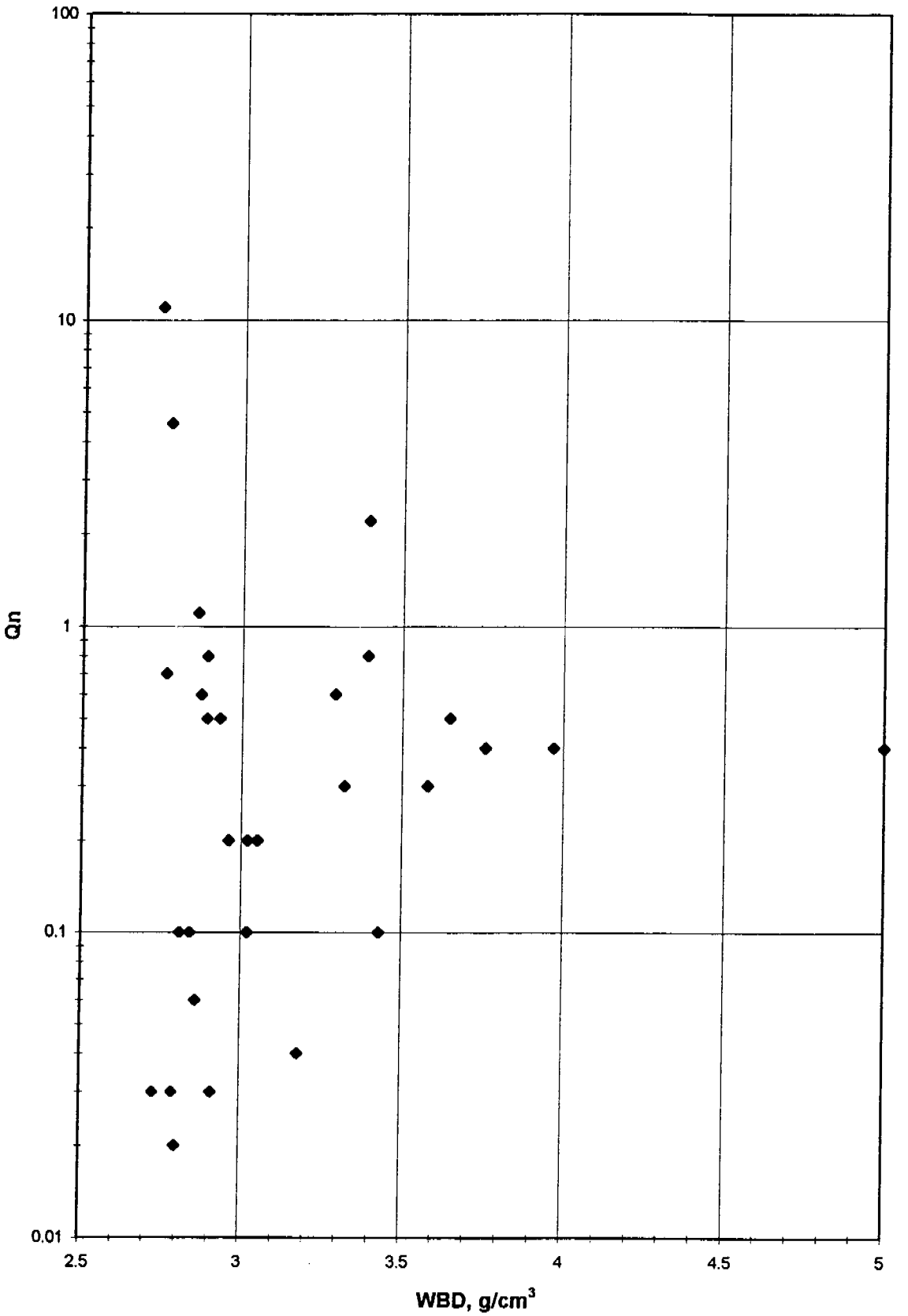
Figure 2C



(This is an Excel generated plot and should be regarded as approximate only)

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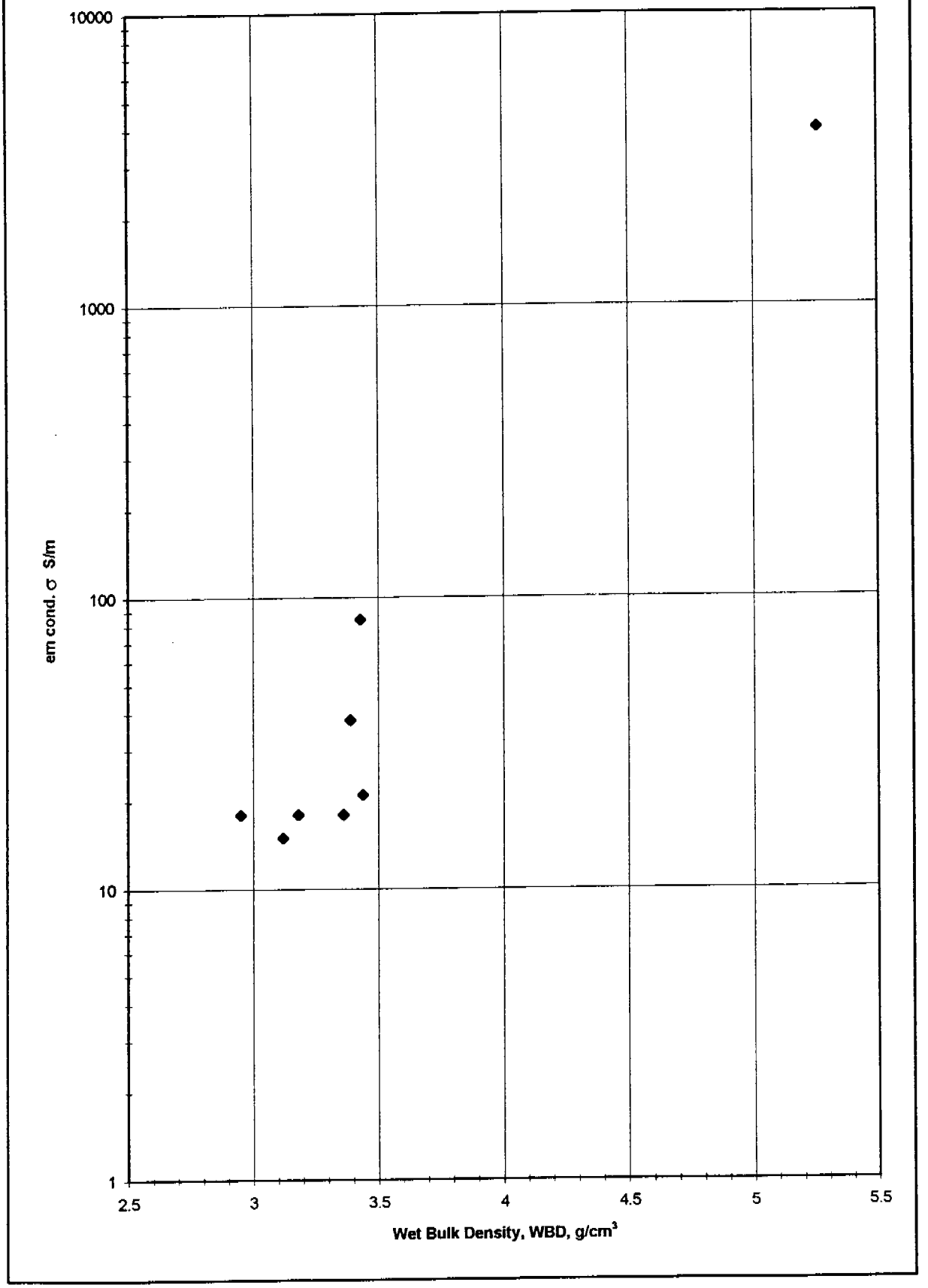
Figure 3



(This is an Excel generated plot and should be regarded as approximate only)

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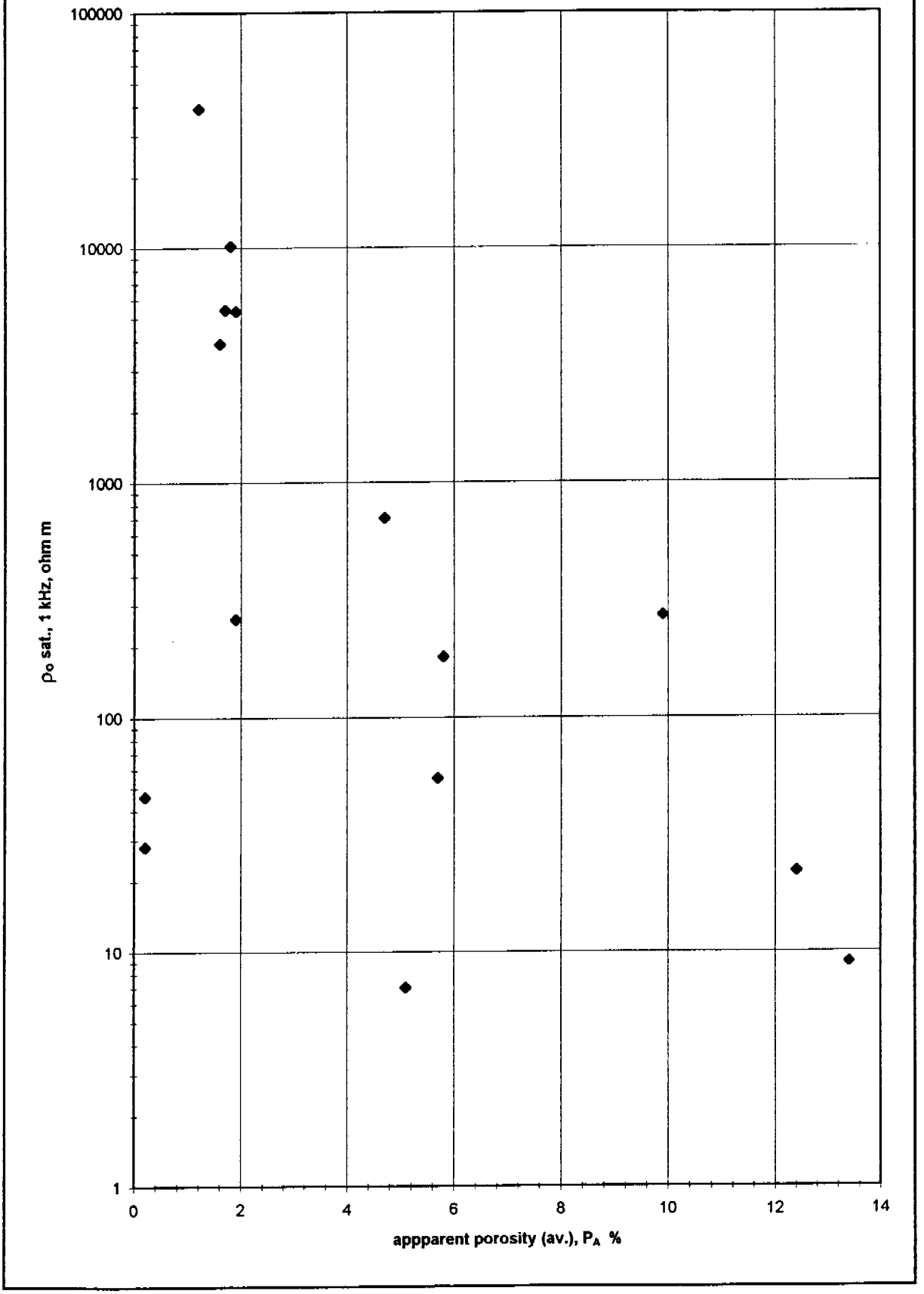
Figure 4A



(This is an Excel generated plot and should be regarded as approximate only)

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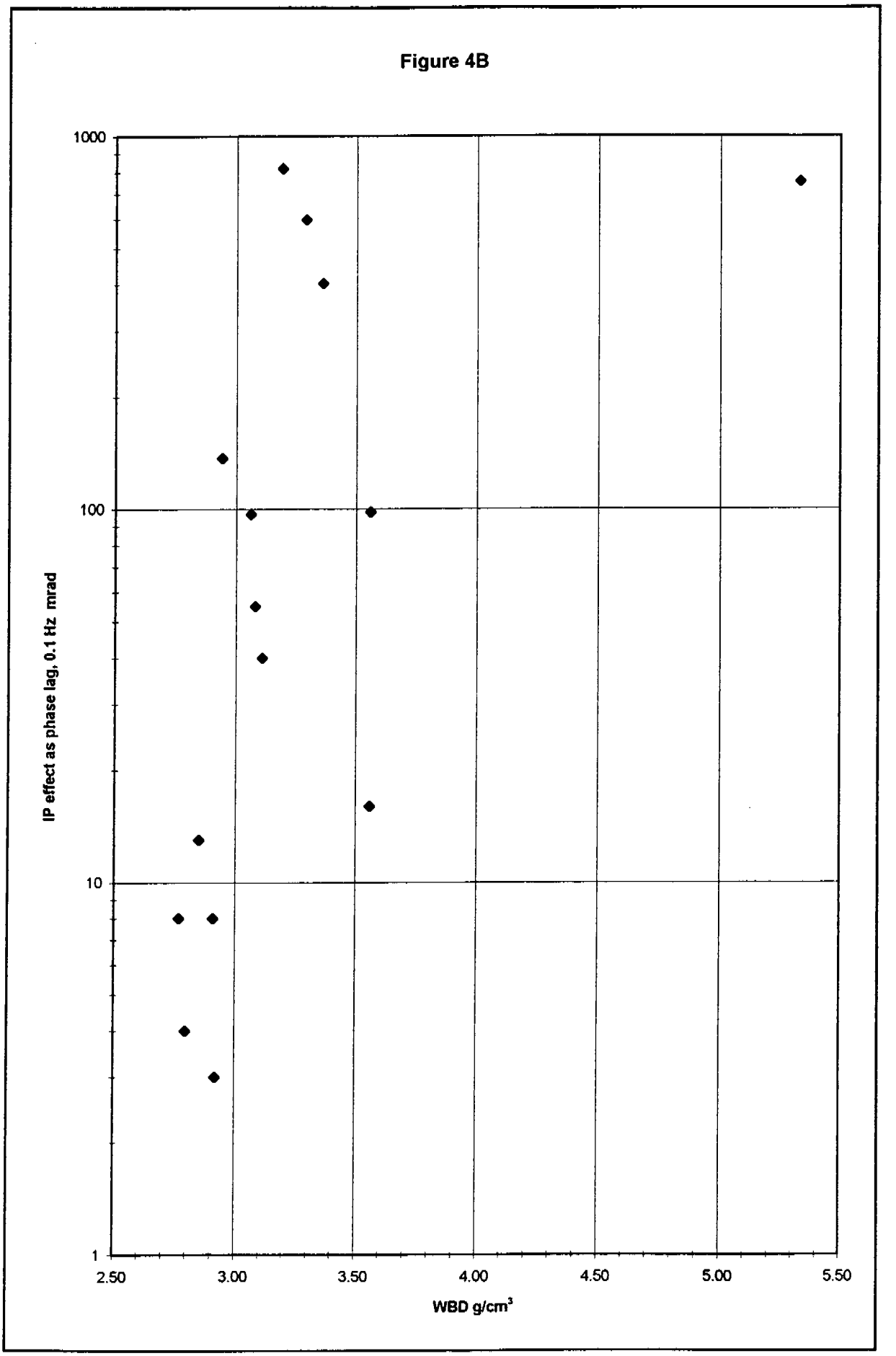
Figure 4B



(This is an Excel generated plot and should be regarded as approximate only)

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30 September 1999
Project #9940

PETROPHYSICAL RESULTS
MEASURED LABORATORY DATA

Systems Exploration (NSW)
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Induced Polarisation Data
Frequency Domain System

STUDY: MIM Exploration Project #9940

DATE: October 1999 **AREA**: Jervois

REFERENCE: D Burt P.O. No. 00072

METHODS:

Four electrode water bath, Pt/Pt potential electrodes
High input impedance preamp. & probe tips connected to freq. response analyser
Voltage: 1V
Frequency scan: 0.1 to 1000 Hz
Steps per decade: 3
Samples vacuum saturated with freshwater NaCl solution ($\rho_w \approx$ 50 ohm m 25°C)
Sample surface treated to minimise surface conduction

measurements on a tube of water (water core, wc) indicate quite low system noise

see Phase Spectra Plots for 15 samples

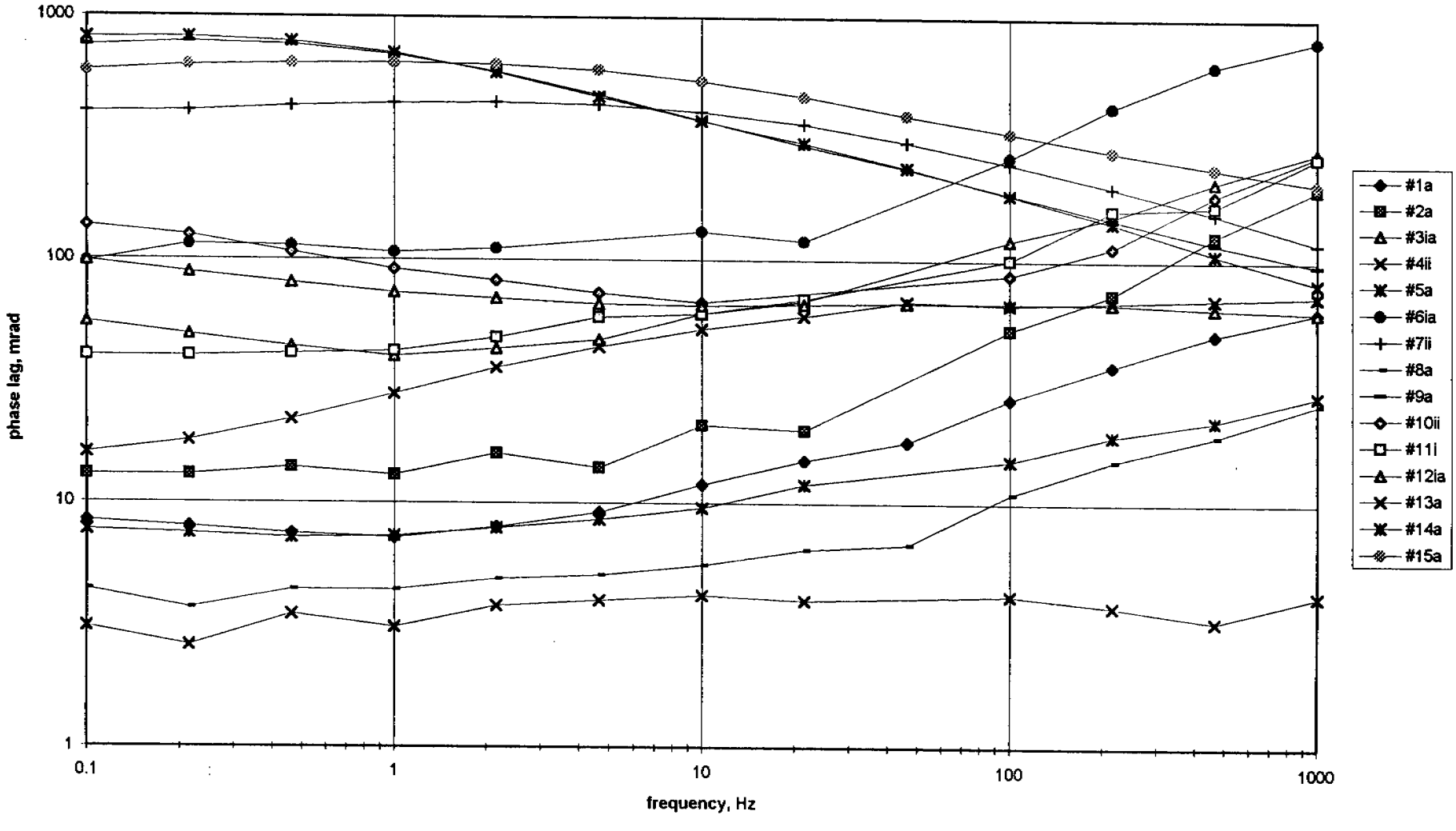
Notes

1. 1 mrad phase lag ≈ 1 ms chargeability in the time domain, numerically (at low frequency)
2. some metallic-lustre-mineralised samples generated termination impedances (surface polarisation) in the water bath meas.
3. regard phase lags as maxima especially those with surface polarisation
4. remember high $\rho \rightarrow$ high IP

Important Note: These petrophysical data results relate to laboratory measurements on small samples. The extrapolation of these results to large masses of in situ material should take account of sampling statistics, rock texture, structure (e.g. jointing) and other relevant variables e.g. water saturation in electrical studies.

The results contained herein relate only to the material submitted for testing.
No responsibility is accepted for the representivity of the material submitted.

Figure P-1



(This is an Excel generated plot and should be regarded as approximate only)

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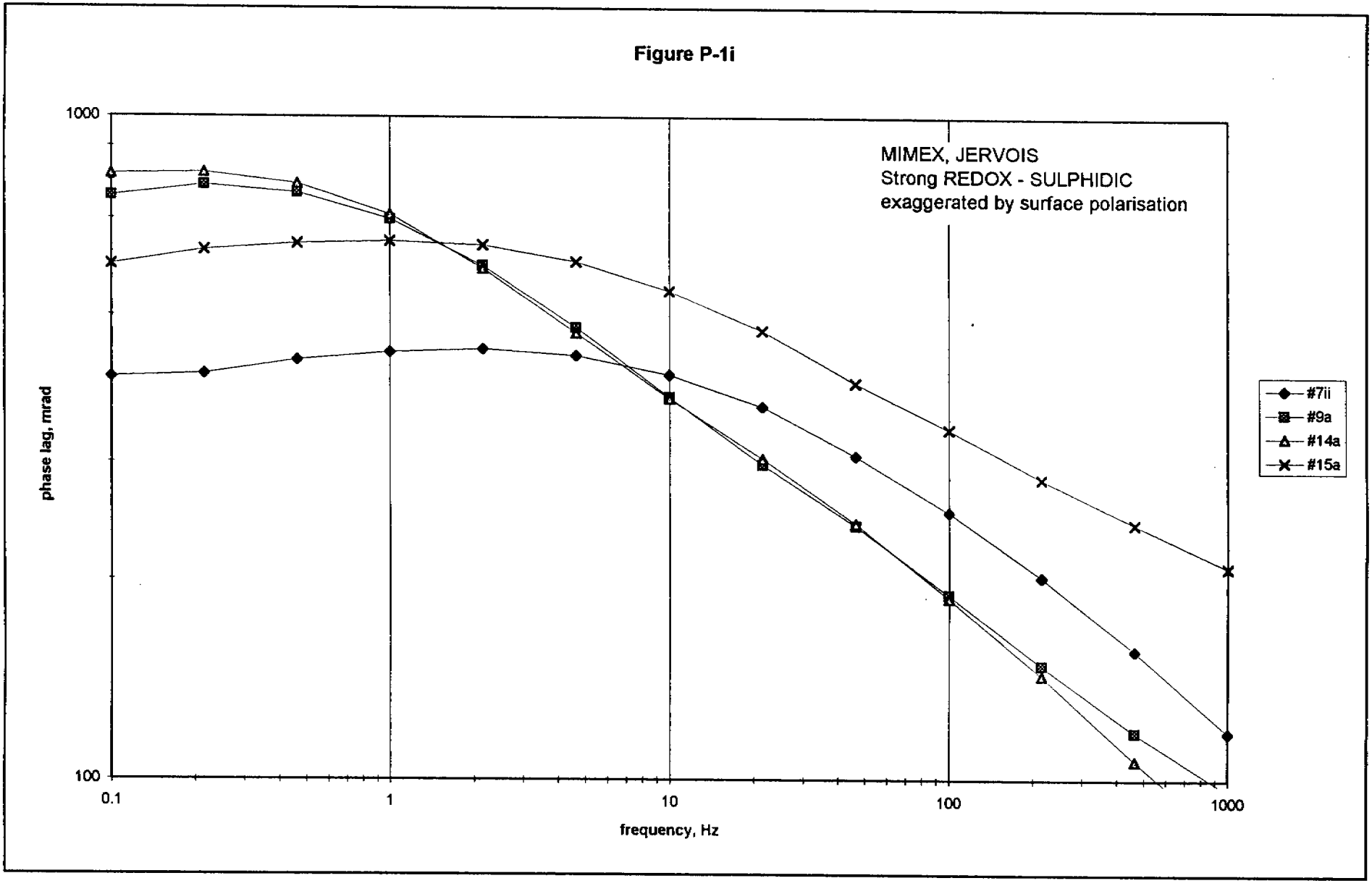
24 September 1999
Project #9940

Figure P-1i



(This is an Excel generated plot and should be regarded as approximate only)

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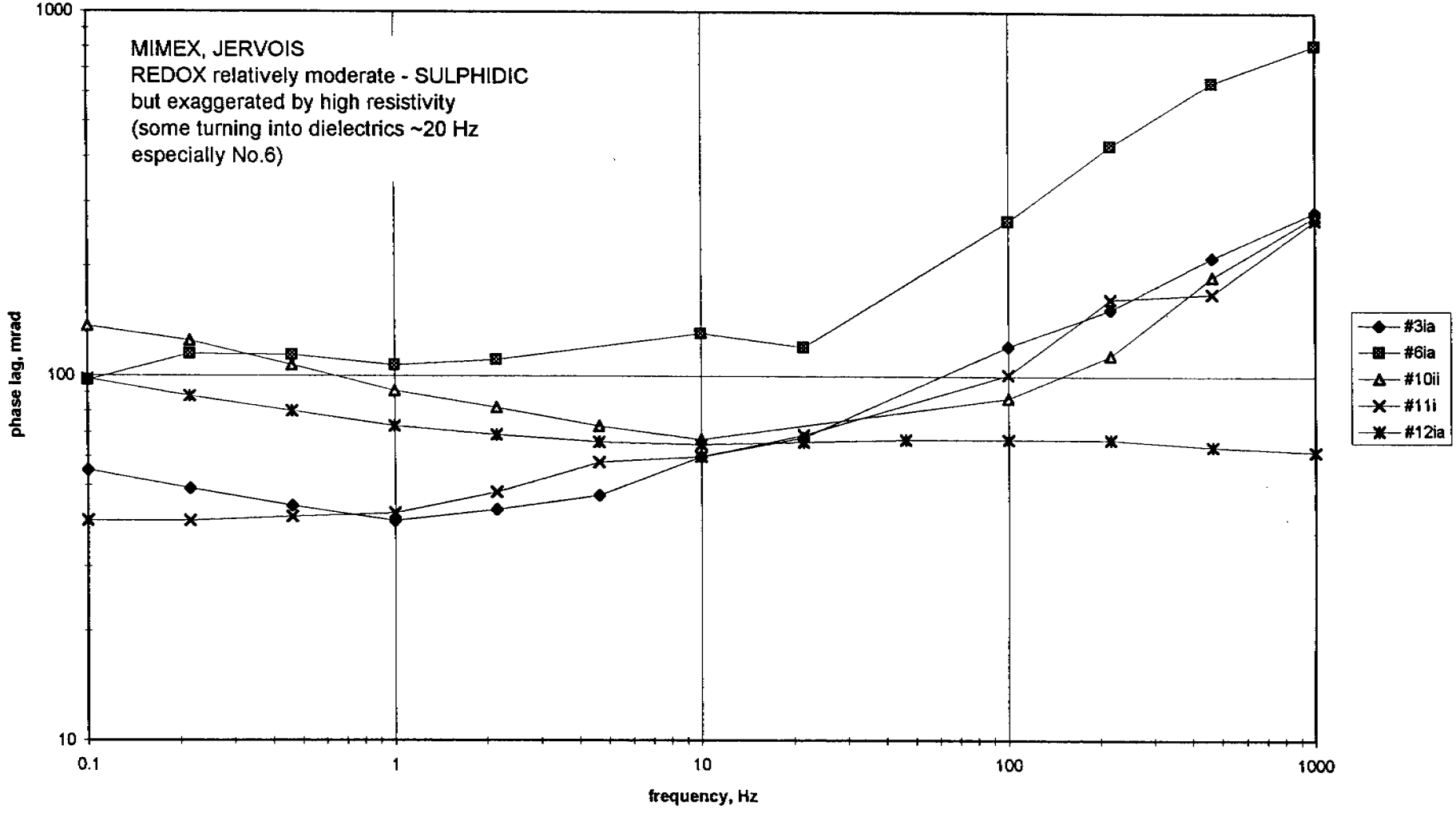
5 October 1999
Project #9940

Figure P-1ii



(This is an Excel generated plot and should be regarded as approximate only)

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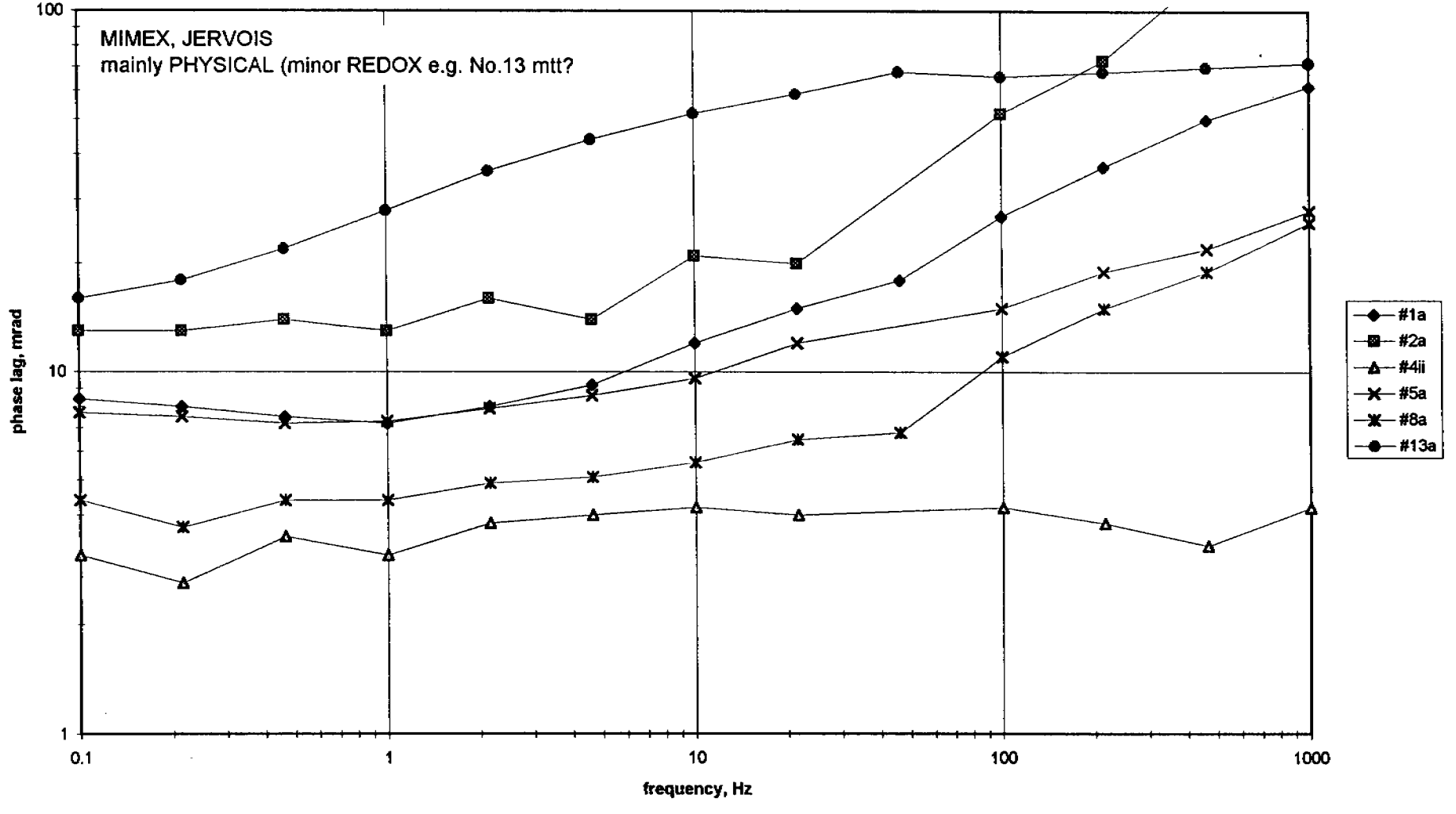
5 October 1999
Project #9940

Figure P-1iii



(This is an Excel generated plot and should be regarded as approximate only)

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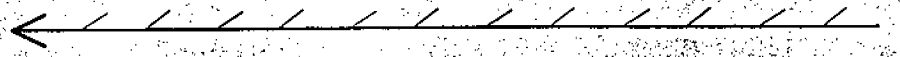
5 October 1999
Project #9940

NRM BULK/BLOCK oriented sampling procedure

please mark a horizontal strike line on a suitable plane face
of the rock outcrop, as follows, right to left as you view it



also note AZIMUTH (mag./ or true) i.e. STRIKE of this line (STRR)

then mark the dip & note the dip of this face & its azimuth i.e. the DOWN DIP ANGLE
and AZIMUTH of this DIP DIRECTION

this dip arrow should point to your torso or feet depending on the attitude of the face that you have selected for sampling

example:

sample no.	STRR	DIP	(Dip direction)
1	045 (mag) (NE)	60°	315° (NW)

Ideally samples should be about half a house brick or about half a loaf of bread in size,
but we can work with much smaller samples, if necessary

PENCIL MAGNETS SHOULD NOT BE APPLIED TO THE SAMPLE BEFORE OF AFTER SAMPLING

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Systems Exploration (NSW) Pty Ltd
08/99

PETROPHYSICS STUDIES

Physical characterisation studies of rocks, ores, concretes, unconsolidated and weathered materials, soils and minerals from a variety of geological environments carried out by arrangement. Drill core, full or split, drill cuttings and bulk specimens can be handled. Some of this work may be done in conjunction with other organisations and laboratories.

1 **Sample preparation:** cleaning, trimming, blocking, coring, silicone potting.

2 Mass properties: **dry bulk density, apparent porosity** (vacuum saturation), total porosity, grain density, air and water permeability, fracture studies.

3 **Magnetic susceptibility:** bulk k using ΔL induction coil, dual frequency - frequency effect one decade apart e.g. 0.4 & 4. kHz, ΔL/k frequency spectra, anisotropic k - k1, k2, k3, magnetic fabric.

4 **Remanent magnetization:** 'raw' NRM - J, D, I and subsequent demagnetization, Koenigsberger Ratio.

5 Electrical and EM properties at specified fluid saturations and salinities:

(a) **Complex resistivity**, frequency domain, Induced Polarization effect and Resistivity: 1mHz - 10kHz, 4-electrode method: higher frequencies by 2 electrode method. PFE, phase lag to 1 milliradian.

(b) **Galvanic electrical resistivity** and phase: 2 electrode method, 100Hz to 100 megaHz, bridge techniques.

(c) Time domain **IP** studies: decay curve, **chargeability** to 1ms, DC resistivity.

(d) Inductive **(EM) conductivity**: inductive, non contact, ΔR spectra → EMσ 100Hz - 4MHz, heterogeneity effects - inductive and galvanic measurement comparison.

(e) **EC** 1:5 tests for desorbable salt (crushed samples), groundwater conductivity and pH.

(f) Nonlinear electrical responses.

6 **Dielectric constant (permittivity):** tests on lossy rocks to 100MHz, real & imag. K, atten.

7 **Thermal conductivity** via thermal diffusivity.

8 Acoustic (ultrasonic) velocity: Vp 500kHz; Vs 250 kHz; Dynamic Elastic Constants from (8) and (2). Velocities measured under variable unaxial load.

9 Nuclear properties: **radiometric** K, U, Th from natural gamma counts (lead castle).

10 **Reports** on physical property measurement programs - by arrangement.

11 Fluorescence studies: by special arrangement.

12 Mechanical strength properties: unconfined compression and point load tests, correlations with velocity.

13 High Pressure / Temperature measurements: by special arrangement.

14 Anisotropy studies: physical property tensor determination: electrical, thermal conductivities; permeability.

15 Effects of pollutants on physical properties. Environmental Studies.

16 Commentary and / or interpretation of results and relation to Petrology and Structure. Field calibration studies and in situ checks.

17 Applied research on specific aspects of physical properties of rocks and their implications for field studies.

Don Emerson AM BE MSc PhD FAusIMM FAIG Hon Member ASEG
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email: systems@lisp.com.au

Rock samples may be couriered to Don Emerson, "Coach Hill", River Rd, Sackville North, NSW 2756 (please fax copy of consignment note) or posted to Box 6001, Dural Delivery Centre, NSW 2158 by Australia Post - please do **NOT** courier to Box 6001. We prefer posting to Box 6001, if possible please.

Appendix 4

Review of Previous Geophysics

Appendix 4a

Electromagnetic Re-interpretation

JERVOIS RANGE

JOINT VENTURE PROPOSAL

ELECTOMAGNETIC INTERPRETATION

ANDREA RUTLEY

14 JULY 1999

JERVOIS ELECTOMAGNETIC INTERPRETATION

FIXED LOOP GROUND EM AND QUESTEM DATA

INTRODUCTION

An area of ground held by Brittania Gold is available for Joint Venture. The area is prospective for BHT mineralisation. About 40% of the rocks in the area are outcropping, with mineralisation identified, and currently being mined at Marshall, Reward, Green Parrot, Bellbird, and Attutra.

Fixed loop EM (Sirotem) and Questem data were available for reinterpretation. The initial fixed loop interpretation had been completed by Normandy Exploration in 1992, whilst the Questem interpretation had been completed by Dickson and Associates in 1991. The first section of this summary is the reinterpretation of the fixed loop survey, and the second section details the Questem reinterpretation.

FIXED LOOP SURVEY REINTERPRETATION

The fixed loop survey specifications were outlined by Normandy as follows, and Plate 1 shows the location of these loops, with respect to the main mineralized horizon.

Transmitter	Satx
Receiver	Sirotem MkIII
Receiver Coil:	Zonge Ferrite Core
Loop Size:	600 m x 300 m
Average Current:	13 amps
Lines/loop:	8 lines (6 lines inside loop; 2 lines outside loop)
Line Spacing:	100 m
Station Spacing:	50 m
Components:	X (grid north), Y (grid east) & Z (positive down)

The data quality of the fixed loop survey is poor with at best only channels 9 – 20 usable in any modelling. Channels 1 –8 all appear to be recording within a long ramp (up to 0.5 msec), whilst the late time channels appear to be "held up", possibly by the characteristics of the receiver coil. Figure 1 shows the decay from a station in Loop 7 where no conductor is present, which highlights some of these problems.

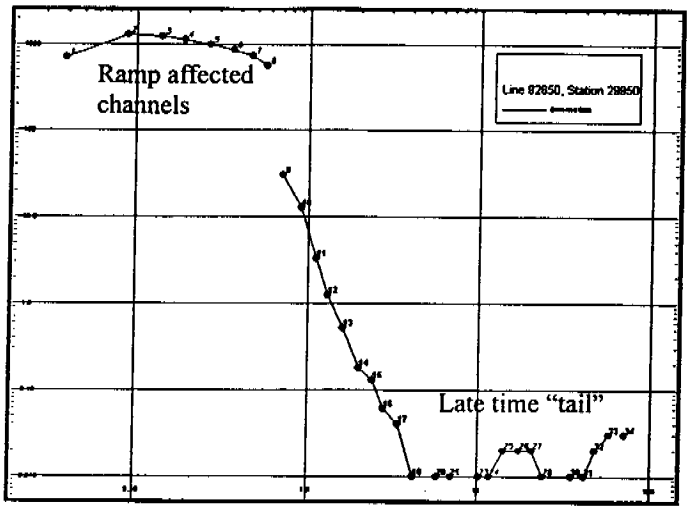

Figure 1 ***Decay curve showing data quality issues.***

Profiles of each line in each of the loops in the survey are plotted in Appendix A.

Conductors have been identified on Loops 3, 4, 17 & 18. These are all known lode horizons. The fixed loop survey failed to detect any conductors from the remaining loops. For those loops where a conductor has been identified, LEROI inversions have been run. The models have all been inverted using a highly resistive background of up to 50000 Ohm.m. The plates used in the modelling have low conductances, in the range of 10 – 20 S, and depths to the top of the plate are less than 70 m. Table 1 shows the results of the LEROI modelling. Appendix B contains the model sections for these four loops.

Table 1 ***LEROI Modelling Results***

LOOP	LINE	EASTING	DEPTH TO TOP	CONDUCTANCE
Loop 3	94950	30265	70 m	9 S
Loop 4	94350	30280	25 m	10 S
Loop 17	90725	27200	50 m	15 S
Loop 18	90625	27190	40 m	20 S

Loop 3:

This loop is coincident with the Reward horizon and the existing interpretation by Normandy suggests that the conductor is open to the south.

LEROI modelling has been completed on line 94950N, where a strong crossover defines the conductor location. Line 94850N and 94750N, to the south of 94950N, show only weak crossovers which would suggest that the conductor has a limited strike extent, and is not open to the south, or becomes considerably weaker on these lines. The plate modelled has a low conductance (9 S), dips at 75° to the west and the depth to the top of the plate is 70 m. A drillhole, inclined at 60° to east, was proposed by Normandy to test the anomaly at 30194E, 94950N. This proposed hole does not appear in the Jervois drillhole database. The nearest holes are R14 and JR63. Assay results from R14, which was drilled to the east, show an intersection of up to 5000 ppm Pb and 3000 ppm Cu, at depths of about 30 m, which is shallower than the modelled plate. JR63, which was drilled back to the west, returned slightly lower assay values of up to 3500 Pb, but at depths of 80 – 85 m. It is interpreted that these two holes have tested the modelled conductor.

Loop 4:

The placement of Loop 4 was originally designed by Normandy to test the Attutra Horizon, but no conductor was coincident with this horizon. It was determined by Normandy that this horizon must have been mined out. The conductive response observed was attributed to the Marshall Horizon.

LEROI modelling positions a plate on line 94350N at 30280E, with a steep dip to the west, and a depth to the top of the plate of 25 m. The plate is a weak conductor, with a conductance of 10 S.

Normandy recommended drilling on line 94150N and 30200E. Observing the strength of the crossovers on the four lines, line 94150N, 94250N, 94350N, and 94550N, the conductor on the line proposed by Normandy for drilling, is close to the southern most part of the conductor. Again there are no data in the drillhole database to suggest that the conductor had been tested at this location. The nearest holes are M4E11, M4E12, M4E13, M4E18, B97-3 and B97-4, all of which have been drilled to the west of the interpreted conductor. Assay results from these holes were not anomalous with at best < 40 ppm Pb and < 15 ppm Cu.

The modelled conductor does not appear to have been adequately tested.

Loop 17:

Normandy interpret the response from Loop 17 to be attributed to the Bellbird Lode, and recommended drilling the target at 27200E and 90625N.

LEROI modelling has been conducted on Line 90725N. The conductor is present on lines 90525 – 90825N and is equally strong on both 90625N and 90725N. The conductor models as a plate with a conductance of 15 S, steep dip of 75° to the west and a depth to the top of the plate of about 50 m. No information on the drilling could be obtained.

Loop 18:

Loop 18 was positioned adjacent to Loop 17, and was designed to test the same horizon. The conductor identified in Loop 17 was observed within Loop 18 and modelled. The resulting plate has similar characteristics, dipping at 75° to the west with a conductance of 20 S, and depth to the top of the plate of 40 m.

QUESTEM SURVEY REINTERPRETATION

Aerodata flew a 75 Hz Questem survey over the region of interest during 1991, and Dickson & Associates interpreted these data. The Questem survey was flown at 110° – 290° and positioned to cover the main J-curve region. Data quality of the Questem is poor, with considerable noise on mid-late time channels. The aeromagnetic data obtained from the survey are of reasonable quality, but still highlight leveling problems. The digital data available for interpretation did not includ any 50Hz monitor information.

Profiles of each flight line have been examined in Geosoft, using all 15 Questem channels and the profile of the aeromagnetic data for each line. From these profiles twelve anomalies have been interpreted. The following table shows the location and priority of the anomalies, with a more detailed table included in Appendix C.

Table 2 Location of Questem Anomalies Chosen from Geosoft Profiles.

ANOMALY	LINE	EASTING	NORTHING	PRIORITY
JRAEM-01	110150	633550	7495400	3
JRAEM-02	110190	632768	7494836	3
JRAEM-03	110230	630186	7494831	2
JRAEM-04	110250	630173	7494393	1/2
JRAEM-05	110270	629785	7494093	1/2
JRAEM-06	110270	630149	7493975	1/2
JRAEM-07	110260	630263	7494141	1/2
JRAEM-08	110320	628487	7493484	3
JRAEM-09	110320	627679	7493740	3
JRAEM-10	110440	626633	7491567	3
JRAEM-11	110480	627142	7490575	3
JRAEM-12	110480	627667	7490388	3

Anomalies with a priority of 1, 1/2 or 2 are strong, coherent EM anomalies, worthy of additional work, whilst those with a priority of 3 require compelling information, *e.g.*, favourable geology, structure, or geochemistry, to upgrade their current status. As surface information (including the location of power lines) is unavailable, all anomalies should be validated against known culture.

Channels 3, 8 and 12 were gridding in Geosoft. Grids with all lines showed significant levelling problems and so for interpretation and display purposes, separate grids were created containing easterly flying lines and westerly flying lines. The most coherent grids were produced from the westerly flying lines. These images are the plates included in this report. By channel 12 a considerable portion of the signal was overwhelmed by noise and as such was not a useful channel for interpretation. A narrow strip of overburden (1 – 2 km wide) occurs on the western ends of the lines. The remainder of the survey area is resistive.

Plates 2, 3 and 4 are images of the aeromagnetics and gridded channel 3 and channel 8 of the Questem data, showing the flight path and lode horizons as overlays, as well as anomaly locations. The lode horizon, referred to as the J-curve, is a magnetite garnet horizon, which dips steeply to either the west or east between 75° and 80°. The main J-curve trend is strongly magnetic. West of the J-curve, are zones of calc-silicate rocks with galena mineralisation. These zones parallel the magnetic trend of the J-curve. A strong correlation between the aeromagnetics and the Questem data is evident in the northern section of the J-curve. This region of the J-curve has the highest magnetic intensity along the curve and is also the most conductive section. The Marshall and Reward Horizons are within this area. Anomalies selected in this region have a higher priority. Both the Marshall and Reward areas show as conductors, (JRAEM-04 and JRAEM-03 respectively) with moderately strong early time amplitudes, through to mid-times, but are lost in noise by late times. No decays have been calculated directly, but have been qualitatively estimated.

Anomalies JRAEM-01 and JRAEM-02 are located in the northeast region of the survey. These anomalies are adjacent to an apparent cross-cutting magnetic trend. Additional information on the geology and possible geochemistry in this region should be obtained in order to upgrade these anomalies. The majority of the anomalies are distributed along the J-curve. Anomaly JRAEM-10 is located close to mineralisation at Bellbird.

Further information should be acquired over these anomalies to enable an accurate assessment of the quality of the anomalies.

CONCLUSION

Fixed Loop Survey

Aside from the four loops with known delineated conductors, *i.e.*, Loops 3, 4, 17 and 18, no additional conductors have been identified. Limited drilling information available form MapInfo suggests that the conductor at Loop 3 has been tested, but doubt exists over the conductor identified from Loop 4. A more extensive search of the databases may reveal additional drillhole information for drilling in the vicinity of Loop 4, and may also provide information on any drilling at Loops 17 and 18.

Questem Survey

Using the MapInfo database, *jervois_drill_collars.tab*, and *BR_drill_collars.tab*, no drillholes could be identified which tested any of the interpreted Questem anomalies. If additional drillhole databases can be found, then these anomalies should be checked to determine whether the conductors have been tested and adequately explained.

Anomalies given a priority of 1, 1/2 or 2 should be considered as strong, coherent EM anomalies, worthy of additional work. Anomalies with a priority of 3 would require additional compelling information, *e.g.*, favourable geology, structure and/or geochemistry, to upgrade their status. As any cultural information (including power line locations) is unavailable, all anomalies should be validated against known surface cultural features.

For a more detailed and accurate interpretation, the Questem data should be reprocessed, and then reinterpreted.

General

Based on the interpretation of the Questem and Fixed Loop Surveys, the mineralisation styles in the area are conductive. The Questem data should be able to be used as a regional survey tool to highlight anomalies. Given the poor data quality of this 1991 survey, it is not an effective screening dataset, unless further processing is undertaken. Despite this limitation, the Questem identified the Marshall, Reward and Bellbird areas (JRAEM-04, JRAEM-03 and JRAEM-10), which were also interpreted from the fixed loop survey of Loops 3, 4, 17 and 18.

Using the fixed loop method of regional surveying is a restrictive targeting tool. Only conductors with the correct geometry relative to the loop positions are coupled. Often this can mean that conductors may go undetected. As a consequence, even though the entire J-curve has been surveyed, and only four conductors identified from the fixed loop survey, the presence of additional conductors cannot be disregarded.

RECOMMENDATIONS

- Reprocess Questem data, followed by reinterpretation of these data;
- Investigate further information over Questem anomalies, with emphasis on those higher anomalies, and those along J-curve area of interest;
- Check location of known culture with respect to Questem anomalies;
- Plan any follow-up of Questem anomalies with a moving loop EM survey.

Appendix 4b

Green Parrot IP Re-interpretation

JERVOIS RANGE

GREEN PARROT IP RE-INTERPRETATION

DAVID BURT
PETER ROWSTON

26 JULY 1999

JERVOIS RANGE IP RE-INTERPRETATION

MCPHAR DIPOLE-DIPOLE SURVEY

INTRODUCTION

The Jervois Range prospect is located some 450km SW of Mount Isa, within the Arunta Provence of the Northern Territory. The area is prospective for BHT mineralisation. About 40% of the rocks in the area are outcropping, with mineralisation identified, and currently being mined at Marshall, Reward, Green Parrot, Bellbird, and Attutra.

McPhar Geophysics Pty. Ltd. for Petrocarb Exploration N.L. in December 1970 conducted an IP survey over the Green Parrot and Bellbird areas within this prospect. This survey was designed to follow up an earlier, larger IP survey (1964) conducted on behalf of New Consolidated Goldfields Pty. Ltd. The data from this earlier survey was not available for re-interpretation.

The later survey was designed to better define shallow anomalies located in the earlier survey. This was achieved by reducing the dipole size and a number of different dipole widths were used to give better definition of anomalous sources.

Only one line of data was provided over the Bellbird grid and it was not possible to locate this line or reference it to any known previous work. No further work was carried out on this data for inclusion in this report.

IP SURVEY REINTERPRETATION

The IP survey specifications were outlined by Petrocarb Exploration N.L. as follows:

Transmitter	McPhar Tx
Receiver	McPhar Rx
Dipole Separation:	100', 200' and 300'
Frequencies:	0.31Hz to 2.5Hz
Lines:	11 lines
Line Spacing:	200m and 400m

The data was not provided in digital format and hence it was necessary to digitise from the plots provided with the Petrocarb report. The main problem encountered when reinterpreting this data was the difficulty of accurately locating the data. The original survey was conducted on a local grid and using dipole separations of imperial feet rather than metric meters. With reference to the known location of drill holes and the survey plan provided the lines were crudely reprojected to AMG (AGD 84, Zone 53) coordinates. This final location of the survey is known to an approximate accuracy of +/- 25m.

The reprojected digitised data was then inverted using S2DIP software to produce the Resistivity and IP sections provided. The inversion control parameters are shown on the plots. The data for all three dipole spacing's were combined prior to the inversion process. This was not possible during the original interpretation of this data and allows for a much better use of this data previously collected.

Topography was only available over the central portion of these lines. Toward the ends of each line the topography was considered to be flat. It is also possible that mining has altered the topography since this survey was completed.

Green Parrot Area Overview:

The Green Parrot survey area is located between the Marshall Pit to the north and the Green Parrot Pit to the south. The most important plan images to look at are **Figure 1:** *Maximum IP Effect* and **Figure 2:** *Minimum Resistivity Below 2 Cells*. The former will identify the more chargeable zones and the later, the more conductive zones below the overburden effects. **Figure 3:** *Maximum Resistivity* and **Figure 4:** *Minimum Resistivity* are included for completeness.

In **Figure 1** we see that there is a linear zone of elevated IP between the two pits. This zone is strongest to the north and there is some indication of a deflection in the zone near a known fault at or near Line 1600N. Also of interest here is a second zone toward the eastern ends of a number of the lines to the north. In producing this image the largest value of IP Effect at each station, regardless of depth was used. This allows us to track zones of varying depth between survey lines. This technique is a simplification of the data for fast interpretation and should always be used in conjunction with the individual sections.

The main feature of **Figure 2** is the large zone of low Resistivity to the north of the survey area and stretching south to centre of the area and the known fault. There are also low resistivity values in the far south of the area along the line of known mineralisation and coincident with the Green Parrot workings. Generally there is increased resistivity to the west of the central zone and this is more pronounced in the north.

Figures 5 – 26 show the inversion results and the original recorded data for each of the survey lines. It should be remembered when using these results that the actual depth of data validity is much less than that shown. On average for these sections the inversions are valid to roughly 75m towards the centre of the section and shallower to the extremities. Below this depth the inversion is seen to revert to the seed model values. To best view the recorded data, the profiles provided with the original Petrocarb report should be consulted.

Throughout the sections it is possible to follow a zone of anomalous chargeablity with varying resistive properties. The zone is most interesting in the north where its conductivity is strongest. Most of the anomalies seen in these sections appear to have very limited depth extent. However this may also be a function of the limited depth of penetration of the equipment and surveying method used. All of the sections show thin conductive overburden of between 5 and 10m which is broken in areas of outcrop.

Line 0N: **Figures 5, 6**

The conductive zone coincident with the Green Parrot Pit shows very limited vertical extent. There is also a very small coincident IP/conductive anomaly at 630175E.

Line 200N: **Figures 7, 8**

Again the conductive zone coincident with the Green Parrot workings shows limited vertical extent and appears slightly weaker on this line. There are three separate chargeable zones the weakest of which is coincident with the previously mentioned conductive zone.

Line 400N: **Figures 9,10**

Again the conductive zone is present and very shallow. Two separate chargeable zones are also present in this section.

Line 800N: **Figures 11,12**

A strengthening IP anomaly at 630100E appears to show a limited increase in conductivity. This IP anomaly would appear to be a continuation of that seen in Line 400N to the east.

Line 1200N: **Figures 13,14**

The IP anomaly from Line 800N appears again at roughly the same intensity. The increase in conductivity over this anomaly could reflect a deepening of the weathering profile in this area.

Line 1600N: **Figures 15,16**

The IP anomaly has increased significantly in this section however there does not appear to be a coincident conductive zone.

Line 2000N: **Figures 17,18**

The IP anomaly is again strong in this section and this time is accompanied by a region of increased conductivity.

Line 2400N: **Figures 19,20**

This is the most interesting line of the survey. Here we have a strong, although narrow, steeply dipping chargeable anomaly coincident with a strong conductive zone. Given the limitations of the survey these anomalies could well be open at depth.

Line 2600N: **Figures 21,22**

The same anomalous zone as in Line 2400N is present again in the data although on this time appears slightly weaker in both conductivity and chargeability.

Line 2800N: **Figures 23,24**

The section shown here is similar in character to that of Line 2600N although note the generally decreasing conductivity of the rock unit to the east of the anomalous zone.

Line 3000N: **Figures 25,26**

On this line the anomalous zone appears to have broken into two, the western most outcropping and the eastern at depth. Note also the broad IP anomaly at 630075E, however it is relatively weak and has now coincident anomaly in the resistivity section.

CONCLUSIONS and RECOMMENDATIONS

Two Micromine block models are provided with this report, Resistivity and IP. It is essential that these be combined with the previous drilling information to better assess the worth of this method as a geophysical tool over this prospect. We need to be sure that the known zones of mineralisation are coincident with anomalous geophysical characteristics. It is also important to ensure that drilling has adequately tested all previously defined anomalous zones.

If we can determine that the IP method is useful in delineating the ore package then further surveying using the MIMDAS system should be conducted. This will allow detection of new ore zones or possible extensions to the known ore zones at depths much greater than those achieved with this conventional surveying.

I would also recommend that some effort be made to locate the earlier IP survey data. However due to its age and large single dipole spacing, its usefulness will be limited.