0920 112001

OPEN FILE

PASMINCO EXPLORATION

EL 37/89 – BULGOBAC HILL

ANNUAL REPORT

FOR THE PERIOD
3 February 1991 to 2 February 1992

92-3327

MINES
File Ref. EL 37/89
10 FEB 1992
Doc. Ref.
Action Officer | Initials
COVERING LETTER
ON FILE FOLIOS
10-11 dated 7/2/92.
Resubmit to | Date

[illegible]

AUTHOR: J G Purvis
J G Purvis & Associates Pty Ltd

DATE: February 1992

REPORT No: T92-2

SUBMITTED TO: Regional Exploration Manager – Tasmania

DISTRIBUTION: Department of Resources & Energy,
Division of Mines & Mineral Resources – Hobart
Pasminco Exploration – Burnie
– Melbourne

SUBMITTED BY: J. G. Purvis

ACCEPTED BY:

Burnie
February 1992

112002

0001

CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

LIST OF TABLES

Hole BHD3 in progress at High Point Prospect, December 1991.

1. SUMMARY

The 1991 year saw a very active programme of exploration on the Bulgobac Hill EL. Work concentrated on the **High Point** area where three diamond drillholes, BHD1-3 totalling 1481m, were put down with negative results (best intersect: 74m @ 0.2% Zn in BHD1)

Geological mapping, ground magnetics, detailed gravity and soil sampling, were also carried out at **High Point**, principally to cover the trend of the Mt Charter Fault which appears to be controlling the location of the known weak zinc mineralization. This mineralized zone may well be already drilled out by the holes put down to date.

Following the poor results from the drilling, and apparent problems correlating the detailed stratigraphy with that hosting the Que and Hellyer deposits, a thorough geological review is recommended at **High Point** before any further drilling is contemplated.

A similar review is also recommended for the **Sock Creek** area to determine if a deep drillhole is warranted to test the possibility that the zinc mineralization there is remobilised from a massive basemetal sulphide body at greater depth.

Outside of High Point, work on the EL was of a more reconnaissance or regional nature, comprising geological traverses and ground magnetics at **Bulgobac Hill**, gravity traverses at **Tullabardine Gorge**, and geological mapping traverses and wide-spaced gravity coverage at **Sock Creek, Mt Block** and elsewhere. The geology and mineralization in the **Sock Creek - High Point** area was the subject of an Honours Thesis study by a student of Tasmania University. The interpretation of the 1990 aeromagnetic survey was updated.

A NNE trending lineament recently delineated by gravity surveys in the **Mt Block - Tullabardine Gorge** area, is considered to be the southern extension of the Hellyer-Que-Charter Mineralized Axis - a highly prospective linear extending parallel and 1-2km west of the Henty Fault (the Axis probably reflects a subsidiary splay structure off the latter). The known orebodies on the Axis are located where it is intersected by deep-seated E-W structures evident in the gravity and magnetic data.

The NNE lineament cuts across the SE corner of the EL and is associated with a series of unusual gravity lows possibly reflecting extensive alteration along it. Potentially mineralized sites, considered the most significant exploration targets on the EL at the present time, exist where two major E-W structures intersect the lineament east of **Mt Block** and at the eastern end of **Tullabardine Gorge**.

The area of interest extends onto vacant ground flanking the SE corner of the EL and 8.8km^2 of this is recommended for immediate pegging and incorporation into EL 37/89.

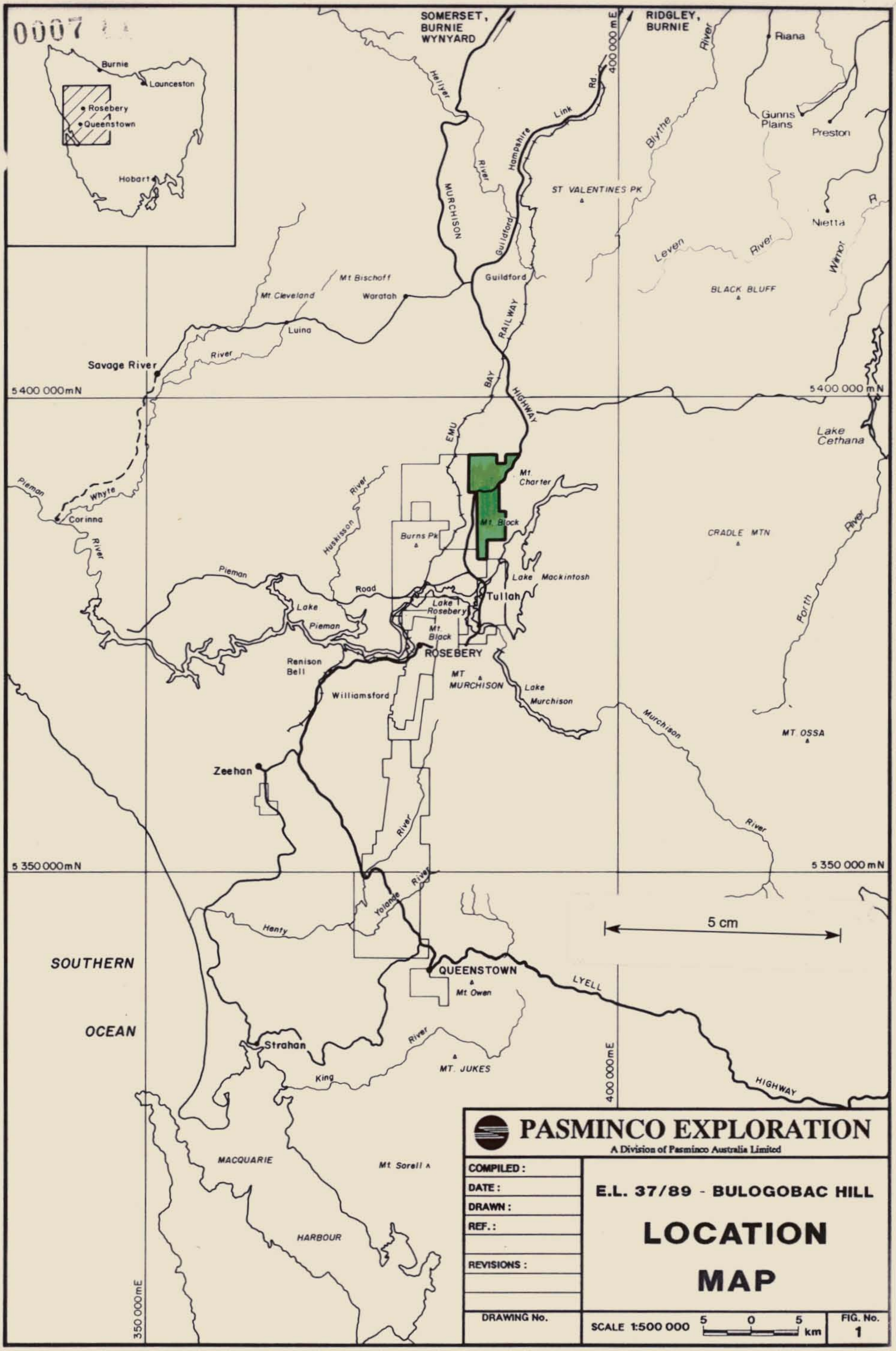
Any mineralization associated with these structural intercepts is likely to occur at considerable depth and be hosted by volcanics lying beneath the barren weakly-altered rhyodacitic Central Sequence Volcanics outcropping in the **Mt Block – Tullabardine Gorge** area. Possible candidates for such target volcanics realistically include the mafic Que-Hellyer Volcanics or correlates.

A detailed gravity survey, with back-up from ground magnetics and geological mapping, and using the old BHP grid for access wherever possible, is recommended over a 10km^2 area east and south of **Mt Block** to refine the subsurface geological picture in the area of the structural intercepts. If the results are favourable, a deep drillhole (+800m?) is recommended to test for buried mineralization at the best of the intercept sites.

Other work proposed for the EL in 1992 includes review of all of BHP's UTEM data, and continued upgrading of the gravity coverage – especially in the general vicinity of **Sock Creek** and to the north of **Bulgobac Hill**.

112008

0007



PASMINCO EXPLORATION

A Division of Pasminco Australia Limited

COMPILED:	**E.L. 37/89 - BULOGOBAC HILL**
DATE:	
DRAWN:	
REF.:	**LOCATION**
REVISIONS:	**MAP**
DRAWING No.	**SCALE 1:500 000** 5 0 5 km
	FIG. No. 1

2. INTRODUCTION

This report covers all work done on the Bulgobac Hill EL 37/89 between February 1991 and January 1992. It also outlines work proposed for the coming year.

The Bulgobac Hill EL is located 5km SW of the Hellyer volcanogenic massive sulphide deposit in Western Tasmania, and covers 32km^2 of the Cambrian Mt Read Volcanics (see Figures 1 - 4). The principle targets of the exploration programme on the EL are auriferous base metal massive sulphide bodies similar to the adjacent Hellyer and Que River deposits.

The EL covers extremely rugged and heavily vegetated country bisected by the sealed Murchison Highway. Vehicle access via 4WD tracks is limited but is best in the area north of the highway. The southern one third of the licence area, to the south of Mt Block, has no vehicle access at all. The EL is transected by 100 or 200m spaced gridlines cut by BHP in the period 1985 to 1987. These grid lines are generally aligned NW-SE and allow access on foot to most parts of the tenement.

During the period under review, exploration has been concentrated in the **High Point** area where the prospective Que-Hellyer Volcanics occur at depth. Three diamond drill holes were drilled here during the year: BHD1 (563.2m), BHD2 (133.9m), BHD3 (784.4m), - a total of 1481.5m. In addition to normal logging and assaying, lithogeochemical, petrological, SG and magnetic susceptibility data were collected from the drill core. (Similar data was also collected from BHP drill holes HP1-4).

Other work undertaken at **High Point** included ground magnetic and gravity surveys, geological mapping and limited soil geochemical sampling. Downhole EM surveys are in progress on all the holes at **High Point** at the time of writing.

At **Bulgobac Hill** geological traverses backed-up by lithogeochemical and petrological sampling, and ground magnetics, were carried out to try and delineate an alteration zone and associated major thrust interpreted from the regional aeromagnetic data.

At **Tullabardine Gorge** gravity traverses and limited geological / lithogeochemical follow-up, were done to detail a major E-W structure interpreted to exist from the regional aeromagnetic data.

At **Sock Creek** geological traverses checked for interpreted structural intersections immediately west of the known mineralization. D Barwick of Tasmania University also completed an Honours Thesis on the geology and mineralization in the **Sock Creek-High Point** area.

Geophysical consultant Dr D Leaman provided an updated interpretation of the 1990 aeromagnetic survey, and reported on the magnetic and gravity surveys undertaken on the EL during the year.

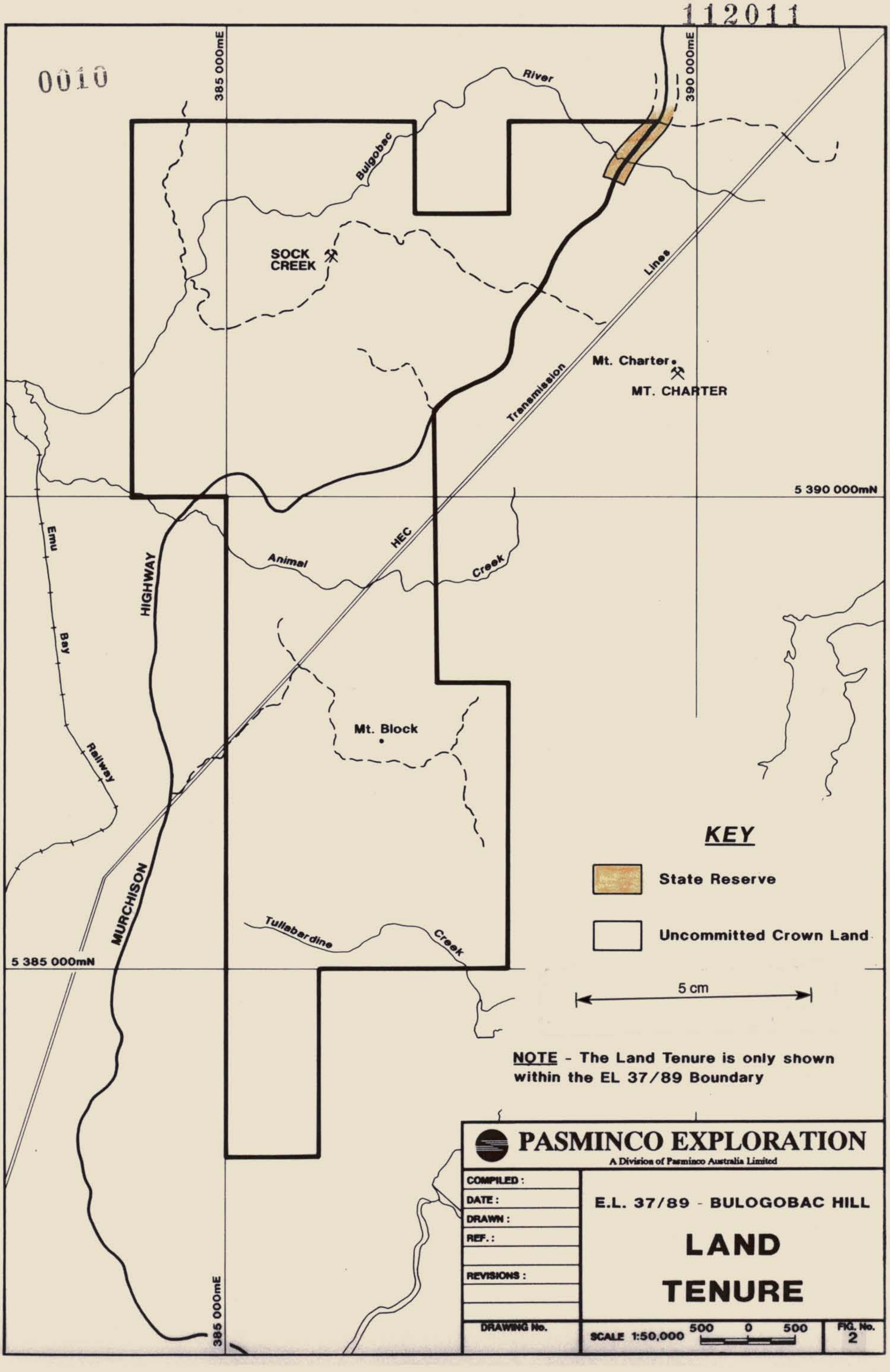
At **High Point** environmental rehabilitation work was carried out by Pasminco Exploration on BHP drill sites HP1, HP2 and HP3, put in during the period 1988-89.

In addition to the activities outlined above, the Bulgobac Hill EL was included in a continuing regional geological investigation of all the northern EL's held by Pasminco in the Mt Read Volcanics, following the 1990 review by T Lees and Dr J Wright. This regional programme in 1991 took the form of detailed geological traverses in the general vicinities of **Mt Block, Tullabardine Gorge, Bulgobac Hill** and **Sock Creek.**

Geological work on the EL during 1991 was carried out by A Lorrigan and G Purvis. All work undertaken is summarized in Figure 6.

112011

0010



KEY

▨	State Reserve
☐	Uncommitted Crown Land

5 cm

NOTE - The Land Tenure is only shown within the EL 37/89 Boundary

PASMINCO EXPLORATION

A Division of Pasminco Australia Limited

COMPILED :
DATE :
DRAWN :
REF. :
REVISIONS :
DRAWING No.

E.L. 37/89 - BULOGOBAC HILL

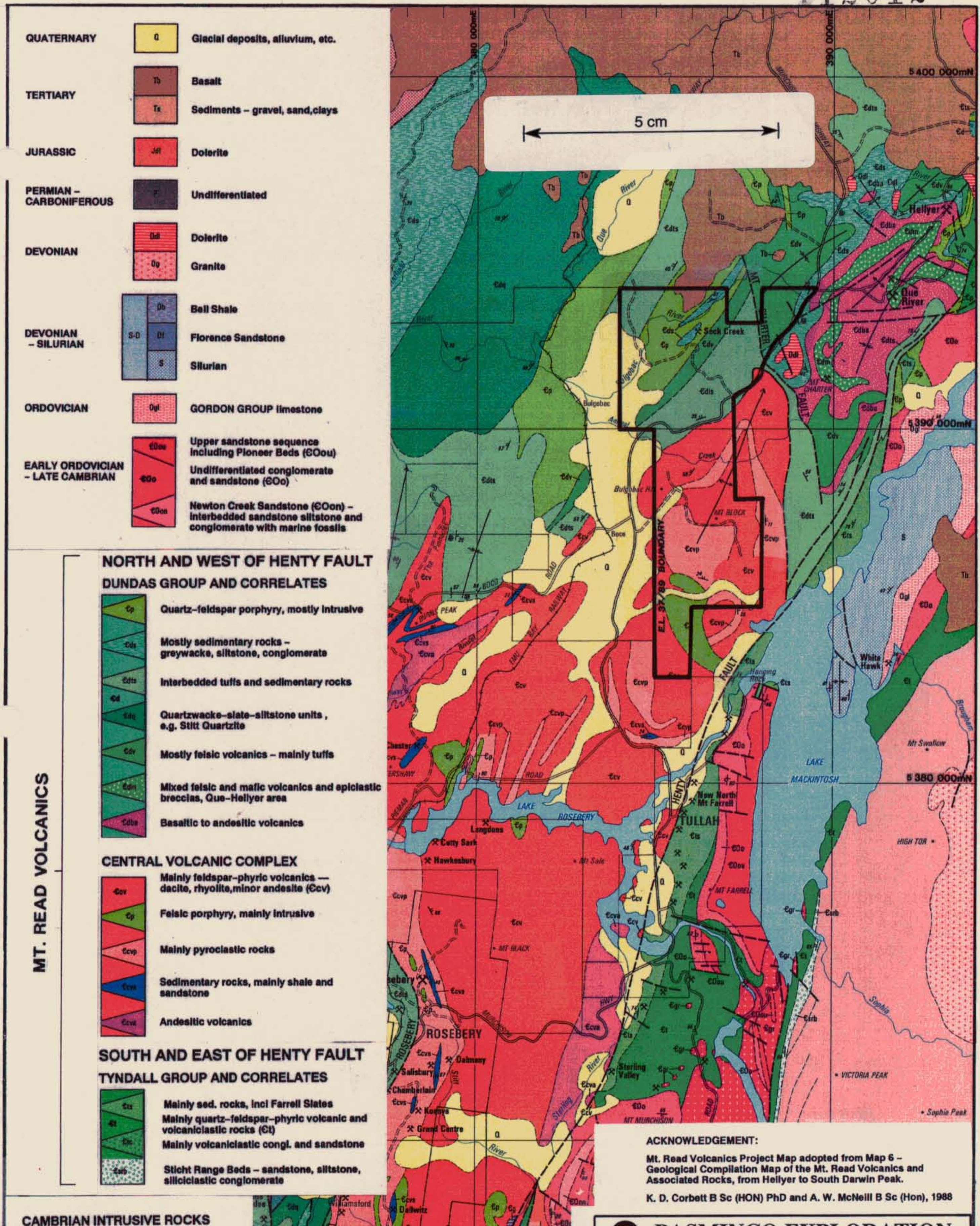
LAND TENURE

SCALE 1:50,000 500 0 500

FIG. No. 2

0011

112012



QUATERNARY	Q	Glacial deposits, alluvium, etc.
TERTIARY	Tb	Basalt
	Tx	Sediments – gravel, sand,clays
JURASSIC	Jdl	Dolerite
PERMIAN – CARBONIFEROUS	P	Undifferentiated
DEVONIAN	Ddl	Dolerite
	Dg	Granite
DEVONIAN – SILURIAN	S-D Db	Bell Shale
	Df	Florence Sandstone
	S	Silurian
ORDOVICIAN	Ogl	GORDON GROUP limestone
EARLY ORDOVICIAN – LATE CAMBRIAN	€Oou	Upper sandstone sequence including Pioneer Beds (€Oou)
	€Oo	Undifferentiated conglomerate and sandstone (€Oo)
	€Oon	Newton Creek Sandstone (€Oon) – interbedded sandstone siltstone and conglomerate with marine fossils

MT. READ VOLCANICS

NORTH AND WEST OF HENTY FAULT

DUNDAS GROUP AND CORRELATES

€p	Quartz–feldspar porphyry, mostly intrusive
€ds	Mostly sedimentary rocks – greywacke, siltstone, conglomerate
€dts	Interbedded tuffs and sedimentary rocks
€d €dq	Quartzwacke–slate–siltstone units , e.g. Stitt Quartzite
€dv	Mostly felsic volcanics – mainly tuffs
€dm	Mixed felsic and mafic volcanics and epiclastic breccias, Que–Hellyer area
€dba	Basaltic to andesitic volcanics

CENTRAL VOLCANIC COMPLEX

€cv	Mainly feldspar–phyric volcanics — dacite, rhyolite,minor andesite (€cv)
€p	Felsic porphyry, mainly intrusive
€cvp	Mainly pyroclastic rocks
€cvs	Sedimentary rocks, mainly shale and sandstone
€cva	Andesitic volcanics

SOUTH AND EAST OF HENTY FAULT

TYNDALL GROUP AND CORRELATES

€ts	Mainly sed. rocks, incl Farrell Slates
€t	Mainly quartz–feldspar–phyric volcanic and volcaniclastic rocks (€t)
€tc	Mainly volcaniclastic congl. and sandstone
€sb	Sticht Range Beds – sandstone, siltstone, siliciclastic conglomerate

CAMBRIAN INTRUSIVE ROCKS

€gr	Granite
€p	Felsic porphyry
€g	Gabbro
€um	Ultramafic rocks & serpentinite

PRECAMBRIAN

Pe	Quartzite–slate sequences — correlates of Oonah Formation
Pm	Metamorphosed sequences of Tyennan Region. Major lithological boundary trends shown

ACKNOWLEDGEMENT:

Mt. Read Volcanics Project Map adopted from Map 6 – Geological Compilation Map of the Mt. Read Volcanics and Associated Rocks, from Hellyer to South Darwin Peak.

K. D. Corbett B Sc (HON) PhD and A. W. McNeill B Sc (Hon), 1988

PASMINCO EXPLORATION

A Division of Pasminco Australia Limited

COMPILED :
DATE :
DRAWN : G.M.B.
REF:
REVISIONS :

E.L. 37/89 – BULGOBAC HILL

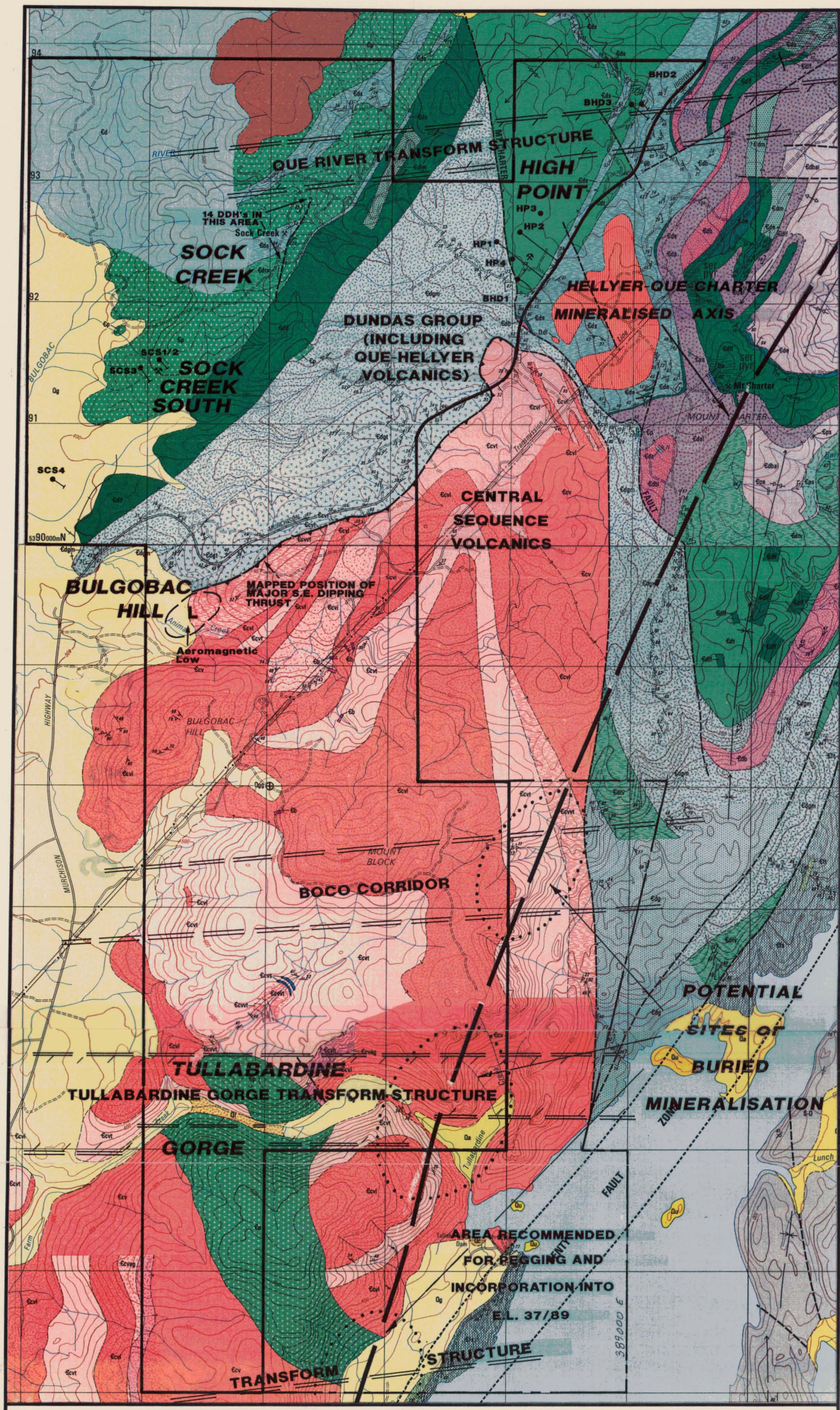
REGIONAL GEOLOGY

FROM MAP 6 OF THE
MT. READ VOLCANICS PROJECT

DRAWING No.

SCALE 0 2 4 km

FIG. No. 3



QUATERNARY

Qu	Qa	*Alluvium, swamp deposits.*
	Qg	*Glacial deposits, mostly till.*

TERTIARY

Tb	*Basalt.*

WEST OF HENTY FAULT ZONE

DUNDAS GROUP

CAMBRIAN — €d

€p	*Quartz-feldspar porphyry.*
€ps	*Felsic intrusive, commonly spherulitic and flow-banded, feldspar-quartz-phyric.*
€dg, €dt	*Lithicwacke with interbedded siltstone and mudstone and intercalations of felsic tuff (€dt).*
€dt	*Felsic tuff, generally quartz-feldspar-phyric, often well bedded, with pumice clasts in some cases.*
€ds, €de	*Dominantly shale, siltstone and mudstone, generally black and pyritic, with basal lenses of epiclastic agglomerate (€de).*
€dba: €db	*Basaltic lavas and breccias, including pillow lavas with inter-pillow chert.*
€dba: €da	*Andesitic lavas, breccias and tuffs.*
€dm: €de, €da, €dba, €dlf	*Epiclastic breccias and grits with clasts of basalt, andesite, felsic lava and massive sulphide (€de). Intercalations of andesitic volcanics (€da), vesicular basaltic-andesitic lava (€dba), flow-banded spherulitic felsic lava (€dlf) and massive sulphide shown.*
€dm: €dlf	*Felsic lava, generally flow-banded and spherulitic, feldspar-quartz-phyric.*
€dbal, €dal, €dbl, €dtv	*Lower sequence of basaltic and andesitic lavas, breccias and tuffs. Some basaltic (€dbl) and andesitic (€dal) units shown. Some intercalations of felsic tuff (€dtv)*
€dt, €dtv	*Felsic tuff with intercalations of fine grained vitric tuff and minor felsic lavas (€dtv).*
€dg	*Lithicwacke sandstone, commonly micaceous, with interbedded siltstone, felsic tuff and minor basaltic-andesitic volcanics.*

WEST AND SOUTH OF MT CHARTER

€d

€p	*Quartz-feldspar porphyry intrusives with possible minor lavas and tuffs*
€ds, €dtv	*Dominantly black shale and siltstone with intercalations of felsic vitric tuff (€dtv).*
€dlf, €dlm	*Felsic lava, mostly feldspar-phyric, massive to vesicular, with zone of flow breccia and epiclastic rocks indicated (€dlm).*
€dg: €dgm	*Dominantly micaceous lithicwacke with interbedded siltstone.*
€dg: €dgt	*Dominantly tuffaceous lithicwacke with interbedded siltstone.*

CENTRAL VOLCANIC SEQUENCE

€cv

€cvt, €cvi, €cvvt	*Felsic pyroclastic rocks, generally feldspar-phyric. Some units of fiamme-bearing ignimbritic tuff (€cvi) and fine grained vitric tuff (€cvvt) shown.*
€cvl	*Felsic lava, generally feldspar-phyric.*

INTRUSIVE ROCK

5 cm

DEVONIAN	Ddl	*Dolerite*
CAMBRIAN	€p	*Quartz-feldspar porphyry*
	€ps	*Felsic intrusive, commonly spherulitic and flow-banded, feldspar-quartz-phyric.*

OVERPRINTS AND MINERALIZATION

pyr	*Alteration in volcanic rocks, usually with strong schistosity. ser = sericite, pyr = pyrite*
▨	*Area of strongly cleaved or disrupted rocks, usually associated with fault zones.*
PQ	*Massive sulphide lens with mine designation where applicai*
Ba	*Barite.*

112013

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.
DATE : Jan., 1992
DRAWN : G.M.B.
REFERENCE : Maps 1 & 2 of The Mt. Read Volcanics Project.
REVISIONS :
DRAWING No.

E.L. 37/89 - BULGOBAC HILL

GEOLOGY

SCALE 1:25,000 0 500 m

FIG. No. 4

3. TENURE

The Bulgobac Exploration Licence 37/89, covering 32km^2, was granted to Pasminco Mining Rosebery on 3rd March 1990, for a renewable one year term.

Title was transferred to Pasminco Exploration, a Division of Pasminco Australia Limited, on 19th August 1990. The EL was renewed in March 1991 and a further one year renewal is being sought from March 1992.

The Licence area is almost entirely Unallocated Crown Land. Part of a small Highway Reserve extending 100m either side of the Murchison Highway, occurs in the NE corner of the EL (see Figure 2).

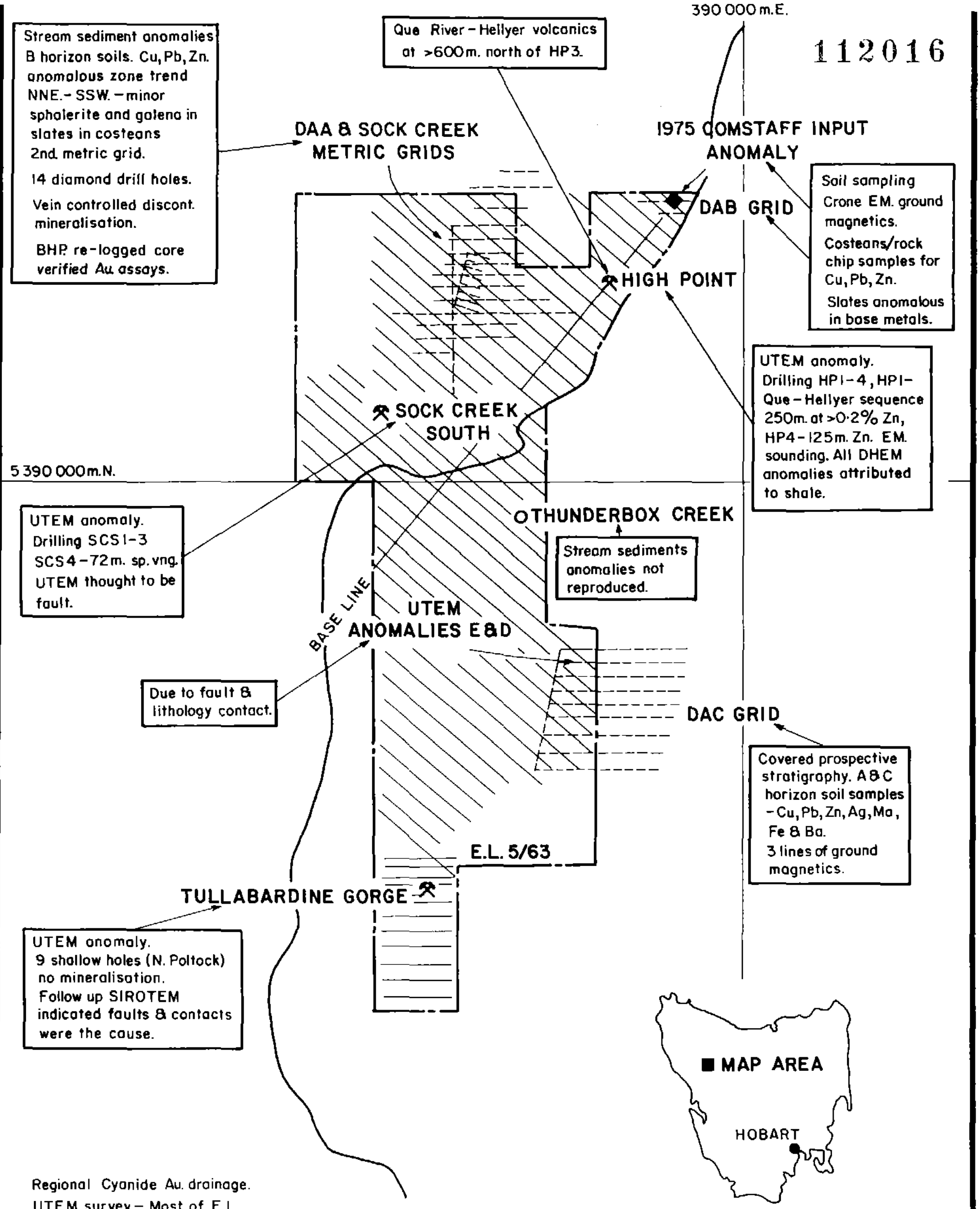
4. PREVIOUS EXPLORATION

Reviews of previous exploration in the area now covered by EL 37/89 appear in Wild & Kerr (1989) and Lorrigan (1991). A summary of earlier exploration is shown in Figure 5 (taken from Lorrigan, 1991).

This earlier work was undertaken in the period 1963 to 1989, when the Licence area was part of Comstaff's EL 5/63. This consortium and its Joint Venture partners (Pruessag after 1977 and BHP after 1985), using regional EM and/or stream sediment surveys, discovered and drilled zinc-rich basemetal mineralization in the volcanics at **Sock Creek** (14 diamond drill holes), **High Point** (4 holes) and **Sock Creek South** (4 holes). In addition, BHP drilled 9 shallow diamond drill holes (less than 50m each) at **Tullabardine Gorge** without encountering any mineralization.

No mineralized shows or old workings are known on the EL area from any prospecting activities that may have occurred prior to Comstaff.

112016



Stream sediment anomalies B horizon soils. Cu, Pb, Zn. anomalous zone trend NNE.-SSW.-minor sphalerite and galena in slates in costeans 2nd. metric grid.

14 diamond drill holes.

Vein controlled discont. mineralisation.

BHP. re-logged core verified Au. assays.

Que River-Hellyer volcanics at >600m. north of HP3.

Soil sampling Crone EM. ground magnetics.

Costeans/rock chip samples for Cu, Pb, Zn.

Slates anomalous in base metals.

UTEM anomaly. Drilling HP1-4, HP1-Que-Hellyer sequence 250m. at >0·2% Zn, HP4-125m. Zn. EM. sounding. All DHEM anomalies attributed to shale.

UTEM anomaly. Drilling SCS1-3 SCS4-72m. sp. vng. UTEM thought to be fault.

Stream sediments anomalies not reproduced.

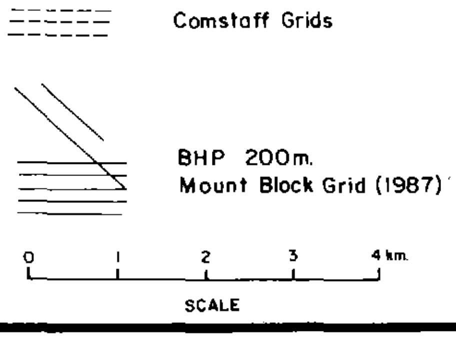
Due to fault & lithology contact.

Covered prospective stratigraphy. A&C horizon soil samples -Cu, Pb, Zn, Ag, Mo, Fe & Ba. 3 lines of ground magnetics.

UTEM anomaly. 9 shallow holes (N. Poltock) no mineralisation. Follow up SIROTEM indicated faults & contacts were the cause.

Regional Cyanide Au. drainage.

UTEM survey - Most of E.L.



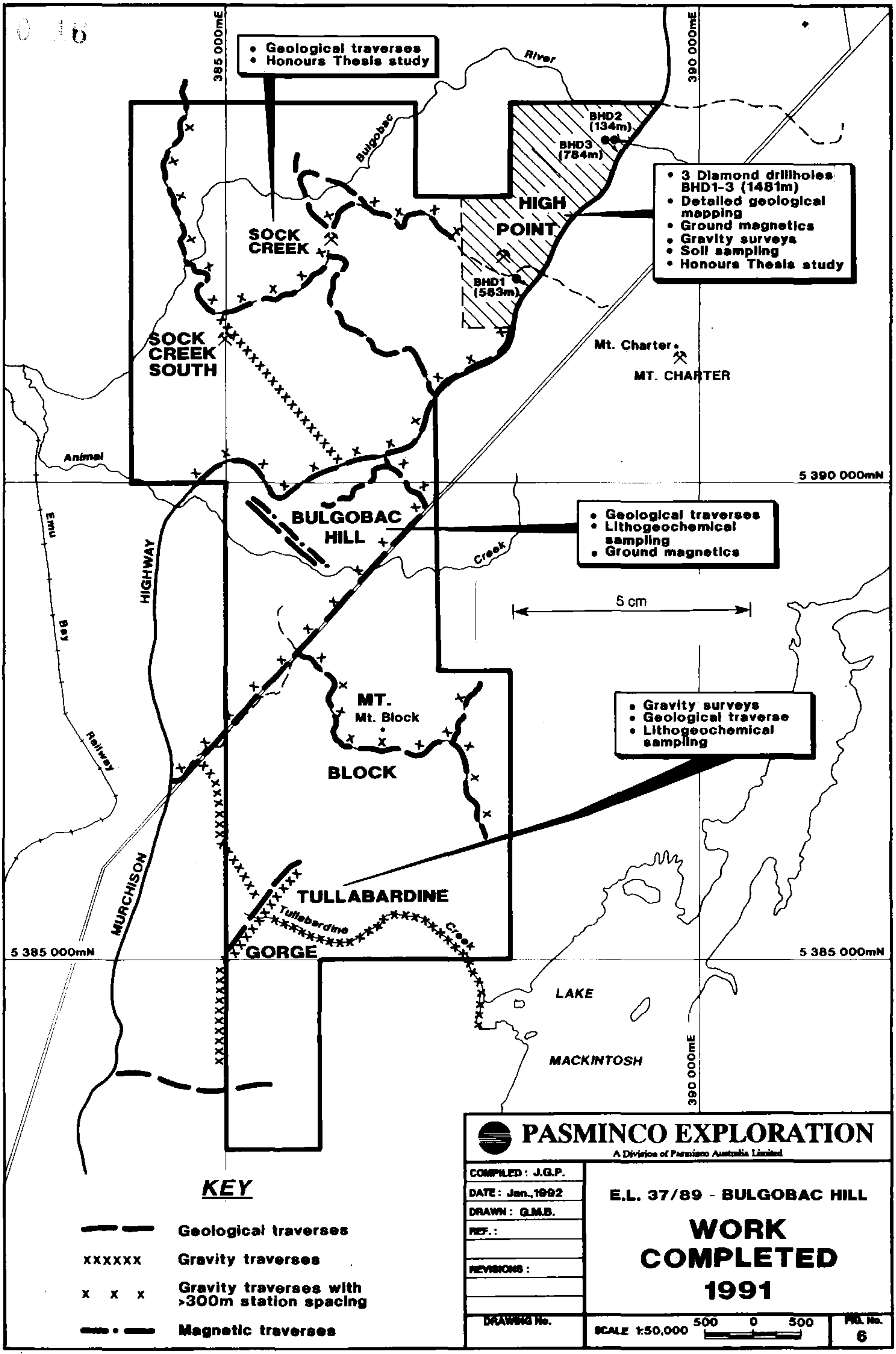
PASMINCO EXPLORATION

A Division of Pasminco Australia Limited

COMPILED: A.N.L.
DATE: 24-1-'91
DRAWN: N.W.D.S.
REF.: A4-2934
REVISIONS:

SUMMARY OF PREVIOUS WORK BY COMSTAFF and BHP. (1963-1989)

DRAWING No.
SCALE N.T.S.
FIG. No. 5



PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.
DATE : Jan., 1992
DRAWN : G.M.B.
REF. :
REVISIONS :
DRAWING No.

E.L. 37/89 - BULGOBAC HILL

WORK COMPLETED 1991

SCALE 1:50,000 500 0 500

FIG. No. 6

5. GEOLOGY

The geology of the EL is shown in Figures 3 & 4.

The Bulgobac Hill EL covers various rock units of the Cambrian Mt Read Volcanics, which can be divided into two main groupings:

1 Central Sequence Volcanics

These occur in the southern part of the EL and largely comprise rhyodacitic lavas and volcaniclastics, with some intrusive quartz-feldspar porphyry. Corbett & McNeill (1986) correlate these volcanics with those overlying the Rosebery deposit, 10km to the SW.

2 Dundas Group & Correlates

These cover the northern half of the EL and are made up predominantly of sediments with lesser quartz-feldspar porphyry, felsic volcanics and the subaqueously-deposited Que-Hellyer mafic volcanics. The latter lie mainly to the NE of the major Mt Charter Fault, covering less than 2km^2 in the NE corner of the EL.

The boundary between these two rock groupings has been described by Corbett & Komyshan (1989) as a fault, and inferred as a major thrust by Leaman (1990) with the Central Sequence thrust to the NW over the Dundas Group. However, recent Pasminco mapping has failed to locate this contact and its nature remains unresolved at present.

Magnetic and gravity surveys conducted by Pasminco over the past two years have improved understanding of the structural setting of the EL, and delineated several major buried structures which have little or no mapped expression. These include a western arm of the Mt Charter Fault which passes through the Sock Creek prospect, and several major structures trending E-W or WSW-ENE including the Tullabardine Gorge Transform, the Boco Corridor and the Que River Transform. The last one is so named because the Que River orebody lies on it, 2km to the east of the EL boundary.

Three sphalerite-dominated mineralized occurrences are known on the EL area, all found by exploration over the past 20 years. These comprise a broad weak disseminated sp-py zone in altered Que-Hellyer Volcanics beside the Mt Charter Fault at High Point, sp with minor gn-cp in net-veins on an intrusive porphyry/black shale contact at Sock Creek, and very weak disseminated sp in black shale at South Sock Creek. No other sulphide occurrences of note are known anywhere on the EL.

6. RESULTS OF EXPLORATION

The 1991 exploration programme concentrated on the mineralized **High Point** area, where the principal work done was the drilling of three diamond drillholes totalling 1481.5m. Elsewhere on the EL, although activity was at a high level the exploration was largely of a regional or reconnaissance nature, involving geological, geophysical and geochemical surveys.

6.1. Drilling at High Point

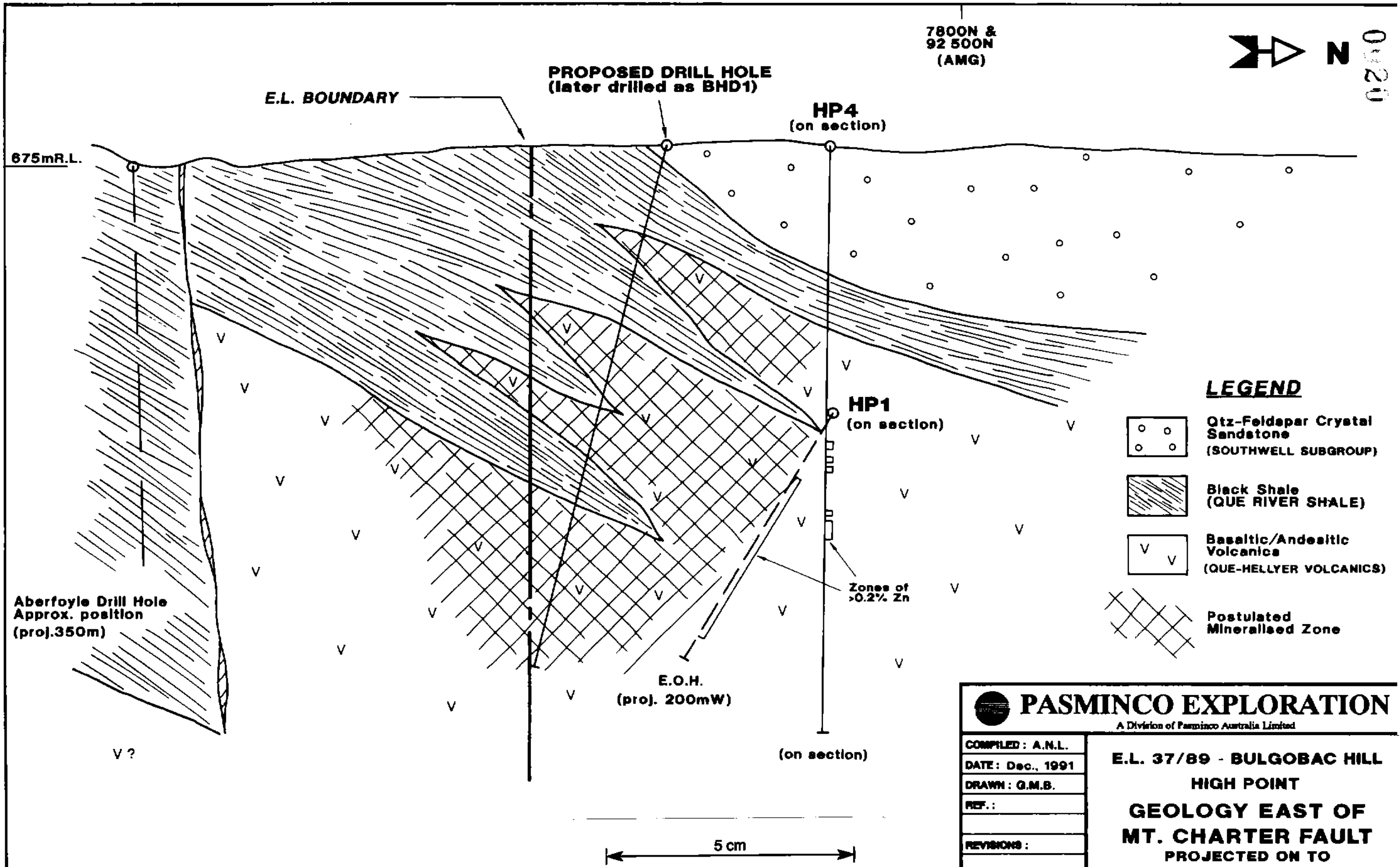
6.6.1. Drillhole BHD1

The diamond drillhole was designed by A Lorrigan and put down to 563.2m between 28th August and 15th October 1991. The hole collared beside the Mt Charter Fault at AMG 5392193mN / 388051mE, drilling at -75° to 128° AMG (see Figure 17). Its primary purpose was to test for ore adjacent to the weak sphalerite-dominated mineralization intersected by BHP in holes HP1 and HP4 at relatively shallow depths beside the Mt Charter Fault. The mineralization is hosted by altered basalts and andesites of the Que-Hellyer Volcanics.

Adjacent to the Mt Charter Fault, the mafic volcanics are apparently thickened at the expense of the overlying Que River Shale. Lorrigan considered this thickening to be the result of uplift of the volcanics closest to the fault during deposition of the shale. Sediments overlying the shale are easy to correlate and reveal no significant displacement.

The mineralized rocks in the BHP holes are extensively faulted. The faults that displaced the volcanics may well have acted as conduits for the mineralising fluids which then may have been trapped beneath the overlying shale. In proposing hole BHD1, Lorrigan assumed that the zinc mineralization in HP1 was peripheral to ore formed by such a process. The hole was sited to test the volcanics 100m up-plunge to the south of the HP1 intersection (see Figure 7).

Lorrigan was of the opinion that the altered and mineralized volcanics in HP1 probably belong to the Upper Basalts and Andesite unit of the Que-Hellyer Volcanics, and could be hangingwall to ore in the prospective Mixed Sequence at greater depths. BHD1 was thus also designed to test the stratigraphy 100-150m deeper than HP1. (*See comments at *end of this section*).



PASMINCO EXPLORATION

A Division of Pasminco Australia Limited

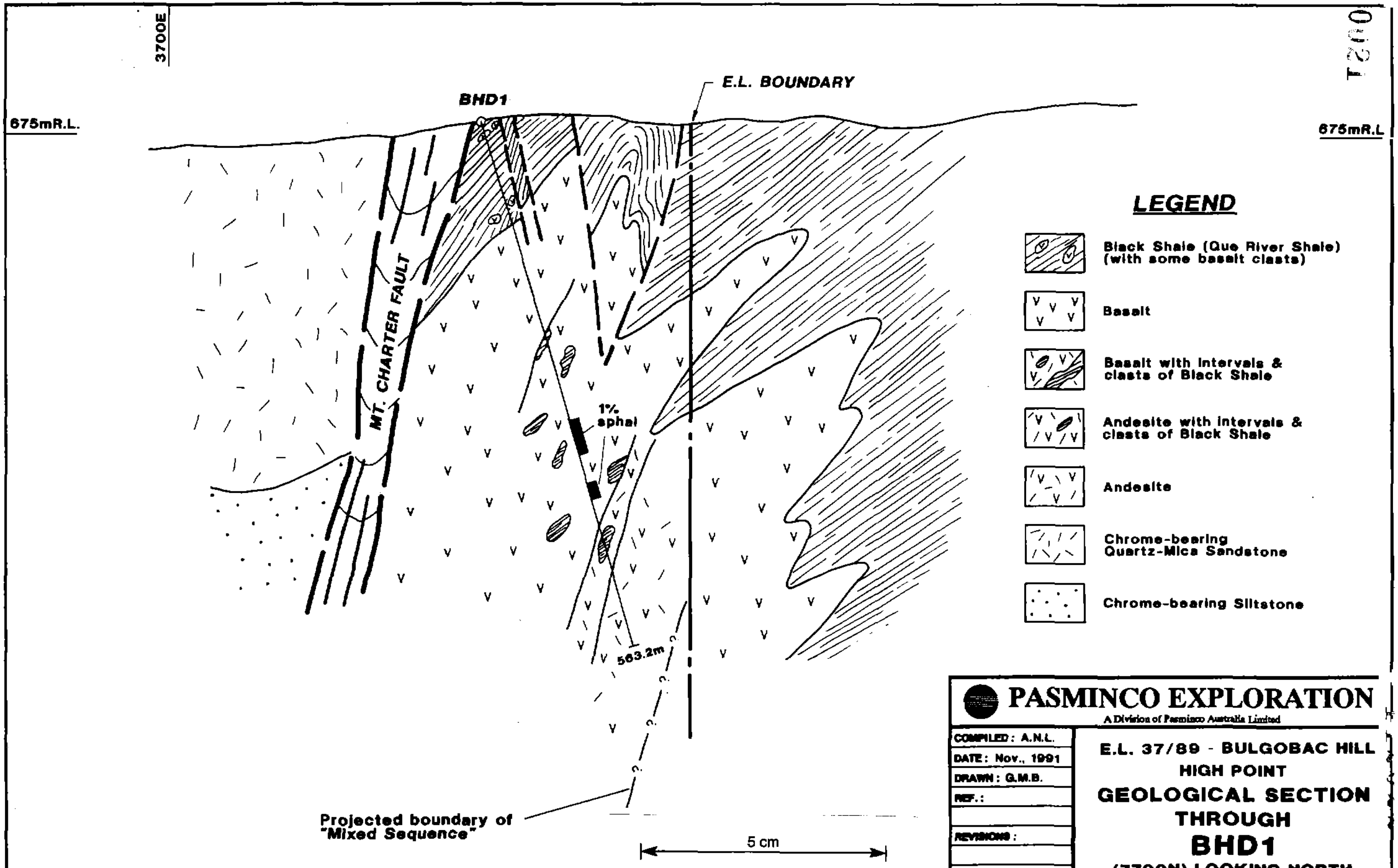
COMPILED : A.N.L.
DATE : Dec., 1991
DRAWN : G.M.B.
REF. :
REVISIONS :
DRAWING No.

E.L. 37/89 - BULGOBAC HILL
HIGH POINT

GEOLOGY EAST OF MT. CHARTER FAULT
PROJECTED ON TO
388 000mE (AMG)

SCALE 1:5000 0 100 m

FIG. No. 7



PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : A.N.L.
DATE : Nov., 1991
DRAWN : G.M.B.
REF. :
REVISIONS :
DRAWING No.

E.L. 37/89 - BULGOBAC HILL
HIGH POINT
GEOLOGICAL SECTION THROUGH
BHD1
(7700N) LOOKING NORTH

SCALE 1:5000 50 0 50 m

FIG. No. 8

The completed drill section of BHD1 is shown in Figure 8 & 15, and the log in Appendix 1.

To 176m BHD1 encountered the carbonaceous, calcareous and partly-graphitic Que River Shale, with intervals of carbonatised mafic lava, and breccia composed of mafic volcanic and sediment clasts in black shale matrix. Below 176m the hole was in the Que-Hellyer Volcanics. From 176 to 326m these comprised altered and brecciated mafic volcanic lavas (alteration mainly chlorite-carbonate-silica, with minor sericite-fuchsite at 172-183m and 248-265m).

From 326m to 419m BHD1 intersected mineralized peperitic mafic lava breccias, with altered (chlorite-carbonate or silica) vesicular basalt lava clasts in a matrix of black shale (below 400m the clasts were feldspar-phyric andesite). Very fine pink sphalerite (and lesser pyrite) was associated with the silica alteration, being disseminated through both the shale and lava clasts (especially on the boundaries of silicified clasts and in vesicles), and also in stringers of carbonate and silica.

Unmineralized andesitic peperite continued to 449m, and the hole terminated in lesser-altered and unmineralized brecciated feldspar-phyric andesitic lava at 563.2m, close to the EL boundary.

The mineralization in BHD1 is of the same style as that in BHP holes HP1 and HP4, but assays from the BHD1 core show that it is not as strong as in HP1. The best intersection in BHD1 was 0.4% Zn, 10ppm Pb, 1g/t Ag, over the 8m interval from 347.3m to 355.3m, while the 74m interval from 323m to 397m averaged 0.2% Zn, 0.02% Pb and <1g/t Ag. Copper levels were generally <100ppm and gold was all <0.02g/t. The Zn : Pb ratio of the mineralization is extraordinarily high (>10 : 1) - much higher than in BHP's hole HP1 (<3 : 1).

Lorrigan considered BHD1 at bottom was still in the Upper Basalts and Andesites unit of the Que-Hellyer Volcanics (as she considered HP1 had been). However, this viewpoint has been the subject of some discussion among Pasminco geologists. It is hoped the stratigraphic correlations in the hole will be clarified when the lithogeochemical and petrological results are received. However, it must be noted that the lithogeochemical sampling carried out by Lorrigan on BHP's holes gave equivocal results that did not resolve the controversy.

6.1.2. Drillhole BHD2

This hole was put down 1750m NE of BHD1 and only a few hundred metres from the NE corner of the EL. It was designed to test the prospective Mixed Sequence of the Que-Hellyer Volcanics in an area where, from gravity and magnetic data, Leaman (1991a) had postulated the intersection of two important structures: a Cambrian volcanic rift margin or growth fault extending N-S subparallel to the Mt Charter Fault, and the Que River Transform Structure (an E-W lineament passing through the Que River Mine and thought to have influenced the focussing of ore fluids there). Such an intersect was considered to be an area where Cambrian mineralized fluid flow may have been concentrated.

The broad outline of Leaman's concept is shown in Figure 9. Full details of his interpretation appear in Appendix 8.

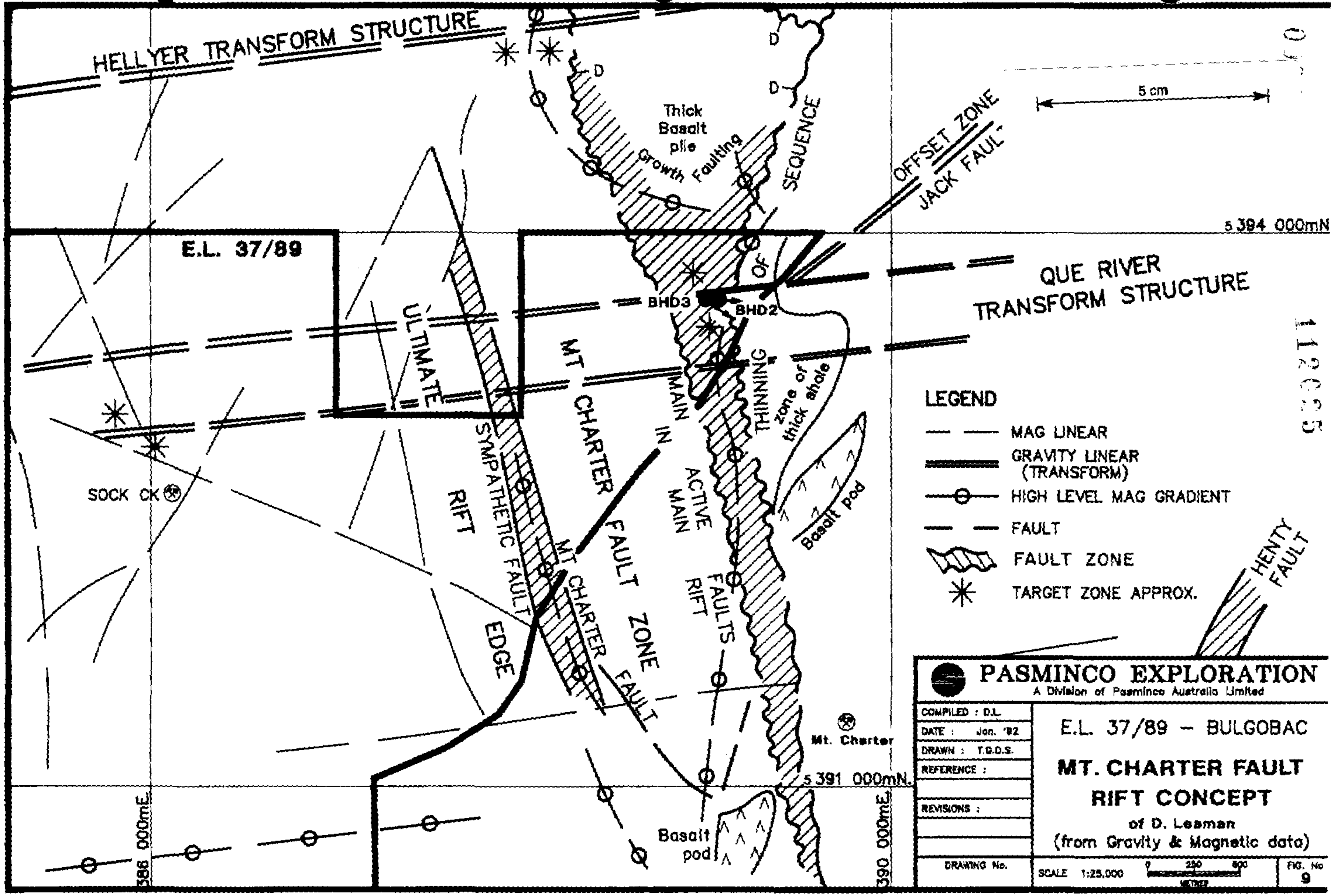
The hole was collared at the western edge of the Que River Shale on the 31st October 1991, drilling AMG east at -80°. The hole azimuth was designed to avoid a SE swing in rock strike mapped within the volcanics in the target area by Komyshan (1986) - see Figure 4. However, this azimuth was at an angle of some 40° to local rock strike near the collar of the hole, which caused the hole to swing violently to the south and to shallow much more quickly than planned.

As a result of this deviation the hole had to be aborted at 133.9m on 14th November 1991, while still in the Que River Shale. Details of the geology in this hole are given in the log (Appendix 2) and shown on the drill section (Figure 16).

6.1.3. Drillhole BHD3

Drill hole BHD3 was collared 75m west of BHD2 on 19th November 1991, drilling at 132° AMG along old BHP gridline 9400N. The hole was a re-drill of BHD2 and designed to test the same target. It was completed at 784.4m on 14th January 1992, without encountering any sulphides of note.

A summary log of the hole is given in Table 1 and the full log in Appendix 3. Location of the hole is shown on Figure 17 and the geological drill section in Figure 16.



PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : D.L.
DATE : Jan. '92
DRAWN : T.G.D.S.
REFERENCE :
REVISIONS :

E.L. 37/89 – BULGOBAC

MT. CHARTER FAULT RIFT CONCEPT

of D. Leaman
(from Gravity & Magnetic data)

DRAWING No.
SCALE 1:25,000 0 250 500 METRES
FIG. No 9

TABLE 1: SUMMARY LOG OF HOLE BHD3

0 - 52.9m: SOUTHWELL SUBGROUP:

0 -52.9m:	**PUMICEOUS CRYSTAL-LITHIC BRECCIO-CONGLOMERATE** Mod silicified. 1% pyrite. Clasts of massive py below 36m.

52.9 - 453.0m: QUE RIVER SHALE:

52.9 -257.2m:	**BLACK SHALE** Carbonaceous, graphitic & calcareous. 1-2% bedded pyrite, with zones to 5%.
257.2 -453.0m:	**MIXED SEQUENCE OF BLACK SHALE, FELDSPATHIC SANDSTONE & FELDSPAR-PHYRIC AMYGDALOIDAL MAFIC LAVAS** Dolerite 441 -448m. Sediments calcareous, mafics carbonatised. 1-3% pyrite in shale. Gen minor to 1% py in volcs, with limited intervals to 3% (best: 416.7 -423m: 2-3% py, trace sp).

453.0 -784.4m: QUE-HELLYER VOLCANICS:

453.0 -461.7m:	**CLEAVED, SERICITISED & PYRITIC FINE MAFIC BRECCIA** Probable major ductile structure. Mod-strong sericite-carbonate alteration. 5-10% pyrite, minor sp-gn in calcite veinlets.
461.7 -580m:	**BRECCIATED AMYGDALOIDAL MAFIC LAVAS** Carbonatised & chloritised. Bleached & silif lava clasts 485 -498m. Gen minor to 1% pyrite, except 2-3% py in faulted zone @ 466.5 -474m.
580 -646.4m:	**PARTLY-PEPERITIC FELDSPAR-PHYRIC MAFIC (TO DACITIC?) LAVA BRECCIA** Carbonatised & chloritised. Minor fuchsite in v strong fault @ 610 -611m. Minor to 1% pyrite, decreasing with depth.
646.4 -695.4m:	**ALTERED POLYMICT EPICLASTIC VOLCANIC BRECCIA** Dacitic & andesitic composition. Apparent primary debris-flow lineation. Strong silica-albite alteration. Minor pyrite.
695.4 -709.8m:	**FELDSPAR-PHYRIC (ANDESITIC?) LAVA** Carbonate-chlorite-sericite alteration. V minor pyrite.
709.8 -757.7m:	**ALTERED DACITIC VOLCANIC BRECCIA** Dacitic fragments in possibly more-andesitic matrix. Extensively detextured by strong silica-albite-chlorite-carbonate alteration. Several amygdaloidal mafic dykes to 5m. V minor pyrite.
757.7 -784.4m:	**PEPERITIC FELDSPAR-PHYRIC LAVA BRECCIA** Andesitic to possibly dacitic composition. Chloritised, with patchy silicification. Minor pyrite.

END OF HOLE

Best intersection:

453 -456m: 3m @ 0.15% Zn, 0.04% Pb, 1g/t Ag, <0.01g/t Au.

BHD3 was collared in pumiceous breccio-conglomerates of the Southwell SubGroup and at 53m passed into the calcareous, pyritic and graphitic Que River Shale. At 257m the hole entered a zone of intercalated sediments and amygdaloidal mafic lavas which is considered to be the basal portion of the Que River Shale, demonstrating a graduational stratigraphic change from the waning mafic volcanism to overlying quiet sedimentary conditions.

Oriented core from these upper sedimentary units indicates they generally have a moderate westerly dip, although strike shows some tendency to swing from NE to more NW with depth (ie: towards parallelism with the direction of the hole), apparently reflecting the swing mapped by Komysham (1986) in the rocks immediately east of the Murchison Highway. Apart from one local minor fold, all facings in the hole indicate the rocks are upright and face west.

The sedimentary section terminated at 453m in a major ductile structure, which orientation measurements determined dips very steeply west. The strongest sulphides in the hole were associated with this structure which extended to almost 462m downhole. Unfortunately, the sulphides are almost entirely pyrite with only traces of basemetals and no precious metals (although the fault zone produced the best assay from the hole: 3m @ 0.15% Zn, 0.04% Pb).

From this structure to the bottom at 784.4m the hole was in the Que-Hellyer Volcanics. In the uppermost sections these volcanics are amygdaloidal and non-porphyritic mafic lavas and breccias, but with increasing depth they become feldspar-phyric, occasionally quartz-amygdaloidal or flow banded, and apparently andesitic to dacitic.

From 646-758m the volcanics largely comprise a series of altered polymict and probably epiclastic breccias, with predominantly dacitic lava fragments in a matrix that appears to be of more-andesitic composition. (The strong silica-albite alteration and associated detexturing makes these rocks extremely difficult to identify in hand specimen). This section also includes amygdaloidal mafic dykes.

This polymict section is here equated with the Mixed Sequence that hosts the Que River and Hellyer deposits. It is possible this zone has its upper margin as high as around 600m in the hole, where quartz-amygdaloidal lava fragments were first noted. Although this section has some apparently-primary debris-flow lineation, no obvious layered or bedded rocks occur in it.

Below 758m the hole finished in peperitic feldspar-phyric lava breccias of probable andesitic composition.

Although the volcanics in the hole are altered (usually ubiquitous carbonate and chlorite), particularly in the polymict epiclastic breccias which are strongly silica-albite-sericite altered and bleached, sulphides are limited to minor disseminated pyrite. The only fuchsite alteration noted in the hole was trace amounts in a fault zone at 610m.

Petrological and lithogeochemical results from sampling in BHD3 were not available at the time of writing. It is hoped these will clarify the stratigraphic divisions within the volcanics in the hole.

The major ductile structure at 453-462m in BHD3 is perhaps evidence for the Cambrian rift margin postulated by Leaman (1991a) - one of the reasons the hole was drilled. This structure marks an abrupt change from the Que River Shale, with its intercalated mafic volcanics in the lower sections of the unit, to the Que-Hellyer Volcanics proper. The structure strikes NNE (AMG), parallel to the general rock strike in this area, and on surface on the drilled section appears to coincide with the position of the Bulgobac River and a tributary parallel to the highway (see Figure 17).

The disposition of the major units in the hole indicates the overall sense of movement on the structure is normal, with east block up (as proposed by Leaman), but the amount of movement is unknown. However, flattening of bedding, contact and cleavage angles, in rocks immediately west of the structure suggest late-stage movements on it were reverse, with the west block rocks being dragged upwards. The sedimentary section in the hole is much thicker than anticipated from Komyshan's surface mapping, and the inference is that the Que River Shale is abruptly thicker west of the structure than to the east of it. All these relationships are shown in Figure 16.

It is unfortunate for the rift theory that the structure is apparently not associated with any significant mineralization or alteration (viz: basemetals or fuchsite-carbonate), in the adjacent volcanics.

6.2. Other Work at High Point

6.2.1. Geological Mapping and Lithogeochemical Sampling

Detailed mapping at High Point was carried out by A Lorrigan of Pasminco, with some additional traverses by D Barwick as part of his Honours Thesis project on the geology and mineralization in the Sock Creek / High Point area. The latter also re-examined the BHP holes at High Point, as did J McPhie of Tasmania University as part of her regional stratigraphic study of the Mt Read Volcanics. Some of McPhie's work has been incorporated into Figure 10 and her assistance is gratefully acknowledged. To date, there has been insufficient time to fully evaluate the work done by Barwick but this will form part of the review planned for this area in 1992.

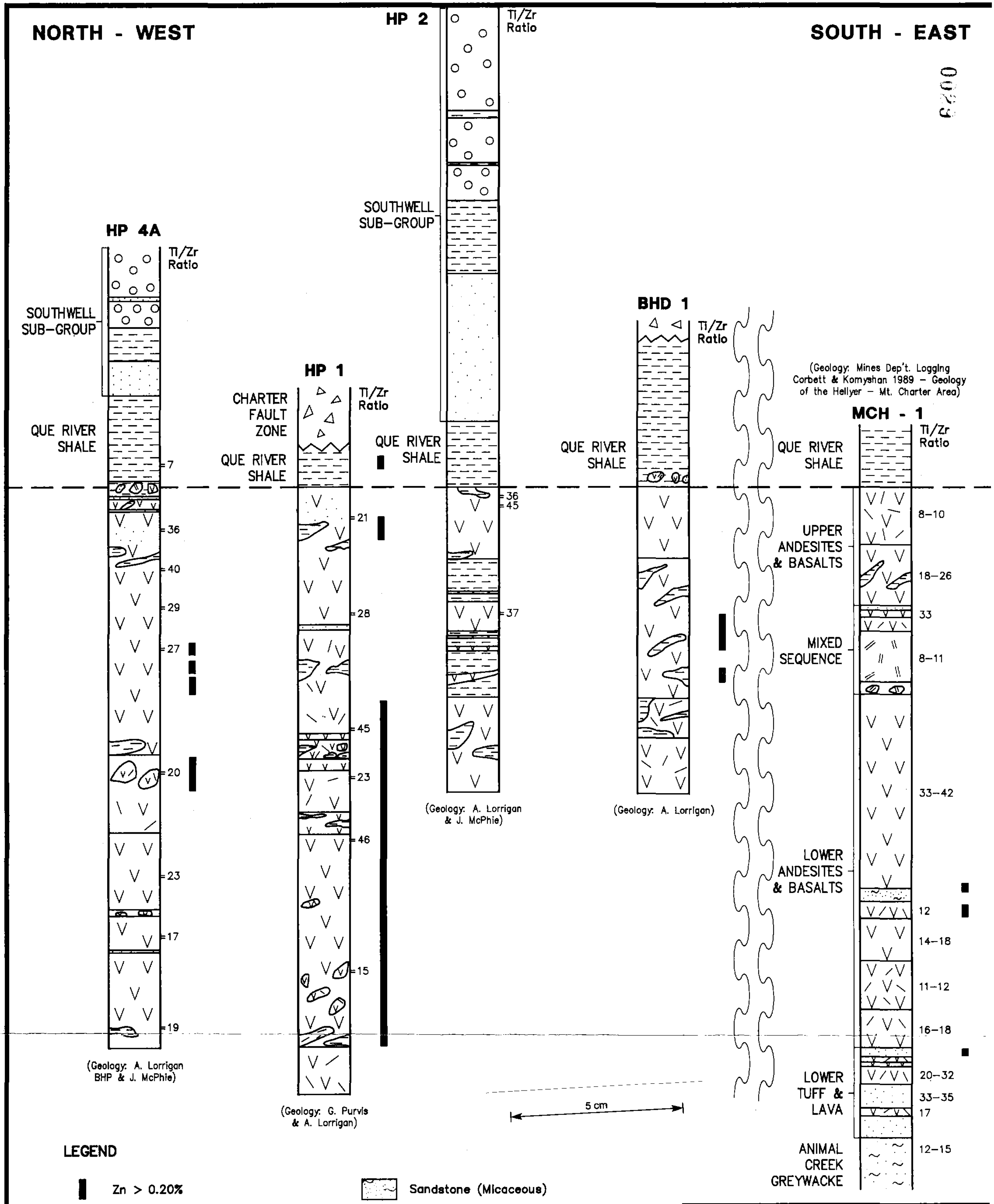
The mapping and core relogging was augmented by rock chip, petrological and lithogeochemical sampling, the results of which appear in Appendix 4. Locations of rock chip samples are shown in Figure 19.

Mapping by Lorrigan concentrated along the trend of the Mt Charter Fault to determine whether any mineralization was evident at surface in the fault or rocks adjacent to it. The intent was to identify drill targets along the fault zone either to the north or south of the area drilled by BHP. Although no mineralization was noted at surface, the 'zone of disturbance' associated with the Mt Charter Fault is much wider than previously thought.

Lorrigan compiled stratigraphic columns and sections through the mineralized area at High Point and these are shown in Figure 10. It is noticeable that the detailed geology of the volcanics and intercalated sediments cannot be properly correlated between adjacent close-spaced holes at High Point, indicating that many of the units are local lenses.

Lorrigan showed there is great difficultly in correlating the stratigraphy in the Que-Hellyer Volcanics at High Point with the detailed stratigraphic "model" outlined by Aberfoyle geologists and others, for the volcanics in the vicinity of the Que and Hellyer deposits. Not

112030



LEGEND

- ▮ Zn > 0.20%
- Tectonic Breccia
- Quartz – Feldspar Crystal Sandstone
- Black Shale
- Siltstone/Sandstone (Volcaniclastic)
- Sandstone (Micaceous)
- Dacite Lava
- Basalt Lava
- Andesite Lava
- As above with peperitic black shale mixing
- Probable Epiclastic (Basalt & Dacite Clasts)

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : A.N.L.
DATE : Jan. '92
DRAWN : T.G.D.S.
REFERENCE :
REVISIONS :
DRAWING No.

E.L. 37/89 – BULGOBAC HIL

HIGH POINT AREA
STRATIGRAPHIC COLUMNS
(Interpreted true thicknesses)

SCALE 1:2500 0 25 50 METRES

FIG. No 10

only is there difficultly in identifying specific lithologic elements of this "model" at High Point, there is also a lack of correlation in the supposedly-diagnostic Ti/Zr ratios.

This is clearly seen in a comparison of the results in the Mines Department's Mt Charter hole MCH1 and Pasminco's sampling of the BHP High Point holes (see Figure 10). The Ti/Zr ratios in the upper part of the volcanics in the BHP holes are characterised by values of 20-40, and the volcanics at the bottom of the holes by values in the teens. Whereas, in the Mines Department hole the values are the opposite: the Upper Andesites and Basalts unit, and the Mixed Sequence, typically have Ti/Zr values in the teens while the Lower Andesites and Basalts have values of 30-40. Further, the break in Ti/Zr values in the High Point holes does not correlate with any consistent change in rock types, and often substantial changes in Ti/Zr values are not accompanied by lithological changes and vice versa.

Lorrigan concluded that the lithogeochemistry gave equivocal results that could not be used to direct future drilling. She was also of the opinion that the Ti/Zr ratios in the Mines Department's Mt Charter hole were of questionable regional significance.

However, Lorrigan did see at least one broad geological correlation between MCH1 and the High Point holes: black shale intercalations and peperitic volcanic breccias with shale matrices, were noted by Corbett & Komyshan (1989) as being characteristic of the Upper Andesites and Basalts, and these features are present in the upper parts of the Que-Hellyer Volcanics in the BHP holes and BHD1. She noted that the presence of andesites is <u>not</u> diagnostic of any part of the volcanic sequence as there are andesites in both the Upper and Lower units of the Que-Hellyer Volcanics. As mentioned in Section 6.1.1., Lorrigan was of the opinion that none of the High Point holes bottomed the Upper Andesites and Basalts unit.

6.2.2. Soil Sampling

In May 1991 a programme of soil sampling was initiated over the Mt Charter Fault zone and adjacent rocks, to determine whether the fault zone was more prospective north or south of BHP drillholes HP1 and HP4. It was anticipated that if there was mineralization at depth, there would be some indication of it at surface as a result of leaking up the fault.

An orientation line (BHP line 7800N - the section on which HP1 and HP4 were drilled), was sampled prior to the main programme. In this orientation survey 38 samples, comprising Ao and B Horizon soils from the same sites, were taken at 25 or 50m spacings along line 7800N and analysed for Au, Cu, Pb, Zn, Ag, Ba, Mn, Ni and Cr. Following the orientation survey, 70 samples of B Horizon soil were collected along the Mt Charter Fault zone by sampling at 50m intervals on nine 100m-spaced BHP gridlines between 7400N and 8200N. The samples were analysed for Cu, Pb, Zn, Ba, Bi and Cr.

The location of the soil samples taken is shown in Figure 19 and results are listed in Appendix 5.

Unfortunately, the soil sampling results were low and proved more useful in defining rock type boundaries than in locating any mineralization along the fault. The results were used to revise the interpreted geology in this area of High Point.

6.2.3. Ground Magnetics

Ground magnetic traverses were carried out in September 1991 over the northern half of the High Point area, to complement information from the 1990 aeromagnetic survey and enable better interpretation of that data. Specially, it was hoped the ground magnetic data would resolve questions relating to the thickness and structure of the Que-Hellyer Volcanics along the Mt Charter Fault.

Ground magnetic readings were taken at a nominal station spacing of 12.5m along the old BHP gridlines 8200N, 8600N, 9000N and 9400N, and for 500m east of the highway onto Aberfolye ground (with their permission).

Survey coverage and results are given in Leaman's (1991a) report which appears as Appendix 8 (note particularly pages 4 & 5, Figures 4-9). Following the initial survey, Leaman requested further information along a dip line (3500E). This was done in December 1991 and reported on by Leaman (1992c). This report appears as Appendix 12.

Leaman's geological interpretation of the ground magnetic results, integrated with the earlier aeromagnetic and gravity data, led to his formulating the idea of a basalt-filled

Cambrian rift east and subparallel to the Mt Charter Fault, and proposing a drill test where this intersected the Que River Transform Structure (see Figure 9). This feature was the principal target of hole BHD3.

6.2.4 Gravity Surveys

A detailed gravity survey was carried out at High Point in September 1991 over the Mt Charter Fault and adjacent rocks. Stations were read at 200m intervals on lines 200m apart on the old BHP grid, from line 6800N to 8400N. The area covered was about 1.5km^2, extending from the Murchison Highway to approximately 1000m to the NW.

Results of this survey are reported in Leaman (1991a) - see Appendix 8.

6.2.5. Downhole EM

Pasminco Exploration's Chief Geophysicist R Smith reassessed the downhole EM (Sirotem and EM37) done by BHP on their holes HP1-3.(Note, hole HP4/4A became blocked at 350m shortly after drilling was completed and was not surveyed with EM). Smith's preliminary comments appear in Appendix 11.

As a result of the reassessment, a downhole EM survey of holes HP1-3, BHD1 and BHD3, was commenced in late January 1992 using the CRONE system. This work was still in progress at the time of writing.

6.3. Investigations at Bulgobac Hill

In his preliminary interpretation of the Bulgobac EL aeromagnetics, Leaman (1990) drew attention to a series of magnetic lows extending NE along-strike from the altered and pyritic volcanics at the Boco prospect on Pasminco's adjacent EL 2/90. It seemed these lows could have been reflecting altered and mineralized volcanics in a previously-undetected NE extension of the Boco zone.

The most north-easterly of these magnetic lows occurs on EL 37/89, 1km to the north of Bulgobac Hill (see Figure 4), and adjacent to the mapped position of the faulted contact between the rhyodacitic Central Sequence Volcanics and the Dundas Group sediments / mafic volcanics (Corbett & McNeill, 1986). Leaman (1990) interpreted this contact as a major SE-dipping thrust and considered the possible altered zone was along the leading edge of the overthrust block of Central Volcanics. This structural position had independently been highlighted as potentially mineralized by an in-house geological study of the Mt Read Volcanics, conducted by Pasminco in 1990-91.

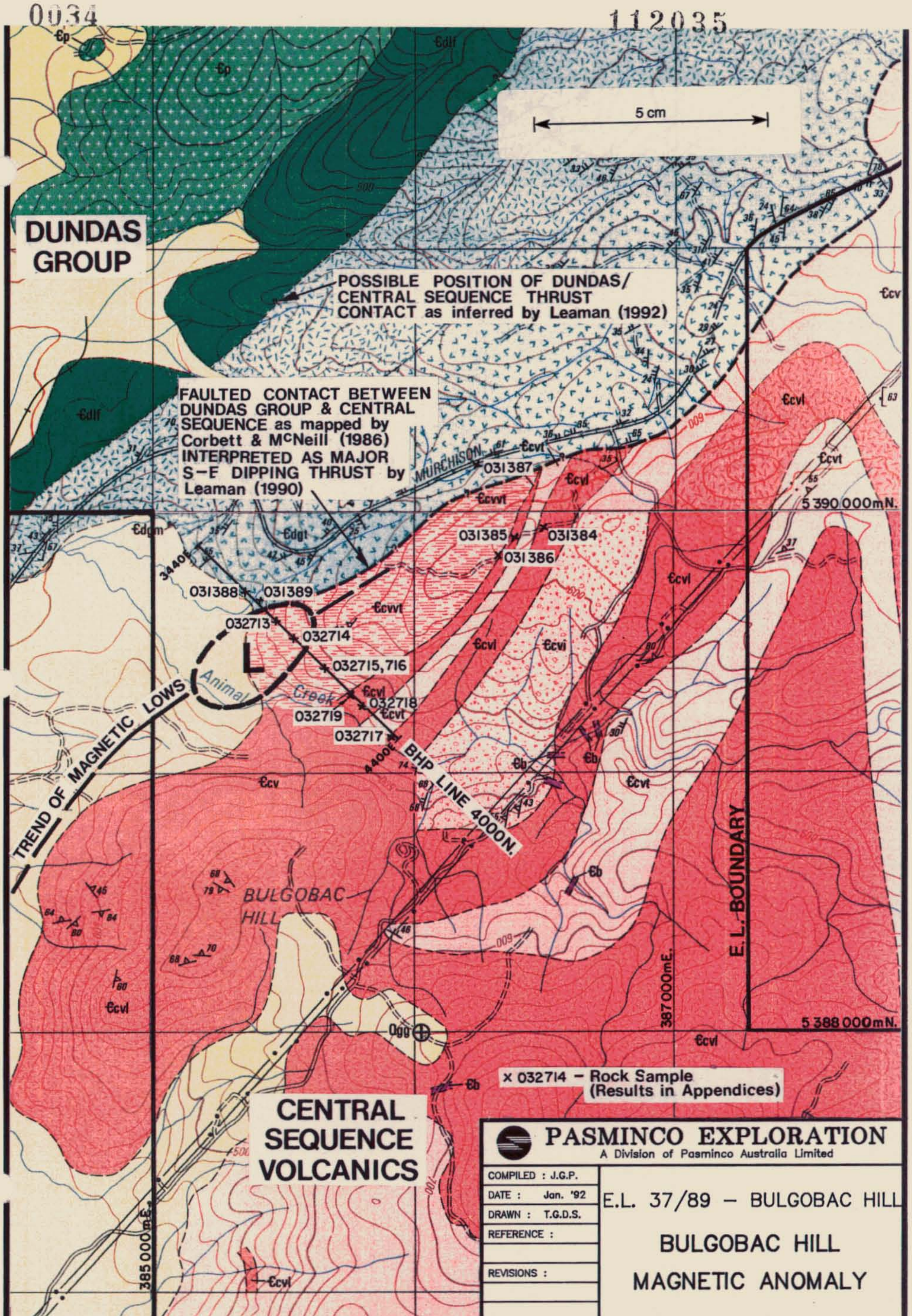
It should be noted that Comstaff had carried out fairly extensive surface exploration (but no drilling) in the general vicinity of the magnetic anomaly between the mid-1960's and the early 1980's, without delineating any mineralization or alteration of consequence. The area was surveyed with UTEM by BHP in 1987, again with negative results.

Geological traverses, backed up by petrological and lithogeochemical sampling as well as normal assaying, were made to try and locate the altered zone but failed to delineate the faulted Central Sequence / Dundas Group contact as mapped by Corbett and McNeill.

A ground magnetic traverse was subsequently done to define the aeromagnetic anomaly, using readings at 5m intervals along old BHP line 4000N between 3440 - 4400E (see Figure 11 and Appendix 9). This resolved the magnetic response into a broad weak low at 3700 - 4100E, considered by Leaman (pers comm) as probably not due to alteration but more likely a structural effect. Leaman (1992a) describes the detailed responses and sources as of "low to moderate contrast, narrow and depth limited". His interpretation that all dips are steeply west is in general accordance with the moderate westerly dips mapped at surface by Corbett & McNeill.

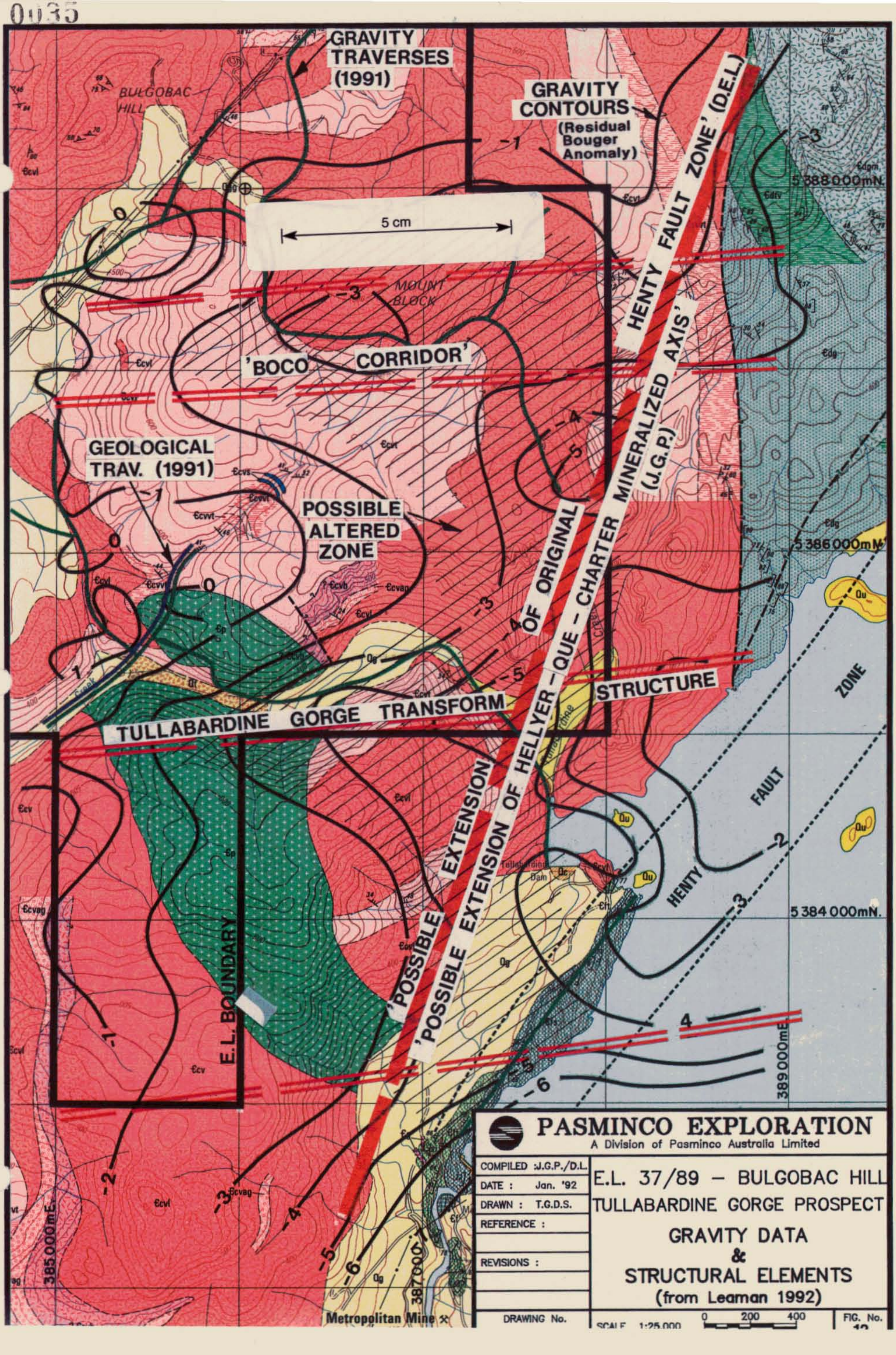
The local geology in the area of the magnetic anomaly is dominated by siliceous and vitric tuffaceous sediments (mainly massive siltstones), with lesser feldspar-crystal volcaniclastic sandstones and dacitic volcanics. In general terms the epiclastics become "more volcanic" and primary towards the east, and more reworked and bedded towards the west. The rocks are unaltered to weakly altered and although some siltstones locally contain up to 3 - 5% pyrrhotite and pyrite, they are essentially devoid of base or precious metals (see Appendix 6).

Mostly the sediments are derived from silicic volcanics, but several display a mixed silicic and mafic provenance. One sandstone sample (032716 from 4055E on BHP line 4000N - well within the Central Sequence Volcanics as mapped), contains basaltic fragments,



PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.	E.L. 37/89 – BULGOBAC HILL
DATE : Jan. '92	
DRAWN : T.G.D.S.	BULGOBAC HILL
REFERENCE :	MAGNETIC ANOMALY
REVISIONS :	
DRAWING No.	SCALE 0 200 400 METRES
	FIG. No. 11



PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P./D.L.	E.L. 37/89 – BULGOBAC HILL
DATE : Jan. '92	TULLABARDINE GORGE PROSPECT
DRAWN : T.G.D.S.	GRAVITY DATA
REFERENCE :	&
REVISIONS :	STRUCTURAL ELEMENTS
	(from Leaman 1992)
DRAWING No.	SCALE 1:25 000 0 200 400
	FIG. No. 12

112037

pyroxene and apatite grains, which the petrologist considered could have come from volcanics similar to the Hellyer hangingwall shoshonitic basalts. This sample contains 3 - 4 times as much P_20_5 (0.264%) as most of the other sampled sediments and also has the highest Cr value at 130ppm (XRF analysis). All petrological sample results appear in Appendix 7.

The conclusions from the work done are that all rocks examined, from the outcrops on the Murchison Highway to over 1km further east (i.e. across the supposed position of the faulted Central Sequence / Dundas Group boundary), are broadly similar and part of the same volcanic suite. The epiclastic units in this area in hand specimen appear identical to tuffaceous and epiclastic units within the rhyodacitic volcanics at Tullabardine Gorge, 4km further south.

For this reason it is believed all the rocks examined at Bulgobac Hill belong to the Central Sequence Volcanics. Either:

a) The faulted (thrust?) contact with the Dundas Group lies further west in rocks presently mapped as Dundas Group (a view favoured by Leaman 1992a),

or

b) The contact between these two major rock groups is gradational in this area - something that is perhaps being suggested by the mixed silicic/mafic provinance of some of the sediments.

Further traverses would be required west of the highway to resolve this point and to try and locate any major structural boundary, but it appears that the initial target in this area, the magnetic low, has no economic significance.

6.4. Tullabardine Gorge Surveys

Late in 1991 several gravity traverses were undertaken at Tullabardine Gorge in order to examine a very large E - W transform structure delineated by D. Leaman (1990) in his initial assessment of the Bulgobac EL aeromagnetic survey. The altered and mineralized zone at the Boco Prospect on the adjacent EL 2/90 appeared to lie on the western extension of this structure.

The gravity survey was carried out by R. Richardson of the Division of Mines and Mineral Resources. It involved a 4km SE - NW traverse through Tullabardine Gorge (from the Tullabardine Dam on Lake Mackintosh to the Murchison Highway east of Boco, where it linked in with the more-detailed gravity coverage on EL 2/90 to the west of EL 37/89), and two smaller side traverses, north into the headwaters of Farm Creek and southwards onto the Tullabardine Massif. Gravity measurements were taken at nominally 200m intervals along the traverses.

The gravity coverage and some features of the results, are shown in Figure 12. The survey is discussed in greater detail in Leaman (1992b) - see Appendix 10. The most significant elements of Leaman's interpretation are:

- The delineation of a major lineament 1-2km west and sub-parallel to the Henty Fault.
- Apparent alteration or acid intrusive rocks associated with the above linear (as inferred from unusual deep bouguer lows aligned along it).
- Intersection of the linear with at least two major E-W structures - the Tullabardine Gorge Transform and the Boco Corridor.

For reasons explained in Section 8 of this report, it is thought the intersections of the E-W structures with the N-S linear are potentially mineralized sites of some significance. They are considered the best exploration targets presently identified on the EL.

In conjunction with the gravity survey, a geological traverse was made across the Tullabardine Transform Structure by following the gravity survey line into the upper part of Farm Creek. Despite the steep terrain exposure was not good, with fairly extensive areas of no outcrop or float.

The local geology is dominated by unaltered to weakly altered massive tuffaceous and volcaniclastic sediments, with lesser rhyodacitic volcanics and quartz-feldspar porphyry. The sediments, comprising mainly siliceous vitric tuffaceous siltstones and pumiceous crystal-lithic volcaniclastic sandstones, appear very similar to those at the Bulgobac Hill magnetic anomaly - an observation confirmed by the petrological results (see Appendix 7).

These again show that although the volcanic provenance of the epiclastics is largely silicic (rhyodacitic), there is a small but persistent intermediate to mafic volcanic component in the detritus - a feature noted in the rocks at Bulgobac Hill. The petrologist remarks that some of the mafic material is derived from pre-existing mafic volcaniclastics. Outcropping primary volcanic units in the Tullabardine area are overwhelmingly rhyodacitic or dacitic, although some minor intercalated mafic units were mapped by Corbett and McNeill (1986).

Only traces of pyrite were noted during the traverse and the assay results confirm this (see Appendix 6). Also, no features that might occur along a major structure (e.g. fracturing, veining, zones of strong cleavage or localized alteration), were seen. In fact, it is a characteristic of most of the rocks at Tullabardine Gorge (and Bulgobac Hill), especially the tuffaceous siltstones, that they are essentially uncleaved and unveined - a most unusual feature in the Mt Read Volcanics. The rocks "look young".

6.5. Sock Creek

Little work was carried out in the Sock Creek area in 1991. The main prospect vicinity was mapped and sampled by D. Barwick as part of his Geology Honours Thesis. The 4WD access track extending through Sock Creek to Sock Creek South and out to the far NW corner of the EL, was surveyed with gravity with stations at 300 - 600m intervals.

Leaman (1990) on the basis of gravity and magnetic data, postulated an unmapped WNW arm of the Mt Charter Fault extending through the main mineralized zone at Sock Creek. Immediately west of the prospect, this lineament intersects two NE-trending structures evident on the magnetics. A geological traverse was made to check this area but no features of interest were noted, with the local geology dominated by weakly sericitised quartz-feldspar porphyry and unaltered black and grey shales.

However, in the main prospect area itself the mapped NNE trending fault is clearly a huge structure, extensively brecciating the adjacent black shale unit and with barren quartz veins up to 1m thick distributed along it.

6.6. Regional

As part of the regional geological investigation of Pasminco's northern EL's (following the 1990 review by Lees & Wright), A Lorrigan and L Kirsner carried out detailed geological traverses in several areas, principally in the Bulgobac Hill - Mt Block vicinity, along the Murchison Highway and at Sock Creek - Sock Creek South. These traverses are shown on Figure 6. This regional work is presently being compiled at 1:25,000 scale.

The upgrading of the overall gravity coverage on the EL continued. This saw stations measured at nominally 500m intervals along the Murchison Highway, along BHP line 5200N between the highway and Sock Creek South (measurements at intervals of 200 - 400m), on tracks in the Bulgobac Hill/Mt Block area, and elsewhere. See Figure 6. Despite these surveys gravity coverage of the EL remains patchy and inadequate in many areas, most particularly in the Mt Block - Tullabardine Gorge vicinity, north of Bulgobac Hill and west of Sock Creek.

7. ENVIRONMENTAL REHABILITATION (H. Rae)

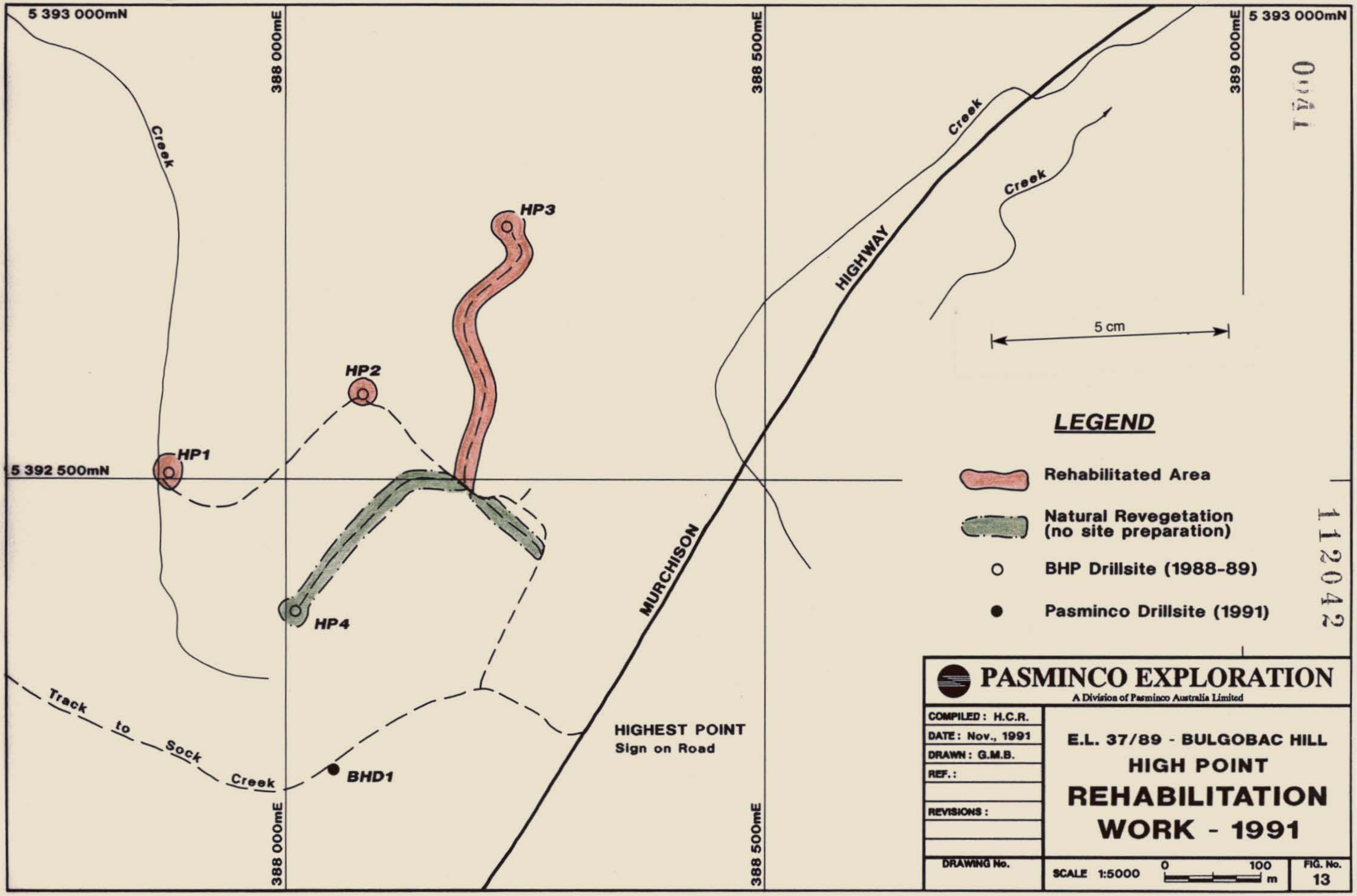
In conjunction with drill rig mobilization to BHD1 at High Point, rehabilitation work was carried out on old BHP drillsites HP1, HP2 and HP3, put in during 1988 -89.

See Figure 13 and photographs.

Shane Groves, using a 22 tonne excavator undertook earthworks prior to re-vegetation of the sites. Fertilizer (N.P.K.) and dolomite) was also applied.

Due to the dense vegetation and plentiful seed source bordering the prepared areas, no slashed vegetation was laid on them.

A rehabilitation management plan for Bulgobac Hill EL 37/89 is currently being prepared and should be completed by mid-March 1992.



LEGEND

🟥	Rehabilitated Area
🟩	Natural Revegetation (no site preparation)
○	BHP Drillsite (1988-89)
●	Pasminco Drillsite (1991)

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED: H.C.R.
DATE: Nov., 1991
DRAWN: G.M.B.
REF.:
REVISIONS:
DRAWING No.

E.L. 37/89 - BULGOBAC HILL
HIGH POINT
REHABILITATION
WORK - 1991

SCALE 1:5000 0 100 m

FIG. No. 13

0041

112042

BHP drillsite HP1 (drilled in 1988.)
During rehabilitation by Pasminco in 1991 (above).
After rehabilitation (below).

BHP drillsite HP2.
Before rehabilitation (above). After rehabilitation (below).

BHP access track to hole HP3.
Before rehabilitation (above). After rehabilitation (below).

BHP drillsite HP3.
Before rehabilitation (above). After rehabilitation (below).

BHP access track to hole HP3.
Before rehabilitation (above). After rehabilitation (below).

8. DISCUSSION

The past 18 months has seen a very active exploration programme on EL 37/89. The amount of data acquired has outstripped the capacity to fully absorb it. It is now prudent that a geological review be undertaken at High Point and also at the other two drilled mineralized sites: Sock Creek and Sock Creek South.

At present the detailed elements of the mineralized stratigraphy at High Point can not be correlated with that hosting the Que and Hellyer deposits. Whether this is a geological fact or due to insufficient knowledge is not clear, but it would seem wise to resolve this point before any further drilling is contemplated. For example, if the interpretation of Lorrigan is correct then none of the High Point holes have yet gone deep enough to intersect the Que/Hellyer host rock horizon.

The known mineralization at High Point may well be already drilled out, with weakly-mineralized holes now completed either side of the best hole - HP1. The disappointing results in the northern hole, BHD3, strengthen the conviction that the High Point mineralization is somehow associated with the Mt Charter Fault. This suggests that if there is to be future exploration at High Point it should be directed at the volcanics along the trend of the fault. Conceptually, the best target would appear to be where the Que River Transform Structure intersects the Mt Charter Fault, but unfortunately this zone lies just outside the EL (see Figure 4).

The other known mineralized occurrences on the EL, at Sock Creek and Sock Creek South, on face value do not appear to have any obvious potential. But the question remains whether the metal in these prospects could have been remobilized from a massive sulphide body at greater depth. Major intersecting faults are evident at Sock Creek. Such structures will undoubtably have a long history and may well have influenced mineralized fluid movement (and ore deposition) earlier, and at deeper levels, than the known mineralization which could be the remobilized 'indicator' of it. Data from the general Sock Creek area needs to be reviewed to examine this possibility and to design a deep drillhole if warranted.

The poor result of hole BHD3, which was targeted primarily at a postulated Cambrian volcanic rift, emulates the results in the Placer holes (drilled about 1km north of the EL in the period 1986 - 90), which were similarly targeted and similarly barren. This experience highlights that simply drilling Cambrian rifts, structural intercepts and the like, is not enough to find ore on the EL: clearly some structural intersects and settings are prospective for mineralization (have better pedigree), and others are not.

To determine which structural settings are pedigreed we only have to look at the locations of the known base and precious metal deposits in the Mt Read Volcanics. It is a notable feature of their distribution that all lie adjacent to three broadly N-S trending major structures, apparently representing fundamental volcanic rift margins:

Rosebery Fault:	**Rosebery** & **Hercules** (Pb-Zn-Ag-Au) deposits (+ Chester massive pyrite body).
Henty Fault:	**Hellyer** & **Que River** (Pb-Zn-Ag-Au), **Farrell** (Pb-Ag) & **Henty** (Au) deposits (+ Mt Charter Pb-Zn-Ag-Au prospect).
Great Lyell Fault:	**Mt Lyell** (Cu-Au) deposit.

When the settings of the individual basemetal massive sulphide deposits are looked at in detail, two other features are notable:

1. The structures all dip towards and beneath the deposits.
2. The deposits are separated from the adjacent structure by a horizontal distance of up to 2km.

It would seem obvious that exploration along these three major pedigreed structures stands a better chance of success than exploration along structures with no known deposits.

Leaman, in his work for Pasminco over the past 2-3 years has shown that the major ore deposits in the Mt Reads also lie on or close to deep-seated E-W structures that generally have little or no surface expression but are visible on the magnetic and gravity data. The orebodies appear to be located where these E-W structures intersect the N-S linears mentioned above.

In the part of the Mt Read Volcanics in which the Bulgobac Hill EL lies, the Rosebery Fault and Henty Fault lie close to the western and eastern margins respectively of the overall volcanic belt. While neither actually falls on the EL, the Henty Fault appears directly associated with the feature that is considered to have the most important bearing on the prospectivity of the EL: what is here termed the Hellyer-Que-Charter Mineralized Axis.

This Axis trends NNE, parallel to and 1-2km west of the west-dipping Henty Fault, and encompasses two massive basemetal sulphide bodies totalling 20mmt and a major prospect. The line is probably a reflection of some sort of splay structure off the main Henty Fault itself, as shown in Figure 14. The postulated southward continuation of this Axis trends across the SE corner of the EL to the SE of Mt Block (see Figure 4).

As outlined earlier, intersections of this Axis with any of the major E-W structures could potentially be mineralized sites. On the Bulgobac EL there are at least three of these E-W structures:

1 **The Que River Transform in the High Point area.**
Intersection with the Mineralized Axis occurs at the Que River Mine 2km east of the EL.

2 **The Boco Corridor at Mt Block**
Apparently partly controls the siting of the Boco Prospect (altered pyritic volcanics) on the adjacent EL 2/90.

3 **The Tullabardine Gorge Transform**
Surface expression is the spectacular glacial gorge 2km south of Mt Block.

The Tullabardine Gorge Transform would intersect the Hellyer-Que-Charter Mineralized Axis wholly within the present EL boundaries, while the intersection with the Boco Corridor lies on the eastern boundary of the EL (see Figure 4).

Quite independently, recent gravity work at Tullabardine Gorge (Leaman 1992b, see Appendix 10) has defined a major NNE-trending lineament immediately west and sub-parallel to the Henty Fault, in the postulated position of the Mineralized Axis (see Figure 12). This structure has two significant features:

1 A series of unusual bouger lows along it which Leaman considers are due to either "extensive alteration" or "acidic intrusion".

2 It trends directly towards the mineralization at Mt Charter.

Leaman interprets this lineament as the "probable extension of the original Henty Fault Zone" because it follows the trend the HFZ would take if it did not turn slightly easterly just to the north of Tullah. While the author prefers to think of the lineament as the probable southerly extension of the Hellyer-Que-Charter Mineralized Axis, in both scenarios it is most likely a splay off the main Henty Fault Zone and a feature of considerable significance.

It should be noted that part of this lineament and its intersection with the Boco Corridor E-W structure, lies on vacant ground immediately outside the SE corner of the EL, as does its intersection with a third E-W structure which cuts across the southern EL boundary (seen on Figure 12). This ground should be acquired as soon as possible - about 8.8km^2 is involved (see Figure 4).

The target "model" for mineralization that may occur on the structural intersections in the Mt Block/Tullabardine Gorge area is shown in sketch form in Figure 14. It must be emphasised that the rhyodacitic Central Sequence Volcanics that occur on the surface in this area are considered unprospective, being largely devoid of sulphides or significant hydrothermal alteration (the author was involved in the 1988 BHP drilling at Tullabardine Gorge).

Any mineralized volcanics must lie beneath them. These host rocks could possibly be the mafic Que-Hellyer Volcanics or equivalents, especially if the Central Sequence is indeed thrust over the Dundas Group (Leaman 1990), or if the Que-Hellyer Volcanics are indeed older than the Rosebery Mine Sequence as suggested by McPhie, pers comm, (given that Corbett & McNeill, 1986, correlate the Mt Block rhyodacites with the Mt Black Volcanics overlying Rosebery).

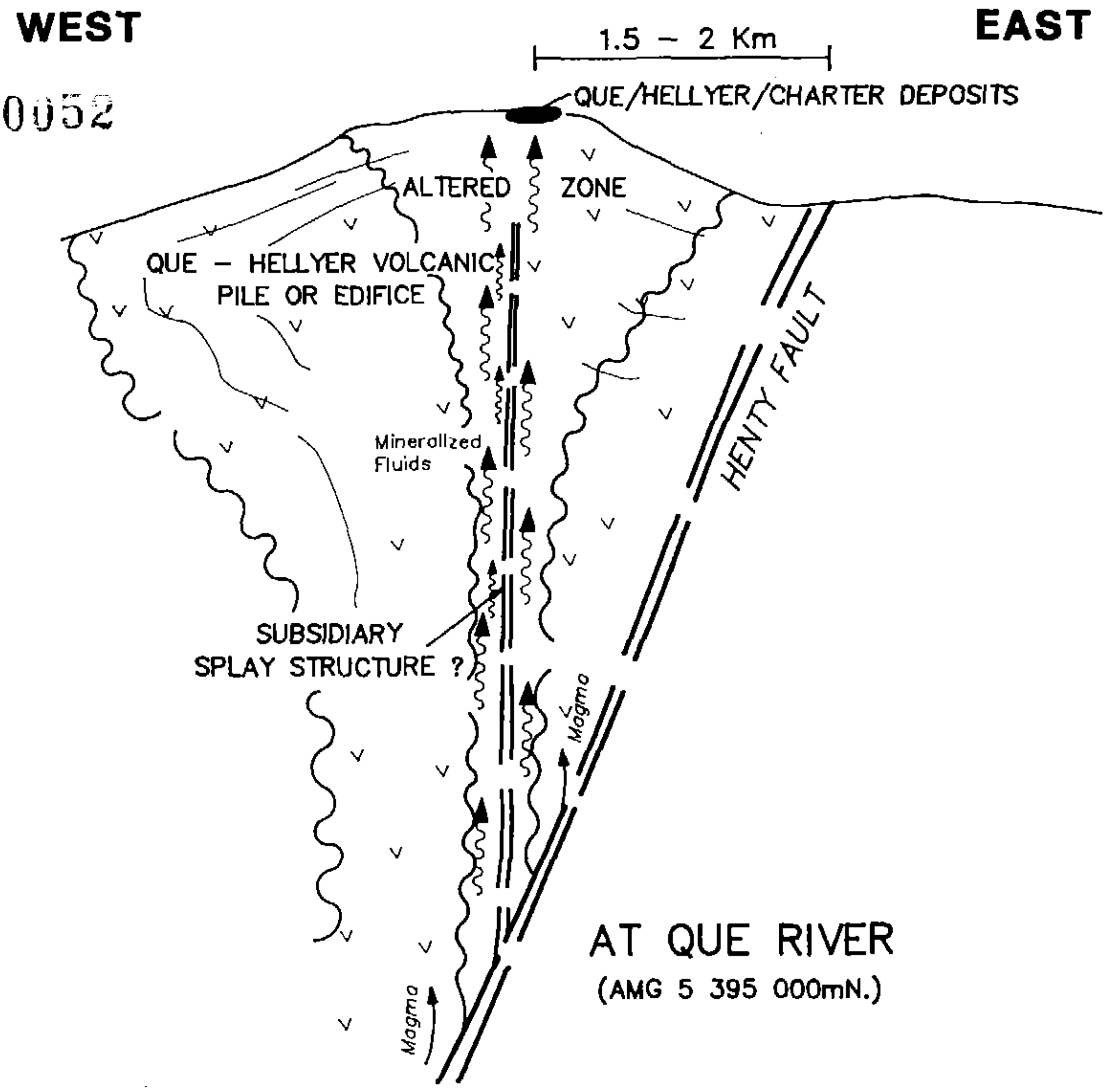
However it is the N-S linear and the structural intersection on it that is the key feature, not any specific host stratigraphy.

To explore this rather inaccessible and critical area at the eastern end of the Tullabardine

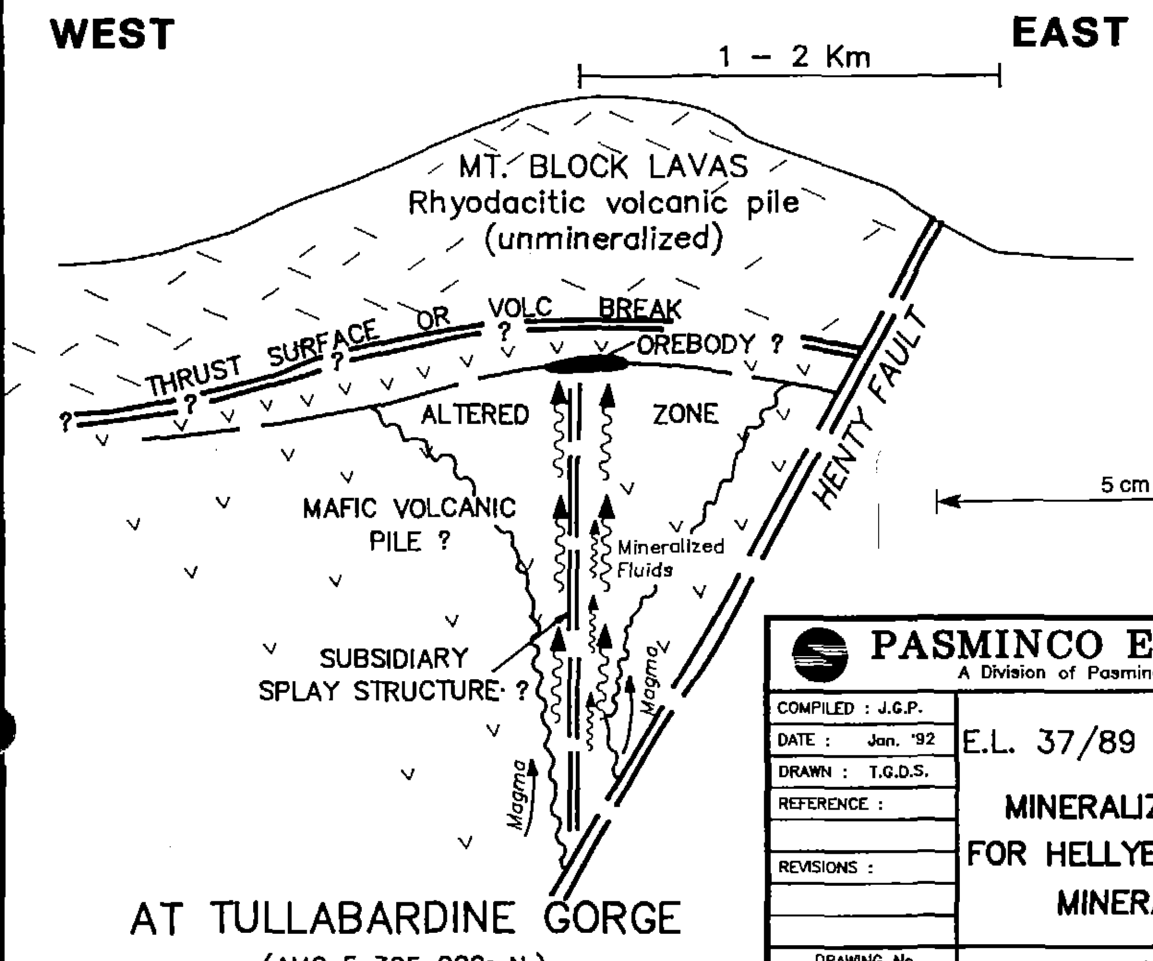
Gorge and east of Mt Block, an initial detailed gravity and ground magnetic survey is required to refine the structural picture, and to try to "see through" the overlying volcanics. If results were favourable, a definitive drill test would probably require a hole at least 800m deep.

0052

112053



AT QUE RIVER
(AMG 5 395 000mN.)



AT TULLABARDINE GORGE
(AMG 5 385 000mN.)

5 cm

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.
DATE : Jan. '92
DRAWN : T.G.D.S.
REFERENCE :
REVISIONS :
DRAWING No.

E.L. 37/89 – BULGOBAC HILL

MINERALIZATION MODELS FOR HELLYER–QUE–CHARTER MINERALIZED AXIS

SCALE
METRES

FIG. No. 14

9. CONCLUSIONS

1 The poor results from drilling to date at High Point and apparent problems correlating the stratigraphy there with that in the vicinity of the Que and Hellyer deposits, make it imperative that a thorough geological review be carried out before any further drilling is contemplated. Amongst other things, such a review should aim to determine if the present drilling has gone deep enough.

2 The known weakly-mineralized zone at High Point is associated with the Mt Charter Fault and may well be already drilled out. If there is to be future drilling at High Point it should be directed at the Que-Hellyer Volcanics along the trend of the fault. The best target appears to be where the Que River Transform Structure intersects the Mt Charter Fault, but this zone lies just outside the EL.

3 The other known mineralized occurrences on the EL, in the Sock Creek area, should also be reviewed to examine the possibility they are remobilized from a massive basemetal sulphide body at greater depth. A deep drillhole would be required to definitively test this concept.

4 The Hellyer-Que-Charter Mineralized Axis is regarded as the most important feature bearing on the prospectivity of the EL. This axis trends NNE, parallel to and 1-2km west of the west-dipping Henty Fault, and encompasses two massive basemetal sulphide bodies totalling 20mmt and a major prospect. It is probably a splay structure off the Henty Fault. The known orebodies on this Mineralized Axis are located where major deep-seated E-W transform structures intersect it.

5 A NNE trending lineament, recently delineated by gravity surveys on the EL, is considered to be the southern extension of the Mineralized Axis. This lineament trends across the SE corner of the EL in the Mt Block / Tullabardine Gorge area, and is associated with a series of unusual gravity lows possibly due to extensive alteration along it.

6 Potentially mineralized sites exist on the EL where two major E-W structures intersect this lineament or Axis. These structures, the Boco Corridor and the

Tullabardine Gorge Transform, intersect the inferred trend of the Axis on the EL boundary east of Mt Block and in the SE corner of the EL at the eastern end of Tullabardine Gorge. These intersect areas are considered the most significant exploration targets currently identified on the EL.

7 Given the barren and weakly-altered nature of the exposed rhyodacitic Central Sequence Volcanics in the intersect areas, any mineralization at these sites is likely to be buried at considerable depth and to be hosted within volcanics of a different sequence and/or composition, possibly the mafic Que-Hellyer Volcanics or correlates.

10. RECOMMENDATIONS

1. An area of vacant ground, comprising approximately 8.8km^2 and flanking the SE corner of the EL between 5383000mN and 5388000mN, and extending east to 389000mE, should be pegged and incorporated into the EL as soon as possible. (The area concerned is shown in Figure 4).

2. A detailed gravity survey, with stations at 200 x 200m spacings, is recommended for a 10km^2 area east and south of Mt Block, lying east of a line joining 5383000mN / 386000E and 5388000mN / 387000mE, and taking in part of the vacant ground mentioned above. Maximum use should be made of the old BHP grid which covers much of this area, and the gravity survey should be backed up by gound magnetics and geological mapping.

3. If the results of the above surveys are favourable, a deep drillhole (+800m?) is recommended to test for mineralization at the best of the structural intercept sites.

4. A geological review should be carried out on the data from the High Point area. No further exploration, particularly drilling, should be carried out at High Point pending the findings of the review.

5. A similar review needs to be undertaken at the Sock Creek and Sock Creek South prospects, with a view to determining if a deep drillhole is warranted to test for mineralization at depth beneath the known zones.

6. All of BHP's UTEM data over the Bulgobac EL should be reviewed and imaged.

7. Overall gravity coverage of the EL should continue to be upgraded, especially in the general vicinity of Sock Creek and in the area of the Dundas Group / Central Sequence boundary to the north of Bulgobac Hill.

11. REFERENCES

Barwick, D. 1991. Geology and Mineralization of the Sock Creek and High Point Areas, Western Tasmania.
BSc Honours Thesis, University of Tasmania.

Corbett, K.D. *Komyshan, P.* 1989. Geology of the Hellyer - Mt Charter Area. Geological Report 1, Mt Reads *Volcanic Project.*
Geol Surv of Tas.

Corbett, K.D. McNeill, A.W. 1986. Geology of Rosebery - Mt Block Area. Map 2, Mt Read's Volcanic Project.
Geol Surv of Tas.

Komyshan, P. 1986. Geology of the Mt Charter-Hellyer Area. Map 1, Mt Read Volcanics Project, 1986.
Geol Surv Tas.

Leaman, D.L. 1990. Aeromagnetic Survey EL 37/89 Bulgobac Hill. Acquisition Report (Including Preliminary Interpretation) for Pasminco Mining.
Unpub Rep to Pasminco Mining, August 1990.

Leaman, D.L. 1991a. Interpretation Update Number 1, Bulgobac Hill EL 37/89, for Pasminco Exploration.
Unpub Rep. to Pasminco Exploration, October 1991.

Leaman, D.L. 1992a. Magnetic Profile - Bulgobac Hill (Line 4000N, 3440 - 4400E).
Note to Pasminco Exploration, January 1992.

Leaman D.L. 1992b. Current Status of Gravity Coverage Tullabardine Gorge Area.
Memo to Pasminco Exploration, January 1992.

Leaman D.L. 1992c. Use of Observed Magnetics Base Line 3500E at High Point.
Memo to Pasminco Exploration, January 1992

Lorrigan, A.N. 1991. *EL 37/89, Bulgobac Hill Annual Report March 1990 - January 1991.*
Unpub Pasminco Exploration Rep., January 1991.

Wilde, A.R. Kerr, T.L. 1989 Exploration Licence 5/63 Comstaff J.V., N.W Tasmania, Final Report May 1989.
Unpub BHP Rep, May 1989.

KEYWORDS

LEAD, ZINC, VOLCANOGENIC, MASSIVE SULPHIDE, MT READ VOLCANICS, QUE-HELLYER VOLCANICS, STRUCTURE, GEOLOGY, LITHOGEOCHEMISTRY, MAGNETICS, GRAVITY.

APPENDIX 1

LOG OF DRILLHOLE BHD1,
HIGH POINT

HOLE No. BHD 1.

PASMINCO EXPLORATION
DIAMOND DRILL CORE RECORD

Page 1 of 12

LOCATION	TASMANIA
PROJECT	BULGOBAC HILL
PROSPECT	HIGH POINT
DESIGNED BY	A.N.L.
LOGGED BY	A.N.L.
RELOGGED	
COMMENCED	28/8/91
COMPLETED	15/10/91
DRILLED BY	EAST COAST DRILLING (W.Hay)
DRILL RIG	LONGYEAR 38

OBJECTIVE

To test ground adjacent to mineralisation intersected in HP 1. Also to test the stratigraphy, thought to correlate with the Que-Hellyer "Mixed sequence", below the level at which it was tested by HP 1.

RESULT

Very weak sphalerite mineralisation was encountered in Basalt Peperite, between 325.9 + 419.0m.

LOCATION/SURVEY DATA (AMG)

Grid	AMG	
Northing m	53 92 192.9	
Easting m	3 88 051.4	
DH Survey Type	Eastman Camera	

RL Collar m 683.7

Bearing Collar 128°

Dip Collar 75

Length Hole m 563.2

Depth m	Bearing	Dip	Depth m	Bearing	Dip
50	128	75			
100	131	75.5			
150	132	75.5			
200	136	76			
250	138	75			
300	142	75			
350	143	75			
359	144	76			
368	144	75			
377	146	75			
400	144	75			
432	145	75			
500	148	75			
550	151	74			

SIGNIFICANT INTERSECTIONS

From m	To m	Interval m	Cu	Pb	Zn	Ag	Au	Comments
323.0	397.0	74	53ppm	0.02%	0.2%	0.6	<0.008	ALTERED BASALT PEPERITE
INCLUDING:								
347.3	355.3	8	88ppm	10ppm	0.4%	1.0	<0.008	
116.0	126.0	10	14ppm	0.1%	0.3%	1.25	0.01	BLACK SHALE

SIGNIFICANT CORE LOSS

From m	To m	% Lost
167.4	168.7	54

POOR GROUND CONDITION ZONES

From m	To m	Condition
533.9	535.0	Broken ground, shear zone

HOLE SIZE

Size	Depth m
H.W.	3.8
HQ.	110.5
N.Q.	563.2.

HOLE CONDITIONS AFTER COMPLETION

Collar	3.8m H.W.
Steel Casing	3.8m at collar
PVC Casing	0 -
Ground Water	No water return from 150m.
Wedge	—
Drill Pad	

PASMINCO EXPLORATION
SUMMARY DIAMOND DRILL CORE LOG

HOLE No. 8HD 1

PROJECT: BULGOBAC HILL.

Graphic Scale 1:

Page 2 of 12

From m	Interval m	Code	Description	Depth	Graphic
0	29.5		BLACK SHALE / VOLCANIC BRECCIA. Mafic volcanic, intermediate volcanic and black shale clasts in an altered black shale matrix.		
29.5	78.5		Bedded BLACK SHALE.		
78.5	116.2		BLACK SHALE / VOLCANIC BRECCIA.		
116.2	125.1		Bedded BLACK SHALE.		
125.1	173.0		?MAFIC VOLCANIC. Intense carbonate alteration.		
173.0	175.9		SHEAR ZONE (Fault Breccia)		
175.9	178.9		BLACK SHALE / MAFIC VOLCANIC BRECCIA		
178.9	325.9		VESICULAR BASALT. Brecciated appearance. Black shale inclusions 218.8 - 274.7m.		
325.9	400.25		BASALT / SHALE BRECCIA ?PEPERITE. Clasts of silica altered and carbonate-chlorite altered basalt in a black shale matrix.		
400.25	448.9		ANDESITE / SHALE BRECCIA. Feldspar phyric clasts. Shale content decreases		
400.25	448.9	(cont.)	down hole, especially below 428m. 325.9m - 419.0m Trace - 0.5% disseminated sphalerite. Associated with silica alteration, within clasts, around clast boundaries and in veinlets.		
448.9	563.2		Feldspar-phyric ANDESITE.		
			563.2m. END OF HOLE.		

5 cm

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

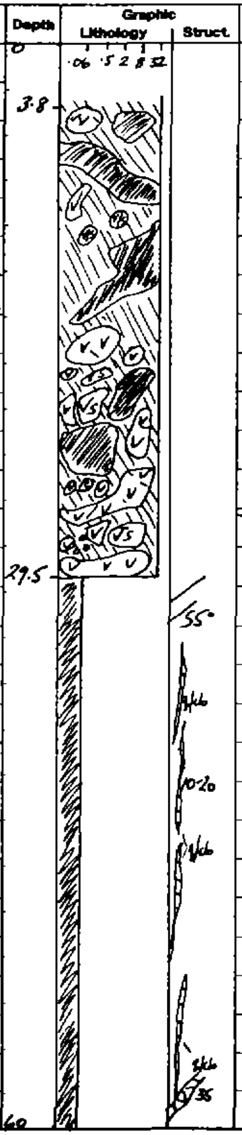
E No. BHD 1

PROJECT: BULGOBAC HILL.

Graphic Scale 1: 250

Page 3 of 12

CORE RECOVERY				DESCRIPTION				CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	MINERALISATION	LITHO	STRUCT	ALTN	MIN
4.0	6.0	15		0	3.8	TRICONE.					
6.0	9.9	54.8		3.8	29.5	START HQ CORE					
9.9	11.1	137.5				Breccia with clasts of volcanics and black					
11.1	12.4	84.6				shales. Volcanics are feldspar-phyric, with					
12.4	12.9	160				flattened, chlorite + carbonate-filled vesicles.					
12.9	14.4	53.3				Alteration of volcanics very strong, White					
14.4	15.1	0				carbonate with subordinate pink, siliceous					
15.1	16.9	94.4				alteration.					
16.9	18.2	84.6				Clasts (both types) rounded, 4-300mm.					
18.2	19.9	41.17				Clast supported. Matrix is an intensely					
19.9	21.3	92.85				carbonated altered black shale.					
21.3	22.4	109.1				Oxidised to 24.5m. Broken throughout.					
22.4	23.5	84.6				BLACK SHALE, MAFIC VOLCANIC BRECCIA.	-26.0 ?Chalcocite assoc. with CO3 alt'n.				
23.5	24.1	100									
24.1	24.2	100		29.5	78.5	BLACK SHALE, bedded to 31.8m. Bedding					
24.2	24.3	300				marked by carbonate-rich layers.					
24.3	25.0	114.2				Below 31.8, becomes very deformed					
25.0	27.2	113.6				Intense q-carb. veining and some					
27.2	27.5	100				circular carbonate alteration textures.					
27.5	29.4	100				Very broken, graphite on all broken					
29.4	29.9	160				surfaces.					
29.9	30.7	100									
30.7	33.7	43.3									
33.7	34.9	66.6									
34.9	35.4	120									
35.4	37.9	26									
37.9	39.1	54.1									
39.1	40.7	62.5									



PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

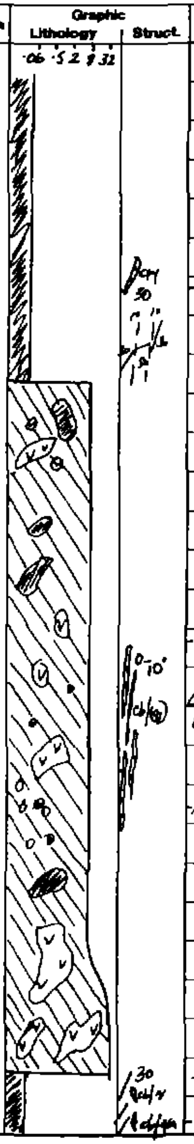
HOLE No. BHD 1

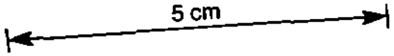
PROJECT: BULGOBAC HILL

Graphic Scale 1: 250

Page 4 **of** 12

CORE RECOVERY				DESCRIPTION					CODES			
From m	Interval m	%	RQD	From m	Interval m	(Incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	MINERALISATION	LITHO	STRUCT	ALTN	Mi
40.7	41.5	87.5					60					
41.5	42.6	100										
42.6	45.7	58.1										
45.7	47.4	88.2										
47.4	49.2	66.6										
49.2	51.5	86.9										
51.5	52.6	154.5						-73.9 20mm vein Chalcopyrite				
52.6	53.3	135.7										
53.3	54.5	112.5		78.5	116.2	Predominantly BLACK SHALE with clasts	78.5					
54.5	55.4	111.1				of sediment (dark grey-black mudstone)						
55.4	57.0	143.7				& altered ?mafic volcanics.						
57.0	58.1	127.3				Clasts are mostly rounded, though						
58.1	59.3	121				they become more angular near bottom						
59.3	59.9	116				contact.						
59.9	60.7	112				Some clasts have veining prior to						
60.7	61.9	66				incorporation in the shale i.e. @ 85.1 +		-93.0				
61.9	62.4	120				86.0m.		Colloform textured veins.				
62.4	63.1	114				Intense carbonate alteration through						
63.1	64.0	133				clasts + shale. Also sericite/silica in						
64.0	64.5	100				the volcanic clasts.		-101.9				
64.5	65.3	112				In most places the volcanic clasts are						
65.3	66.2	133				altered beyond recognition, except from						
66.2	67.1	83				109.9-116.2m, where they are obviously						
67.1	67.7	95				vesicular + probably mafic.						
67.7	70.1	83				REDUCE TO NQ CORE, 110.5m.						
70.1	71.0	111										
71.0	72.4	86		116.2	125.1	Bedded BLACK SHALE Bedding marked	116.2	Tr. sphal. in stringers				
72.4	73.7	106				by carbonate-rich bands.	120	-119.2 galena in Cb. vein				





PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

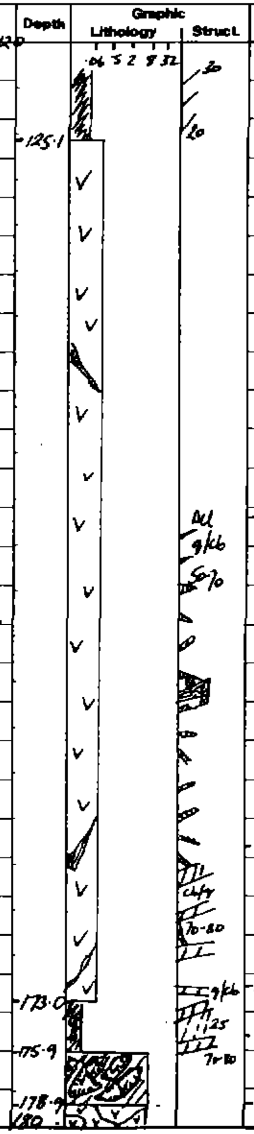
HOLE No. BHD1

PROJECT: BULGOBAC HILL.

Graphic Scale 1: 250

Page 5 of 12

CORE RECOVERY				DESCRIPTION				CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	MINERALISATION	LITHO	STRUCT	ALTN	MIN
73.7	74.9	92									
74.9	76.0	132									
76.0	76.9	117		125.1	173.0	This rock is intensly carbonate					
76.9	77.4	140				altered. Primary rock type is very					
77.4	78.4	160				difficult to identify, some texture					
78.4	79.3	89				near the 173m mark look like					
79.3	80.3	120				amygdales, have therefore concluded					
80.3	81.2	144				this is a MAFIC VOLCANIC. There are					
81.2	82.1	78				occassional streaks of black shale					
82.1	82.9	125				i.e. 163.3m. 1-2mm wide.					
82.9	83.7	81				Carbonate permeates the rock, there					
83.7	85.9	113				are clots and randomly oriented					
85.9	88.9	100				stringers of quartz/carbonate.	-146.3				
88.9	91.9	98				Jig-saw brecciation is often					
91.9	94.9	100				associated with quartz-carbonate veining.					
94.9	97.9	93				This indicates hydraulic brecciation					
97.9	100.8	100				Wide, regular, quartz-carbonate veins					
100.8	101.9	114				cross-cut the breccias and stringers.					
101.9	103.9	30				From 172.5-173.0, Colour changes					
103.9	106.9	100				from grey to pale green, caused by					
106.9	109.9	97				change to sericite/fuchsite alteration.	-163.5				
109.9	110.7	100				Very broken ground 163.5 - 173.0.					
110.7	112.9	100				Puggy 172.5-173.0.					
112.9	115.6	105									
115.6	118.4	103		173.0	175.9	Probable FAULT ZONE, Black Shale	-172.5 Tr. diss. py. 172.5-173.0				
118.4	121.5	103				pug and strong quartz/carbonate	-174.1 Cpy in q/cb vein.				
121.5	124.6	103				veining. Very broken					
124.6	127.6	98		175.9	178.9	Pale green BRECCIA with vesicular 'BASALT	-176.9 Fine py in some of matrix.				



5 cm

0063

112064

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

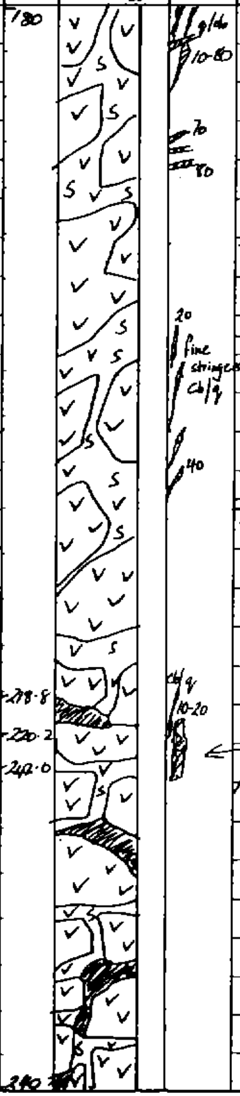
HOLE No. BHD 1

PROJECT: BULGOBAC HILL

Graphic Scale 1: 250

Page 6 of 12

CORE RECOVERY				DESCRIPTION				CODES		
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	MINERALISATION	LITHO	STRUCT	ALTN
127.6	130.7	93		175.9	178.9	(cont.) clasts, strongly chlorite, sericite & carbonate				
130.7	133.8	103				altered, zoning from chlorite on rims				
133.8	136.9	103				of clasts, through to lighter coloured				
136.9	139.9	100				minerals in the centre. Possibly an	-187.0 Tr. sphal. in vein			
139.9	142.9	100				indication of chilling. Clasts are				
142.9	145.9	100				also jig-saw fractured. BLACK SHALE				
145.9	148.9	103				matrix.	-193.0 Fine, dissem. py. in matrix.			
148.9	151.9	100								
151.9	154.9	100		178.9	325.9	Dark grey rock with brecciated	-198.2			
154.9	157.9	100				appearance. Clasts and matrix appear	Trace sphal, cpy,			
157.9	160.9	100				to both be VESICULAR BASALT, alteration	py in cb/q stringers			
160.9	163.9	100				is what defines the "breccia"				
163.9	167.4	105				Black shale occurs within the	-207.0 Fine, dissem. py.			
167.4	168.7	46				matrix at 218.8-2202 + 242.0-274.7m	207.2 in matrix.			
168.7	169.9	116				Main alteration type is dark green				
169.9	170.6	100				chlorite + carbonate a later, semi-				
170.6	171.2	112				pervasive silica alteration gives the				
171.2	171.8	112				rock it's brecciated appearance. This				
171.8	172.9	112				latter alteration occurs behind sharply	← hydraulic "jigsaw"			
172.9	173.5	100				defined "fronts", it also hosts a fine	fracturing within veins.			
173.5	174.2	103				network of sil/carbonate veins which				
174.2	174.8	83				do not penetrate the chloritic areas.				
174.8	177.2	108				Vesicles in the basalt are quartz/carb				
177.2	178.9	105				filled, some contain sphalerite.				
178.9	181.9	100				Variations on main alteration:-				
181.9	182.8	100				178.9-182.9 pale green, fuchsite, sericite,				
182.8	184.9	95				carbonate alt. assoc. c̄ q/cb veining				
184.9	187.9	100				218.7-221.5 Very dark green carb + chlorite				



5 cm

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

PROJECT: BULGOBAC HILL

HOLE No. BHD 1

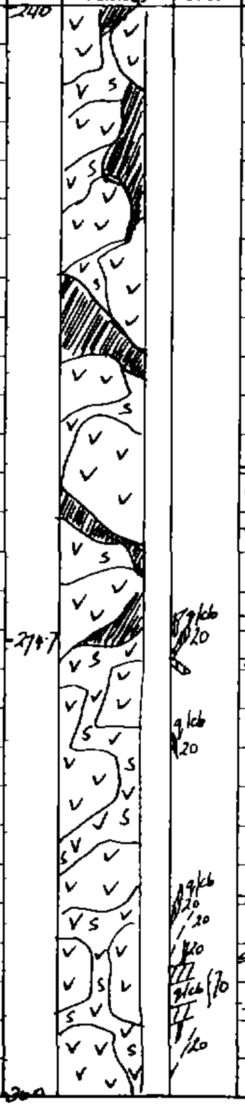
Graphic Scale 1: 250

Page 7 of 12

CORE RECOVERY				DESCRIPTION		
From m	Interval m	%	RQD	From m	Interval m	(Incl. LITHOLOGY, STRUCTURE & ALTERATION)
187.9	190.9	100		178.9	325.9	(Cont.) alteration. Assoc. c̄ veins.
190.9	193.9	97				247.6-248.0 Buff coloured iron carbonate
193.9	196.9	103				alteration also fuchsite.
196.9	199.8	100				263.3-265.0 As above, but pale green.
199.8	202.9	107				273.0-275.5 Pale green ?ser/carb.
202.9	205.9	100				Alt. Assoc. c̄ q/cb veining.
205.9	208.9	100				279.5-279.9 Pale green/buff carb/?ser
208.9	211.9	100				Alt. Assoc. c̄ veins.
211.9	214.9	100				289.1-295.0 Pale green alteration
214.9	217.9	97				Assoc c̄ extensive q/cb veins 3-400mm
217.9	220.9	100				
220.9	223.9	97				
223.9	225.0	127				
225.0	226.9	95				
226.9	229.9	100				
229.9	232.9	97				
232.9	235.9	100				
235.9	238.9	100				
238.9	241.9	97				
241.9	244.9	100				
244.9	247.9	100				
247.9	250.9	97				
250.9	253.9	100				
253.9	256.9	100				
256.9	259.6	107				
259.6	262.9	100				
262.9	265.9	100				
265.9	268.9	100				

5 cm

Depth | Graphic Lithology | Struct.



MINERALISATION

-265.6 Up to 0.5% sphal in vesides + on sil zone edges. Also in stringers.

-268.9 Tr. fine, dissem. py.

-273.0

-275.5

-289.1

← thicker, high angle veins X-cut 20° stringers.

-295.0

CODES

LITHO | STRUCT | ALTN

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

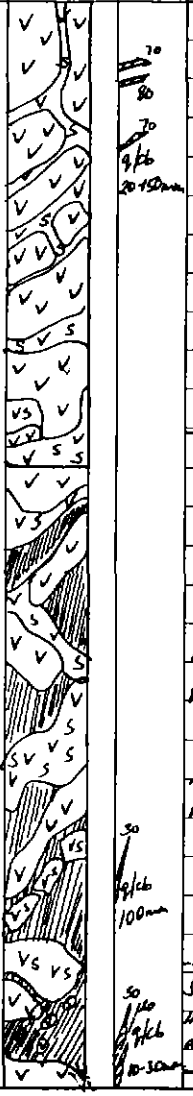
HOLE No. BHD 1

PROJECT: BULGOBAC HILL

Graphic Scale 1: 250

Page 8 **of** 12

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION	LITHO	STRUCT	ALTN	Mi
268.9	271.9	93		178.9	325.9	(cont.) 303.4-308.2 light green ?carbonate	300							
271.9	274.9	100				alteration with quartz-carbonate								
274.9	277.9	100				veining.								
277.9	280.9	100												
280.9	283.9	97												
283.9	286.9	100												
286.9	289.4	100												
289.4	292.4	97												
292.4	295.4	100												
295.4	298.4	100												
298.4	301.4	100								-323.7				
301.4	301.9	120												
301.9	304.9	100		325.9	400.25	Breccia, consists of chloritic, vesicular,	325.9			0.5-1% sphal, v. fine,				
304.9	307.9	97				BASALT clasts, siliceous, light coloured,				Mostly associated with				
307.9	310.9	100				sometimes vesicular ?ALTERED BASALT clasts.				silica alteration within				
310.9	313.9	100				Squeezed between these clasts is black				clast, on clast edges +				
313.9	316.9	97				shale, it is not bedded and has an				in veinlets. Also filling				
316.9	319.9	100				irregular distribution.				vesicles.				
319.9	322.9	100				BASALT/SHALE BRECCIA ?PEPERITE.				Trace of dissem.				
322.9	325.9	100				Predominantly chlorite/carbonate alteration,				py in places, Mostly				
325.9	331.9	100				including pervasive alteration through				within the shale.				
331.9	334.9	97				shale and clasts, fine stringers and								
334.9	337.9	97				vesicle infil. There is also silica								
337.9	340.9	100				alteration, this appears to be confined								
340.9	343.9	100				to particular "clasts" a fine silica veining				-352.9 50mm massive py.				
343.9	346.9	100				is likewise confined. The "clasts" could				Sharp boundaries ?clast. However, surrounded by Tr.				
346.9	349.9	100				be alteration fronts.				dissem. py.				
349.9	352.9	100				Mineralisation occurs within vesicles	360			-358.8				



5 cm

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 1

PROJECT: BULGOBAC HILL

Graphic Scale 1: 250.

Page 9 of 12

CORE RECOVERY

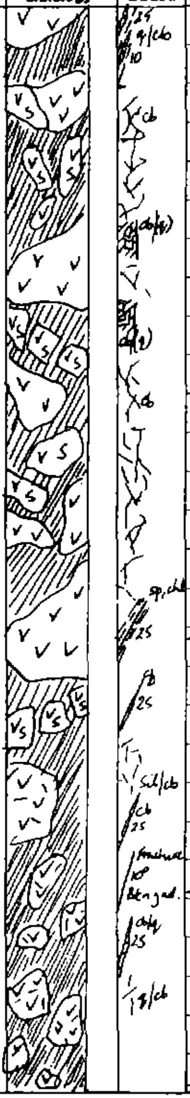
From m	Interval m	%	RQD
352.9	355.9	100	
355.9	358.9	100	
358.9	361.9	100	
361.9	364.9	100	
364.9	367.9	100	
367.9	370.9	100	
370.9	373.9	9	
373.9	376.9	97	
376.9	379.9	100	
379.9	382.9	100	
382.9	385.9	100	
385.9	388.9	100	
388.9	391.9	97	
391.9	394.9	97	
394.9	397.9	103	
397.9	400.9	100	
400.9	403.9	93	
403.9	406.9	93	
406.9	409.9	100	
409.9	412.9	100	
412.9	415.9	100	
415.9	418.9	100	
418.9	421.9	100	
421.9	424.9	97	
424.9	427.9	100	
427.9	430.9	100	
430.9	432.6	106	
432.6	433.9	100	

DESCRIPTION

From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)
325.9	400.25	(cont.) in fine stringers of carbonate + silica on clast boundaries (particularly siliceous "clasts") + disseminated through shale + clasts. It is mostly sphalerite, some pyrite. It is very pink + very fine grained. Occasionally coarser, more yellow coloured sphalerite is found in the wider, more penetrative, quartz-carbonate veins. 358.8 – 392.0. Within this interval there is a sudden increase in the degree of carbonate alteration and also in the amount of carbonate (± silica) veining. Rock has a spotty appearance, especially from 368m probably due to Qz infil of vesicles. This infil appears to be the same generation as the veining, which has a network form with no particular orientation to it. Within some of the veins, there is jig-saw ?hydraulic fracturing of country rock. This interval is less mineralised than the surrounding rock, also has far less silica. Shear zone from 359.0-364.4m, marked by schistosity, veining + broken ground. Bottom of zone is pale green, contains fuchsite + ?sericite.

Depth 360 – 420

Graphic Lithology / Struct.



MINERALISATION

Tr (<0.5%) Sph
as above.

-394.9
1% dissem. sphal.
vesicle infil, assoc. c̄ sil zones, v. fine veining + on clast boundaries.

-408.6
Tr - 0.5% Sph.
as above

-419.0

CODES

LITHO	STRUCT	ALTN	M

5 cm

HOLE No. BHD 1

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

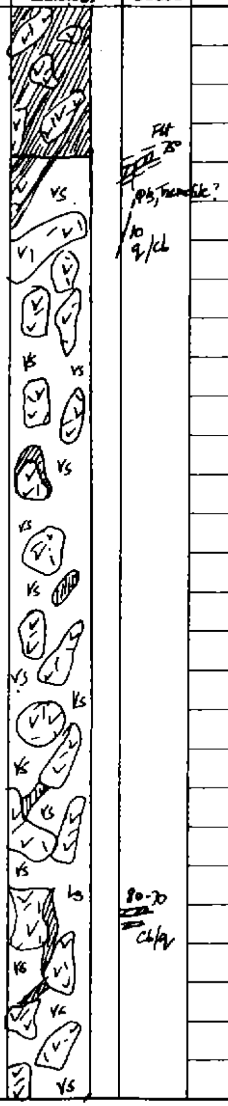
PROJECT: BULGOBAC HILL

Graphic Scale 1: 250

Page 10 of 12

CORE RECOVERY				DESCRIPTION					CODES		
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	MINERALISATION	LITHO	STRUCT	ALTN
433·9	436·9	100		325·9	400·25	(cont.)	420				
436·9	439·9	100				392·0 - 400·25 From here, less intense					
439·9	442·9	100				Carbonate veining & alteration. Increase					
442·9	445·9	100				in siliceous veining + alt. Networks	428				
445·9	448·9	100				Of silica veining, dispersed Carbonate					
448·9	451·9	100				stringers, consistently oriented, 25°,					
451·9	454·9	107				4/m.					
464·9	457·9	100									
457·9	460·9	100		400·25	448·9	Feldspar phyric, Slightly vesicular, volcanic					
460·9	463·9	100				clasts in predominantly shale matrix.					
463·9	466·9	100				ANDESITE /SHALE BRECCIA					
466·9	469·9	103				Decreasing amounts of shale down hole,					
469·9	472·9	100				especially below 428m. Matrix becomes					
472·9	475·9	100				a slightly silicified version of the					
475·9	478·9	100				volcanic clasts. Zones of shale are					
478·9	481·9	100				found down to 448·9m.					
481·9	484·9	103				Volcanic matrix is silica-(carbonate)					
484·9	487·9	100				altered. Clasts predominantly chlorite-					
487·9	490·9	100				carbonate altered.					
490·9	493·9	103				Fault from 429·5 - 429·6 contains					
493·9	496·9	93				quartz and fibrous mineral ?tremolite					
496·9	499·9	100				fill.					
499·9	502·9	100									
502·9	505·2	92		448·9	563·2	Brecciated appearance. Clasts & matrix					
505·2	508·2	100				appear to be of the same primary					
508·2	508·9	121				composition, both are feldspar-phyric,					
508·9	511·9	100				slightly vesicular ?ANDESITE. Brecciated					
511·9	514·9	100				appearance seems to be the product	440				

Graphic Lithology | Struct.



5 cm

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 1

PROJECT: BULGOBAC HILL

Graphic Scale 1: 250.

Page 11 of 12

CORE RECOVERY

From m	Interval m	%	RQD
514·9	517·9	97.	
517·9	520·9	100	
520·9	523·9	100	
523·9	526·9	100	
526·9	529·9	100	
529·9	532·9	107	
532·9	535·9	107	
535·9	538·9	100	
538·9	541·9	97	
541·9	544·9	107	
544·9	547·9	100	
547·9	550·9	100	
550·9	553·9	103	
553·9	556·9	97	
556·9	559·9	100	
559·9	562·9	100	
562·9	563·2	100	

DESCRIPTION

(incl. LITHOLOGY, STRUCTURE & ALTERATION)

of different alteration styles. The matrix is predominantly silica-altered. The clasts are carbonate-chlorite altered.

4969-5024 light pink alteration, especially on clast boundaries. Also pale green alteration of some clasts.

502.4-524.5 Pale green/buff coloured alteration throughout, especially of matrix. Alteration mineral has a waxy texture ?sericite.

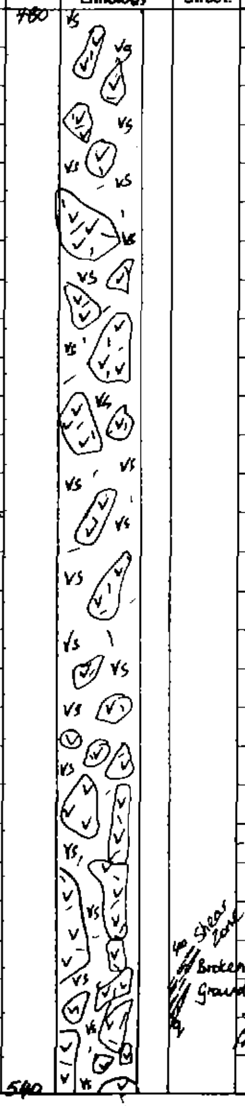
524.5-539.6 Strong chlorite alteration, dark green-black colour. Shear, 533.9-535.0.

539.6 547.8 Light green colour, some pale pink zones. Network quartz veining throughout.

547.8-552.0 Dark green-black chlorite alteration throughout.

552.0-563.2. Clasts dark green, chlorite altereded. Matrix pale green colour & weakly siliceous.

END OF HOLE 563.2m



MINERALISATION

- 526.6-530.0 Tr. sph.

- Py dispersed through Shear zone which extends from 533.9-535.0

CODES

LITHO | STRUCT | ALTN | MI

5 cm

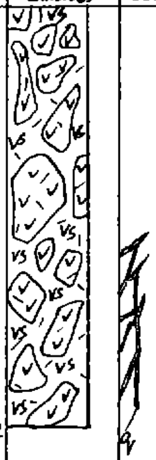
PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 1

PROJECT: BUNGOBAC HILL

Graphic Scale 1: 250

Page 12 of 12

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Graphic Struct.	MINERALISATION	LITHO	STRUCT	ALTN	
							540			539.6 - 547.8				
										Tr. coarse, dark, sphalerite				
										in veins				
										Very fine pyrite on clast edges.				
										561.6 - 563.2				
							563.2			Tr. Sph. in matrix				

5 cm

PASMINCO EXPLORATION
DIAMOND DRILL CORE ASSAY DATA

PROJECT : HIGH POINT, BULGOBAC HILL EL

HOLE No. BHD1

Page 13 of 15

SAMPLE						ASSAYS (ppm unless specified)								→ %						COMMENTS
Number	Type	From m	To m	Interval m	Recovered m	Cu	Pb	Zn	Ag	Au	Ba	Cr	Zr	Al_2O_3 / SiO_2	TiO_2 / Fe_2O_3	MnO / Na_2O	CaO / K_2O	MgO / P_2O_5	LOI / SO_3	
32501	SPLIT HQ	25·0	26·0	1·0		17	8	134	1·3	<0·008										
32502	SPLIT HQ	73·0	74·0	1·0		4995	1089	3624	13·1	0·016										
32503	SPLIT HQ	107·0	108·0	1·0		17	6	185	<0·5	<0·008										
32504	" "	108·0	109·0	1·0		30	18	343	<0·5	<0·008										
32505	" "	109·0	110·0	1·0		18	49	537	<0·5	<0·008										
32506	SPLIT NQ	116·0	117·0	1·0		17	850	3170	1·0	<0·008										
32507	" "	117·0	118·0	1·0		15	531	2637	0·9	0·010 0·008										
32508	" "	118·0	119·0	1·0		17	970	2158	1·3	0·013										
32509	" "	119·0	120·0	1·0		15	799	3098	1·2	0·012										
32510	" "	120·0	121·0	1·0		15	2750	3050	1·9	0·010										
32511	" "	121·0	122·0	1·0		16	1835	5531	1·7	0·009										
32512	" "	122·0	123·0	1·0		12	832	2430	1·3	0·012 0·009										
32513	" "	123·0	124·0	1·0		14	810	2710	1·3	0·017										
32514	" "	124·0	125·0	1·0		11	581	2335	1·3	0·012	440	260	110	11·20 / 62·0	0·43 / 7·12	0·30 / 1·20	3·81 / 1·54	4·55 / 0·083	5·68 / 2·05	
32515	" "	125·0	126·0	1·0		9	360	2157	0·5	0·008										
32516	SPLIT NQ	323·0	325·0	2·0		15	28	1046	<0·5	<0·008										
32517	" "	325·0	327·0	2·0		25	78	2020	<0·5	<0·008										
32518	" "	327·0	329·0	2·0		88	88	2071	0·7	<0·008										
32519	" "	329·0	331·0	2·0		73	116	2731	<0·5	<0·008										
32520	" "	331·0	333·0	2·0		43	56	3034	0·5	<0·008										
32521	" "	333·0	335·0	2·0		30	17	1871	1·7	<0·008										
32522	" "	335·0	337·0	2·0		17	<5	1815	<0·5	<0·008 <0·008										
Laboratory	ANALABS CODEE + PERTH			Analytical-Method		AAS	AAS	AAS	AAS	F/A	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	
Job-No. 0216 + 0218 (111310·60·08460) ANALABS No		Date 29·11·91		Detection-Limit		5	5	5	0·5	0·008	10	5								

0072

PAS.MINCO EXPLORATIO..
DIAMOND DRILL CORE ASSAY DATA

HOLE No. BHD 1

PROJECT: HIGH POINT, BULGOBAC HILL EL

Page 14 **of** 15

SAMPLE						ASSAYS (ppm unless specified)								%						COMMENTS
Number	**Type**	**From m**	**To m**	**Interval m**	**Recovered m**	Cu	Pb	Zn	Ag	Au	Ba	Cr	Zr	Al_2O_3 SiO_2	TiO_2 Fe_2O_3	MnO Na_2O	CaO K_2O	MgO P_2O_5	LOI SO_3	
32523	SPLIT NQ	337·0	339·0	2·0		10	<5	1898	<0·5	<0·008										
32524	" "	339·0	341·0	2·0		14	9	2013	<0·5	<0·008										
32525	" "	341·0	343·0	2·0		17	<5	740	<0·5	<0·008										
32526	" "	343·0	345·3	2·3		26	9	1626	<0·5	<0·008										
32527	" "	345·3	347·3	2·0		33	8	2310	0·7	<0·008										
32528	" "	347·3	349·3	2·0		41	8	3716	0·6	<0·008	730	550	180	12·40 47·7	0·58 8·04	0·45 2·70	9·99 1·25	5·35 0·397	9·75 1·22	
32529	" "	349·3	351·3	2·0		26	14	3458	0·6	<0·008										
32530	" "	351·3	353·3	2·0		261	8	5303	1·9	<0·008										
32531	" "	353·3	355·3	2·0		23	9	2927	0·6	<0·008										
32532	" "	355·3	357·0	1·7		53	11	2855	0·7	<0·008										
32533	" "	357·0	359·0	2·0		217	12	2491	1·0	0·018										
32534	" "	359·0	361·0	2·0		42	7	3140	0·5	<0·008										
32535	" "	361·0	363·0	2·0		57	34	2538	0·6	<0·008	150	1050	160	11·30 42·1	0·66 9·65	0·52 1·10	12·80 0·70	6·75 0·464	13·29 0·78	
32536	" "	363·0	364·8	1·8		28	282	1453	0·5	<0·008										
32537	" "	364·8	366·8	2·0		47	755	790	0·8	<0·008 <0·008										
32538	" "	366·8	368·8	2·0		35	547	976	0·8	<0·008										
32539	" "	368·8	370·7	1·9		44	297	590	<0·5	<0·008										
32540	" "	370·7	372·6	1·9		48	334	794	1·0	<0·008										
32541	" "	372·6	374·6	2·0		52	407	675	0·7	<0·008										
32542	" "	374·6	376·7	2·1		47	890	1553	0·6	<0·008										
32543	" "	376·7	378·7	2·0		51	400	951	0·5	<0·008										
32544	" "	378·7	380·7	2·0		61	629	1806	0·7	<0·008	770	940	110	9·80 38·6	0·58 5·14	0·34 2·80	19·60 1·12	4·35 0·506	15·83 1·07	
32545	" "	380·7	383·0	2·3		40	171	813	<0·5	<0·008										
32546	" "	383·0	385·0	2·0		44	153	1085	0·5	<0·008										
32547	" "	385·0	387·0	2·0		34	41	1149	<0·5	<0·008 <0·008										
32548	" "	387·0	389·0	2·0		62	142	1982	0·5	<0·008 <0·008										
Laboratory				**Analytical-Method**																
Job-No.		**Date**		**Detection-Limit**																

112073

PASMINCO EXPLORATION
DIAMOND DRILL CORE ASSAY DATA

HOLE No. BHD1

PROJECT : HIGH POINT, BULGOBAC HILL EL

Page 15 **of** 15

SAMPLE						ASSAYS (ppm unless specified)								→ %						COMMENTS
Number	Type	From m	To m	Interval m	Recovered m	Cu	Pb	Zn	Ag	Au	Ba	Cr	Zr	Al_2O_3 / SiO_2	TiO_2 / Fe_2O_3	MnO / Na_2O	CaO / K_2O	MgO / P_2O_5	LOI / SO_3	
32549	SPLIT NQ	389·0	391·0	2·0		48	103	1796	<0·5	<0·008										
32550	" "	391·0	393·0	2·0		86	281	2387	0·8	<0·008										
32551	" "	393·0	395·0	2·0		38	346	2477	0·6	<0·008										
32552	" "	395·0	397·0	2·0		90	603	1957	0·6	<0·008	2100	420	140	13·70 / 49·9	0·57 / 6·78	0·42 / 3·75	9·32 / 2·11	4·75 / 0·434	7·11 / 1·01	
32586	SPLIT NQ	496·0	498·0	2·0		43	<5	280	<0·5	<0·008										
32587	" "	498·0	500·0	2·0		43	<5	351	<0·5	<0·008										
32588	" "	500·0	502·0	2·0		24	<5	335	<0·5	<0·008										
32589	" "	502·0	504·0	2·0		14	5	440	<0·5	<0·008	1650		170	15·50 / 59·6	0·51 / 6·59	0·41 / 3·80	5·69 / 2·07	3·65 / 0·308	2·16 / 0·09	
32590	" "	504·0	506·0	2·0																
32591	" "	506·0	508·2	2·2																
32592	SPLIT NQ	520·0	522·0	2·0																
32593	" "	522·0	524·0	2·0																
32594	" "	524·0	526·0	2·0																
32595	" "	526·0	528·0	2·0																
32596	" "	528·0	530·0	2·0																
32597	" "	530·0	532·0	2·0																
32598	" "	532·0	534·0	2·0																
32599	" "	534·0	535·7	1·7																
32600	SPLIT NQ	560·0	562·0	2·0																
32601	" "	562·0	563·2	1·2																

Laboratory

Analytical-Method

Job-No.

Date

Detection-Limit

APPENDIX 2

LOG OF DRILLHOLE BHD2
HIGH POINT

HOLE No. BHD 2

PASMINCO EXPLORATION
DIAMOND DRILL CORE RECORD

Page 1 of

LOCATION	TASMANIA
PROJECT	BULGOBAC HILL EL
PROSPECT	HIGH POINT
DESIGNED BY	J.G. PURVIS/A.N. LORRIGAN
LOGGED BY	J.G. PURVIS
RELOGGED	
COMMENCED	31.10.91
COMPLETED	14.11.91
DRILLED BY	W. HOW
DRILL RIG	LONGYEAR 38

OBJECTIVE

TO TEST POSTULATED EASTERN EDGE OF BURIED CAMBRIAN RIFT INFERRED FROM GRAVITY, AEROMAGNETIC AND PLACER DRILLING DATA.

RESULT

HOLE TERMINATED DUE TO EXCESSIVE LIFT.

LOCATION/SURVEY DATA (AMG)

Grid	AMG		RL Collar m	636.9
Northing m	5 393638.0		Bearing Collar	091°
Easting m	389062.2		Dip Collar	-80°
DH Survey Type	EASTMAN SINGLE SHOT CAMERA		Length Hole m	133.9

Depth m	Bearing	Dip	Depth m	Bearing	Dip
30	102°	-78.25°			
52	108°	-76.5°			
67	110.75°	-76°			
91	113.25°	-73.5°			
121	117°	-70.75°			
133	117°	-70°			

SIGNIFICANT INTERSECTIONS

From m	To m	Interval m						Comments

SIGNIFICANT CORE LOSS

From m	To m	% Lost

POOR GROUND CONDITION ZONES

From m	To m	Condition
0	8.4	VERY CLAYEY AND BROKEN
33.5	37.0	SHATTERED AND BROKEN
51.5	57.5	BADLY BROKEN ALONG CLEAVAGE

HOLE SIZE

Size	Depth m
HW	6m
HQ	133.9m

HOLE CONDITIONS AFTER COMPLETION

Collar	100MM PVC PIPE CEMENTED TO 6m, WITH SCREW-ON TOP
Steel Casing	ALL REMOVED
PVC Casing	32MM UNSLOTTED PVC PLACED TO BASE AT 133.9m.
Ground Water	
Wedge	
Drill Pad	

HOLE No. BHD 2

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

PROJECT: HIGH POINT (BULGOBAC HILL EL 37/89)

Graphic Scale 1: 500

Page 2 of

CORE RECOVERY

From m	Interval m	%	RQD
0			
2.4	2.4	0	
4.0	1.6	12	

DESCRIPTION

From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)
0 – 133.9	133.9	BLACK SHALE (QUE RIVER SHALE)

Lithology: Black, carbonaceous and graphitic, shale. Below 33.5m shale is increasingly calcareous with dispersed and bedded carbonate (at 77.3—77.6m rock is a grey impure shaley limestone)

V minor pale grey siltstone and fine feldspar-rich sst bands to 0.4m, these gen graded with fining all uphole.

Alteration: Highly oxidised and leached to 6.9m, with abund limonitic fracts. Below 33.5m persistent irreg veins + veinlets of qtz-carb, up to 0.4m; these largest and most abund around faulted zones.

Structure: Fine regular bedding visible in places: 50°/LCA @ 4.5m, 55°/LCA @ 16.8m, 60°/LCA @ 27.3m, 62°/LCA @ 36.9m, 43°/LCA @ 43.9m (c̄ cleavage 20°/LCA in same sense), 78°/LCA @ 82.5m (cleav 55°/LCA same sense), 72°/LCA @ 113.8m (cleav 35-40°/LCA same sense), 70°/LCA @ 121.9m (cleav 40-45°/LCA same sense), 70°/LCA @ 129.2m (cleav 40°/LCA opposite sense).

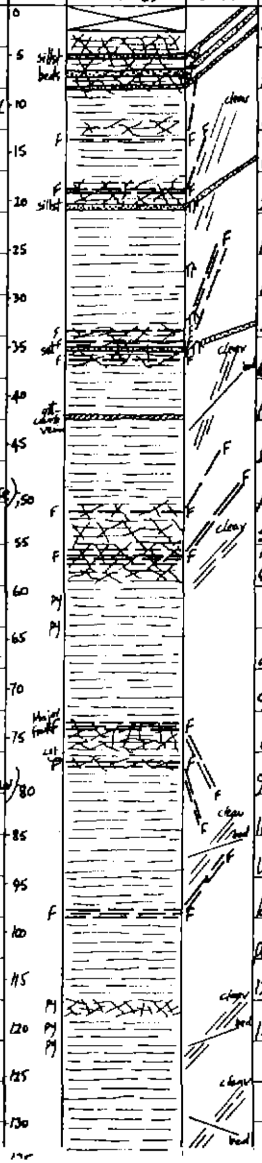
Cleavage gen moderate, inc c̄ depth.

Shale moderately fractured and broken, badly in places (eg: 0-8.4m, 33.5—37m, 51.5—57.5m). Numerous graphitic faults and shears, strongest: 18.65—19.0m (20°/LCA); 33.5—37m (20°/LCA - same sense as bedding); 55.7—57.2m (35-40°/LCA); 77.5—77.9m (15-20°/LCA, opp sense to bedding + cleav)

Major fault 73.4—74.15m (25°/LCA, sense unclear); 97.7—98.6m (40°/LCA)

END OF HOLE

Depth | Graphic: Lithology | Struct.



MINERALISATION

Variably pyritic throughout, with traces of sp,gn+cp in some qtz-carb veins.

0—22m: 1% v fi gr dissem py.

22-40m: 2% py (<1% to 5%), mostly as v fi gr bedded dissem, some massive py beds to 5mm.

40—60.25m: 2-3% py, fi gr dissem.

60.25—64m: 3-5% py, to 10% locally. Mostly as ultra fi gr dissem, some in semi-massive banded irreg patches, poss remobilised. Minor sp-gn in qtz-carb veinlets.

64—90m: 1% py. On fractures, in qtz-carb veins (c̄ trace sp-gn+cp), and as fi gr dissem.

90—97.7m: 2-3% py - ultra fi gr bedded dissem

97.7—117m: 1% py as above. Trace sp-gn

117—122m: 3—5% py, locally +10% Ultra fi gr bedded dissem in fine laminations av 1mm thick. Occ patches of py + tourm (?) to 50×15mm

122—129.5m: 2-3% py.

129.5—133.9m: 1% py.

CODES

LITHO	STRUCT	ALTN	MIN

APPENDIX 3

LOG OF DRILLHOLE BHD3,
HIGH POINT

HOLE No. BHD 3

PASMINCO EXPLORATION
DIAMOND DRILL CORE RECORD

Page 1 of 21

LOCATION	TASMANIA
PROJECT	BULGOBAC HILL EL
PROSPECT	HIGH POINT
DESIGNED BY	J.G. PURVIS
LOGGED BY	J.G. PURVIS
RELOGGED	
COMMENCED	19.11.91
COMPLETED	14.1.92
DRILLED BY	W. HOW
DRILL RIG	LONGYEAR 38

OBJECTIVE

REPEAT OF ABORTED HOLE BHD 2 : TO TEST POSTULATED EASTERN EDGE OF BURIED CAMBRIAN RIFT INFERRED FROM GRAVITY, AEROMAGNETICS AND PLACER DRILLING DATA.

RESULT

NO MINERALIZATION INTERSECTED APART FROM PYRITIC FAULT ZONE 453-461·7m.
HOLE INTERSECTED ALTERED QUE HELLYER VOLCANICS OF UPPER ANDESITES AND BASALTS UNIT, AND MIXED SEQUENCE ANDESITES + DACITES. HOLE BOTTOMED IN PROBABLE LOWER UNIT.

LOCATION/SURVEY DATA (AMG)

Grid	AMG		**RL Collar m**	641·3
Northing m	5393637·2		**Bearing Collar**	132°
Easting m	388987·2		**Dip Collar**	-83°
DH Survey Type	EASTMAN SINGLE SHOT CAMERA		**Length Hole m**	784·4

Depth m	Bearing	Dip	Depth m	Bearing	Dip
31	128°	-83·5°	721	135·5°	-77·25°
61	130·5°	-83°	751	135·5°	-77·25°
91	130·75°	-82°	781	137°	-77·25°
121	127°	-80·25°			
151	126·5°	-78°			
181	129·25°	-77·25°			
211	128·25°	-77°			
241	128°	-75·75°			
271	127·25°	-75·5°			
301	127·5°	-76°			
331	127·5°	-76°			
361	128·25°	-75·75°			
391	126·5°	-75°			
421	127°	-75°			
451	126·5°	-75°			
481	127·5°	-75°			
511	127·5°	-75·75°			
541	129·25°	-76°			
571	130·5°	-76·25°			
601	131·5°	-76·5°			
631	132·25°	-76·5°			
661	134·25°	-77°			
691	135°	-77°			

SIGNIFICANT INTERSECTIONS

From m	To m	Interval m	Pb	Zn	Ag	Au		Comments
453	456	3.	0·04%	0·15%	1 g/t	<0·01g/t		BEST INTERSECTION - PYRITIC FAULT IN VOLCANICS.

SIGNIFICANT CORE LOSS

From m	To m	% Lost

POOR GROUND CONDITION ZONES

From m	To m	Condition
304·4	318·3	BADLY BROKEN BY FAULT // LCA

HOLE SIZE

Size	Depth m
HW	4
HQ	72
NQ	784·4

HOLE CONDITIONS AFTER COMPLETION

Collar	STEEL STEAMPIPE CEMENTED IN PLACE TO 4m, WITH STEEL CAP.
Steel Casing	4m
PVC Casing	TO BOTTOM - 40mm UNSLOTTED.
Ground Water	
Wedge	
Drill Pad	

PASMINCO EXPLORATION
SUMMARY DIAMOND DRILL CORE LOG

HOLE No. BHD3

PROJECT: HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1:

Page 2 **of** 21

From m	Interval m	Code	Description	Depth	Graphic	From m	Interval m	Code	Description	Depth	Graphic

TABLE 1: SUMMARY LOG OF HOLE BHD3

0 - 52.9m: SOUTHWELL SUBGROUP:

0 -52.9m: **PUMICEOUS CRYSTAL-LITHIC BRECCIO-CONGLOMERATE**
Mod silicified. 1% pyrite. Clasts of massive py below 36m.

52.9 - 453.0m: QUE RIVER SHALE:

52.9 -257.2m: **BLACK SHALE**
Carbonaceous, graphitic & calcareous. 1-2% bedded pyrite, with zones to 5%.

257.2 -453.0m: **MIXED SEQUENCE OF BLACK SHALE, FELDSPATHIC SANDSTONE & FELDSPAR-PHYRIC AMYGDALOIDAL MAFIC LAVAS**
Dolerite 441 -448m. Sediments calcareous, mafics carbonatised. 1-3% pyrite in shale. Gen minor to 1% py in volcs, with limited intervals to 3% (best: 416.7 -423m: 2-3% py, trace sp).

453.0 -784.4m: QUE-HELLYER VOLCANICS:

453.0 -461.7m: **CLEAVED, SERICITISED & PYRITIC FINE MAFIC BRECCIA**
Probable major ductile structure. Mod-strong sericite-carbonate alteration. 5-10% pyrite, minor sp-gn in calcite veinlets.

461.7 -580m: **BRECCIATED AMYGDALOIDAL MAFIC LAVAS**
Carbonatised & chloritised. Bleached & silif lava clasts 485 -498m. Gen minor to 1% pyrite, except 2-3% py in faulted zone @ 466.5 -474m.

580 -646.4m: **PARTLY-PEPERITIC FELDSPAR-PHYRIC MAFIC (TO DACITIC?) LAVA BRECCIA**
Carbonatised & chloritised. Minor fuchsite in v strong fault @ 610 -611m. Minor to 1% pyrite, decreasing with depth.

646.4 -695.4m: **ALTERED POLYMICT EPICLASTIC VOLCANIC BRECCIA**
Dacitic & andesitic composition. Apparent primary debris-flow lineation. Strong silica-albite alteration. Minor pyrite.

695.4 -709.8m: **FELDSPAR-PHYRIC (ANDESITIC?) LAVA**
Carbonate-chlorite-sericite alteration. V minor pyrite.

709.8 -757.7m: **ALTERED DACITIC VOLCANIC BRECCIA**
Dacitic fragments in possibly more-andesitic matrix. Extensively detextured by strong silica-albite-chlorite-carbonate alteration. Several amygdaloidal mafic dykes to 5m. V minor pyrite.

757.7 -784.4m: **PEPERITIC FELDSPAR-PHYRIC LAVA BRECCIA**
Andesitic to possibly dacitic composition. Chloritised, with patchy silicification. Minor pyrite.

END OF HOLE

Best intersection:
453 -456m: 3m @ 0.15% Zn, 0.04% Pb, 1g/t Ag, 0.01g/t Au.

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT: BULGOBAC HILL EL, HIGH POINT.

Graphic Scale 1:

Page 3 of 21

CORE RECOVERY

From m	To Interval m	%	RQD
0	3.5	6	
3.5	5.5	80	
55	6.7	100	
6.7	9.0	96	
9.0	10.0	70	
10.0	11.0	75	
11.0	13.2	91	
13.2	14.0	87	
14.0	15.7	94	
15.7	18.7	100	
18.7	20.0	100	
20.0	22.2	98	
22.2	25.2	100	
25.2	26.4	100	
26.4	29.0	100	
29.0	32.0	97	
32.0	34.1	100	
34.1	37.2	98	
37.2	40.2	100	
40.2	43.2	100	
43.2	46.2	93	
46.2	47.2	100	
47.2	49.3	95	
49.3	50.1	100	
50.1	52.6	96	
52.6	53.8	92	
53.8	55.0	100	
55.0	55.6	100	

DESCRIPTION

From m | Interval m | (incl. LITHOLOGY, STRUCTURE & ALTERATION) | Depth | Graphic Lithology | Struct.

0 - 52.9m: PUMICEOUS CRYSTAL-LITHIC BRECCIO-CONGLOMERATE (SOUTHWELL SUBGROUP)

Lithology: Grey, massive, hard.
Rapidly-deposited, unbedded but graded, reworked epiclastic debris of volcanic and volcano-sedimentary origin.
Marked gradual increase in clast size and abundance with depth.
Typically open framework of polymict clasts supported by sandy matrix rich in xyls and xyl frags of qtz & feldspar, to 2mm.
Matrix also contains fine carbonaceous material (poss derived from finely comminuted black shale), and is invaded by fi gr silica.
Lithic clasts angular to well-rounded, gen at least sl rounded.
Clast types include deformed sericitic tubular pumice (very common, often with porphyritic feld &/or qtz xyls), black shale, tuffaceous sediments, bleached & altered mafic volcs (including amygdaloidal lavas and fine mafic clastics), pale pinkish-cream silif and albitised felsic lavas (often flow-banded), and chert.
Mafic clasts inc common below 30m - some are weakly fuchsitic, others pyritic.
Above approx 25m unit dominated by sandy matrix, with subordinate clasts av approx 5mm (max 25mm). Between 25m and 36.2m clasts average 10mm or less with occ clasts (gen black shale) to 80mm.
Below 36.2m there is a coarser lithic-rich basal zone (closed framework in places), with clasts av 20mm and numerous larger lithics (esp black shale), to 100mm. At 46.4 -46.8m badly broken raft of black shale.

Alteration: Mod silif (both matrix and some clasts). V weak sericite-chlorite alt, sometimes as hairline ser-chlor veinlets.
Above 14.2m, mod oxidized and leached to pale yellowish-brown rock with clay seams and limonite on fracts. V weak & patchy ox to 25m with occ limonite on fracts to 44m.
Small patches of strong carb alt 36 -45m, no carb alt elsewhere.
Veining almost entirely absent.

Structure: No clear layering, although clasts display weak primary preferred orientation, as follows: 47o/LCA @ 4.5m, 50o/LCA @ 16m & 27m, 49o/LCA @ 32m (orientated: dip 46o to dip direction 235oM), 55o/LCA @ 43m, 50o/LCA @ 50.5m.
Sl-mod fractured and broken, mainly by fract set //LCA. Breaking worst above 25m and 44.85 -48.6m (latter due to strong fracts 5-10o/LCA).
No faults or shears.
Basal contact 60o/LCA (// clast orientation) - a sl irreg scoured surface on underlying shale. Truncates bedding in shale (50o/LCA in same sense).

52.9 - 257.25 BLACK SHALE (QUE RIVER SHALE)

Lithology: Black carbonaceous and graphitic shale.

Gen calcareous, with common fine beds of carbonate and bands that can be classed as impure shaley limestone (eg: 168.1 -168.5m & 180.3 -180.8m).
The top of the shale (above 56.5m) is finely sandy with numerous 1-2mm beds of fine feldspathic sst & siltst. Occ similar beds, from 1mm to 300mm thick, occur down to 95m & esp 86.7 - 87.8m. Thicker beds are graded, with fining all uphole (largest: 87.3 -87.6m 54o/LCA).
Below 246m shale has finely sandy component in places with occ thin finely sandy to silty beds.

MINERALISATION

0-52.9m:
Av 1% dissem pyrite (ranges from minor to 2%).
Trace dissem sp-gn.
Occ clasts of massive pyrite to 15mm, these most common below 36m.
Minor fine titaniferous oxides & assoc leucoxene.

52.9 -257.25m:
Av 1-2% pyrite, ranging from minor to 5%.

CODES

LITHO | STRUCT | ALTN | MIN

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT: HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1:

Page 4 of 21

CORE RECOVERY

From m	To Interval m	%	RQD
55·6	56·7	91	
56·7	59·7	100	
59·7	62·0	100	
62·0	64·5	100	
64·5	65·9	100	
65·9	68·0	95	
68·0	68·4	100	
68·4	68·9	90	
68·9	69·4	80	
69·4	70·1	86	
70·1	70·6	100	
70·6	71·2	100	
71·2	72·0	100	
72·0	74·8	91	
74·8	77·0	98	
77·0	80·0	100	
80·0	80·7	100	
80·7	81·8	100	
81·8	82·4	92	
82·4	85·5	100	
85·5	86·7	100	
86·7	89·0	100	
89·0	92·0	100	
92·0	95·0	100	
95·0	98·0	100	
98·0	101·0	100	
101·0	104·0	100	
104·0	107·0	100	

DESCRIPTION

From m.	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Graphic Struct.

100mm breccio-conglomerate bed @ 250.5m with clasts av 5-10mm mainly of bleached & altered mafic lavas(?) (some with perlitic cracks). Matrix of breccio-cong contains some qtz grains.

Alteration: Essentially none. Sweated-out calcite veins and veinlets throughout, with common qtz-calcite veins in zones of shearing. Some of these veins contain trace chlorite-sericite, esp veins below 246m..

Structure: Finely and regularly bedded, with moderate cleavage gen almost // bedding (orientated core shows bedding gen has moderate W dip and cleav gen a steep W dip).

Cleav weak at top of unit & gets stronger with depth. Bedding most clearly visible where cleav weak.

Bedding (B) & cleavage (C) measurements: (orientated core as detailed):
62m: (B) 58o/LCA (dips 36o to 325oM);
74m: (B) 61o/LCA;
92m: (B) 54o/LCA (46o/300oM);
111m: (B) 49o/LCA;
129m: (B) 29o/LCA & (C) 30o/LCA (in opp sense);
152m: (B) 40o/LCA (63o/267oM);
179m: (C) 27o/LCA (71o/300oM);
182m: (C) 28o/LCA (68o/260oM);
212m: (B) 70o/LCA (16o/170oM) & (C) 25o/LCA (68o/295oM);
242.5m: (B) 57o/LCA (33o/210M) & (C) 18o/LCA (73o/185oM);
252m: (B) 62o/LCA.

Mod fractured and broken, badly in places (assoc with faults & shears).
Most-broken zones as follows: 52.9 -56.3m, 68 -71m, 108 -113.5m, 123.8 - 126.5m, 188 -190m, 205.5 -207m, 229 -231.5m, 246 -250m.

Larger faults (most with graphitic pug zones and calcite (+qtz) veining:
56.1m: 65o/LCA (strong slickensides).
69.4 -70.7m: 50o/LCA (// bedding).
73.2m: 40o/LCA
112.6 -113.2m: 20o/LCA (// cleavage).
125.25m: 20o/LCA (// cleavage).
186.5 -191.2m: 20o/LCA. Major qtz-carb veined disturbed zone centred approx 188 -189.75m.
204.6 -207.4m: 40o/LCA (opp sense to bedding). Major fault centred 206 -207m.
228.65 -231.5m: 10 -40o/LCA, strongly faulted zone, centred 229 -231m.
Numerous other smaller faults and shears.
Basal contact gradational.

257.25 -278.6m: MIXED SEDIMENTS: BLACK SHALE, SANDSTONE & BRECCIA

Lithology: Pale grey to black.
A complex of sediment types caused by semi-contemporaneous deposition of carbonaceous shale and coarser volcaniclastic sediments.
Sediment types: black carbonaceous shale; fine volcaniclastic sst (sst in lower sections of unit has carbonaceous shaley matrix, while sst near top has vitric matrix with abund tiny pumice frags); & lithic breccia (261.7 - 266.8m).

MINERALISATION

Py mainly as ultra fi gr bedded dissem, and also on fractures.
Some beds and lenses of massive py to 10mm thick.
Difficult to estimate py content because of fine grainsize.
Below 159m: v minor sp-gn-cp in some qtz-carb veins, esp 159 -185m & below 246m.
Zones of 2% py or better:
52.9 -57m: ?3% py, incl thin massive beds.
70.2 -76.2m: ?3-4% py, fi gr bedded dissem.
88 -91m: ?3% py, fi gr bedded dissem.
196 -204.6m: ?2-3% py, incl thin massive beds.
220 -221m: ?3-4% py in ultra fi gr bedded dissem.
225 -228.5m: 3% py, as above.
238.3 -241m: 3-5% py, as above.

257.25 - 278.6m:
Gen minor dissem & veinlet pyrite, with limited zones to 2% in shale, except: 275.7 -278.6m:
2% pyrite as fine bedded dissem in shale.

CODES

LITHO	STRUCT	ALTN	MIN

112082

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT: HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1:

Page 5 of 21

CORE RECOVERY

From m	To Interval m	%	RQD
107·0	108·4	100	
108·4	109·5	55	
109·5	110·5	110	
110·5	110·9	100	
110·9	112·2	92	
112·2	113·2	90	
113·2	113·5	67	
113·5	114·0	80	
114·0	116·0	100	
116·0	119·0	100	
119·0	120·7	100	
120·7	122·0	100	
122·0	124·3	100	
124·3	125·3	100	
125·3	126·0	114	
126·0	127·2	75	
127·2	130·2	100	
130·2	130·9	86	
130·9	134·0	100	
134·0	135·6	100	
135·6	136·1	100	
136·1	136·8	86	
136·8	139·9	100	
139·9	143·0	100	
143·0	146·0	100	
146·0	147·3	104	
147·3	149·0	91	
149·0	150·4	100	

DESCRIPTION

(incl. LITHOLOGY, STRUCTURE & ALTERATION)

Breccia comprises polymict angular clasts av 10-15mm, max 40mm, of grey-black sst/siltst & shale, sericitic glass frags (non-tubular, with qtz & feld phenos), & altered mafic volcanics. Many of the sed & glass clasts are deformed.
Breccia weakly graded, with sl larger clasts densely-packed in sandy matrix towards base, and gen smaller clasts in open framework supported by black shale matrix in upper part.
Numerous irreg soft-sediment deformed bands of black shale from 50 to 500mm in mid to upper sections of breccia band.
Basal contact of breccia irreg & mixed with underlying shale over 200mm.
At top contact breccia fines uphole into sst.
Sediments are gen not calcareous, but several strongly calcareous zones in black shale in basal 3m.
Alteration: Essentially unaltered. V weak sericitisation & chloritisation evident in places.
Structure: Bedded, with sst and breccia units showing uphole fining.
Cleavage evident towards base of unit.
Bedding: 64o/LCA @ 258.5m;
43o/LCA @ 272m (orientated: 62o/280oM);
50o/LCA @ 277.7m (cleavage: 20o/LCA, same sense).
Qtz-calcite net-veins and breccia-fill at intervals throughout, 5-20o/LCA.
These assoc with single fault or series of mild faults, approx 10o/LCA (same sense as veins), that appears in core at intervals below 265.3m & centred in broken calcite-cemented fault breccia zone 275.5 -276.2m.
Mod breaking along these faults below 268.5m.
Basal contact sharp & sl irreg, 55o/LCA (opp sense to bedding).

278.6 - 304.4m: FELDSPAR-PHYRIC AMYGALOIDAL MAFIC LAVA
Lithology: Grey. Massive & uniform. Fi-med gr.
Massive, finely feldspar-porphyritic lava with occ qtz-calcite filled amygdales.
Extensive zones of auto-brecciation (largest: 295.8 -298.5m).
Felds av 1mm (fine white laths), in fine gr feldspar-bearing groundmass with characteristic microscopic carbonate flecks.
Amygdales not common, 2-5mm with larger elongated (gen at almost 90o/LCA) or irreg. Numerous amygdales in 15mm wide zone at top contact.
Alteration: Strongly carbonatised, becoming weak and patchy below about 293m. Weak pervasive sericite>chlorite alteration.
Local silicification in places, esp in brecciated zones.
Minor qtz-carb (+- sericite-chlorite) veins throughout, but largest & most common below 290m.
Structure: Massive, no banding or cleavage.
Only sl fractured & broken.
Strong fault 40o/LCA @ 303 -303.3m, with 300mm of crushed rock & pug.
Basal contact sharp & irreg (approx 40-70o/LCA) - a primary depositional contact with tiny 'feathers' of lava into shale.

Sampling: 032731: 284 -285m. (A) - Petrology. (B) - W.R.Geochem.

MINERALISATION

V minor sp-gn>cp in some thin qtz-carb veinlets, as well as dissem in matrix & clasts in upper 2-3m of breccia band.

278.6 - 287m:
1% pyrite, dissem, some in qtz-carb veins (trace cp in veins also).
287 - 301m:
Minor dissem py.
301 -304.4m:
1-2% dissem py, mainly in clots & stringers around fault at 303m.

CODES

LITHO	STRUCT	ALTN	MIN

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT: HIGH POINT, BULGOBAC EL

Graphic Scale 1:

Page 6 of 21

CORE RECOVERY

From m	To m	%	RQD
150·4	150·8	100	
150·8	152·0	50	
152·0	154·7	98	
154·7	155·5	100	
155·5	158·0	92	
158·0	160·3	109	
160·3	161·3	100	
161·3	164·0	100	
164·0	166·7	100	
166·7	168·1	100	
168·1	170·0	100	
170·0	173·0	100	
173·0	176·0	100	
176·0	179·0	100	
179·0	182·0	100	
182·0	185·0	100	
185·0	188·0	100	
188·0	189·0	80	
189·0	189·5	80	
189·5	191·0	100	
191·0	194·0	90	
194·0	197·0	98	
197·0	200·0	100	
200·0	201·5	100	
201·5	202·5	90	
202·5	203·6	100	
203·6	204·2	83	
204·2	206·0	100	

DESCRIPTION

From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Graphic Struct.	MINERALISATION

CODES

LITHO	STRUCT	ALTN	MIN

<u>304.4 - 312.25m: BLACK SHALE</u>

<u>Lithology:</u> Disrupted & broken black carbonaceous & graphitic shale. Shale itself is not calcareous.

306.4 -307.05m: Irreg intercalation of feld-phyric & amygdloidal mafic lava (identical to unit above), mixed in with shale at low angle to LCA.

<u>Alteration:</u> Calcite-qtz veins & breccia-fill,

<u>Structure:</u> Badly broken, esp above 306.5m & 309 -311.4m, by major faults characterised by graphitic pug, graphitic slickensided fractures & calcite-qtz veins. These faults centered 304.5 -306.25m (5-10o/LCA), & 309.2 -311.3m (10 -25o/LCA).

Bedding visible in upper part of unit: 5 -25o/LCA, in same sense as faults.

Basal contact sharp & v irreg, a 1o depositional plane approx 15o/LCA.

Mineralisation: 304.4 -312.25m:
3% pyrite (locally +5% in zone between faults), mainly as ultra fi gr dissem, gen bedded, & on fractures.
Locally 1% fine dissem sp in intercalated lava @ 306.4 -307.05m.
Rare trace sp-gn in thin qtz-calcite veinlets towards base of unit.

<u>312.25 - 317.8m: AMYGDALOIDAL FELDSPAR-PHYRIC MAFIC LAVA</u>

<u>Lithology:</u> Pale greenish-grey. Massive. Fi-med gr.

Similar to lava above 304m, except more amygdaloidal & with fewer and smaller porphyritic felds (few felds <1mm). All in feldspar-rich groundmass.

Common amygdales av 2mm, some elongated to 20mm, ovoid types orientated approx 50o/LCA near top contact.

<u>Alteration:</u> Strongly carbonatised to 315m, with pervasive carb, calcite in amygdales and qtz-calcite net veins (veins are at low angle to LCA & are related to the major fault. Some veins contain small shale frags).

Gen weak sericite-chlorite alteration, with chlorite inc to mod below 315m.

<u>Structure:</u> Major fault below 315.65m, essent // LCA, with some intermixed crushed black shale.

(This fault is part of a single major structure essent //LCA between 304.4 -318.3m).

Fault centred on puggy crushed & broken zones at 315.9 -316.25m & 316.8 - 317.1m, but lava below 315.65m is highly brecciated (although largely unbroken).

Fault forms basal contact of lava (approx 20o/LCA) - an unbroken fault breccia annealed with qtz-carb vein material.

Mineralisation: 312.25 - 317.8m:
Minor to 1% dissem pyrite.
Rare sp-gn in thin qtz-carb veins.

<u>317.8 - 322.05m: BLACK SHALE</u>

<u>Lithology:</u> Black carbonaceous & graphitic shale.

Shale is not calcareous.

<u>Alteration:</u> Minor sericite & chlorite on fracts (+-qtz-carb).

The only qtz-carb veins present are at both contacts.

<u>Structure:</u> No bedding or cleavage visible.

Upper 0.5m v strongly faulted & broken with 200mm of graphitic pug & broken qtz-carb veins, at top contact.

Apart from 320-321m, shale mod broken (sometimes shattered) by fracts at low angle to LCA.

Basal contact sharp, irreg & broken.

Mineralisation: 317.8 - 322.05m:
2-3% ultra fi gr dissem pyrite.

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT: HIGH POINT, BOLGOBAC HILL EL

Graphic Scale 1:

Page 7 of 21

CORE RECOVERY

From m	To Interval m	%	RQD
206·0	206·4	100	
206·4	206·9	80	
206·9	207·9	80	
207·9	210·9	100	
210·9	212·0	100	
212·0	215·0	100	
215·0	218·0	100	
218·0	220·1	100	
220·1	221·1	100	
221·1	224·0	103	
224·0	227·0	100	
227·0	229·5	96	
229·5	229·8	100	
229·8	230·4	83	
230·4	231·0	83	
231·0	231·7	86	
231·7	233·1	100	
233·1	236·0	100	
236·0	236·8	100	
236·8	237·5	100	
237·5	238·3	100	
238·3	241·3	102	
241·3	242·0	86	
242·0	245·0	102	
245·0	246·6	100	
246·6	247·7	91	
247·7	248·6	100	
248·6	249·3	86	

DESCRIPTION

From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.	MINERALISATION

CODES

LITHO	STRUCT	ALTN	MIN

322.05 - 356.95m: AMYGDALOIDAL MAFIC LAVA

Lithology: Pale greenish-grey. Massive. Fi-med gr (grainsize inc sl with depth).
Characterised by scattered calcite-filled amygdales 1-15mm, and abund microscopic carbonate flecks.
V minor 1mm porphyritic feldspars. Groundmass is feldspar-rich.

Alteration: Patchy strong carbonate alteration, inc with depth.
Weak-mod sericite-chlorite alteration, with local stronger patches as wallrock alt assoc with some calcite-qtz veins & fracts.
This sericite-chlorite predates v local silif (+-bleaching), some of which is assoc with thin qtz-filled fracts.
Common calcite-qtz veins throughout, mostly almost //LCA.
Below 352m lava is tectonically brecciated with calcite>qtz matrix.

Structure: Sl broken at intervals below 343m by fracts & shears almost //LCA, strongest shear: 10-15o/LCA @ 343 -343.75m.
Basal contact an annealed fault zone marked by 550mm qtz-calcite vein with basal slickensided margin 70o/LCA (same sense as bedding in seds below).

Sampling: 032732: 338 -339m. (A)- Petrology; (B)- W.R.Geochem.

356.95 - 416.7m: BLACK SHALE

Lithology: Black carbonaceous & sl graphitic shale, with lesser dark grey fine qtzo-feldspathic sandstone (often with carbonaceous or sericitic matrix). In places the shale itself contains sandy grains of feld.
Sst occurs both as sandy zones up to several metres thick & as common thin beds in shale. Largest sandy zone is at top of unit, above 363.05m.
Both shale & sst are weakly calcareous to 370m and gen strongly calcareous below this, with some thin carbonate beds in places.
378.7 -380m: diffuse beds of breccia in shale -angular clasts to 25mm of sst, siltst, & lesser mafic lavas (some with perlitic cracks).

Alteration: V weak sericite-chlorite alt evident in sandy sections.
Minor chlorite in some qtz-carb veinets (usually with assoc sp).
Qtz-carb veins & veinlets abund around faulted zones, otherwise uncommon.
Minor films of greasy talc-carb material on some fracts, mainly towards base of unit.

Structure: Bedded & weak-mod cleaved (cleav dec with depth).
At 360m: Bedding (B) 80o/LCA; cleavage (C) 18o/LCA, same sense.
At 363.05m: (B) 69o/LCA, with uphole fining.
At 370m: (B) 64o/LCA.
At 378m: (B) 70o/LCA.
At 384m: (B) 57o/LCA, with downhole facing.
At 395m: (B) 64o/LCA.
At 404.5m: (B) 75o/LCA, with uphole facing.
At 415m: (B) 70o/LCA.
Mod fractured & broken, with fracts mainly around 10o/LCA (occ fracts

MINERALISATION

322.05 -356.95m:
1% pyrite, rare cp, sp & gn.
Sulphides vary from trace to locally 2%. Best around qtz-carb veins.
Mostly dissem, commonly in xylline blebs, also in thin veinlets.

356.95 -376.9m:
1% pyrite (varies from minor to 2% - best in shale).
Dissem & minor veinlets.
Minor sp>gn-cp, dissem & in qtz-carb (+-chlorite) veinlets.
Minor cp on fracts in shale.

376.9 -380m:
3% pyrite, as ultra fi gr dissem, commonly bedded. (5-10% py 377.6 -377.9m, in fine semi-massive beds 1-3mm thick).

380 -389.5m:
1-2% dissem pyrite (varies).

389.5 -400m:
Minor to 1% dissem pyrite.

400 -404.5m:
1-2% fi gr dissem pyrite.

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

PROJECT: HIGH POINT, BULGOBAC HILL EL.

HOLE No. BHD 3

Graphic Scale 1:

Page 8 of 21

CORE RECOVERY

From m	~~Interval~~ To m	%	RQD
249.3	249.9	100	
249.9	252.9	98	
252.9	255.9	100	
255.9	257.0	109	
257.0	259.5	100	
259.5	262.6	100	
262.6	265.6	100	
265.6	268.7	100	
268.7	270.3	100	
270.3	272.0	100	
272.0	273.0	90	
273.0	275.0	105	
275.0	276.2	92	
276.2	278.0	94	
278.0	281.0	103	
281.0	284.0	100	
284.0	287.0	100	
287.0	290.0	100	
290.0	293.0	100	
293.0	296.0	100	
296.0	299.0	100	
299.0	302.0	100	
302.0	304.8	100	
304.8	305.9	100	
305.9	308.0	86	
308.0	310.2	95	
310.2	311.1	89	
311.1	314.0	97	

DESCRIPTION

From m | Interval m | (incl. LITHOLOGY, STRUCTURE & ALTERATION) | Depth | Graphic Lithology | Struct.

filled with films of greasy talc-carb(?) material).
Occ badly broken intervals, eg: 370.5 -375.05m; 407.25 -410m.
Fault 371m, 25o/LCA (same sense as bedding).
Possible fold axis at 374.5m, traced out by attitude of qtz-carb veins in highly-veined & brecciated zone 373.95 -375.05m, with strong brittle fault 375.05 -375.4m, 30o/LCA (same sense as bedding).
Strong fault 409 -409.6m, 30o/LCA, sense unknown.
Basal contact sharp, 40o/LCA, // bedding in basal part of shale. 230mm bed of mafic lava breccia in shale 100mm above basal contact. Breccia contains sericitic mafic lava clasts to 75mm, both amygdaloidal & non-amygdaloidal types, with 3-5% pyrite conc in breccia matrix.

<u>416.7 - 433.5m: CARBONATISED AMYGDALOIDAL MAFIC LAVA</u>
<u>Lithology:</u> Pale grey. Massive. Uniform. Fi-med gr.
Common calcite-filled amygdales, from 1 -20mm, often elongated at all angles but with most common attitude essent 90o/LCA.
Characterised by abund carb flecks & spots.
No porphyritic felds noted.
<u>Alteration:</u> Strongly carbonatised, with both pervasive carbonate & calcite (+_ qtz) in veins, veinlets, patches, amygdales & tectonic breccia-fill.
Occ veins to 40mm of grey 'cherty' silica with fi gr pyrite.
Weakly sericitised & v minor local chloritisation. Minor v local silif.
Minor films of greasy talc-carbonate(?) material on some fractures.
<u>Structure:</u> Largely unbroken. Extensive zones above 422m and in basal 1.2m, of net-vein fracturing and tectonic brecciation annealed by calcite-qtz. These zones at all angles but gen are at low angle to LCA.
Weak lineation in places, prob cleavage: Orientated core measurement @ 423m: (C) 64o/LCA @ 423m (dip 30o to 255oM). Amygdales here oriented 70o/LCA in opp sense to cleav.
Basal contact sharp & irreg, approx 20o/LCA, with sl brecciation of upper surface of shale below & thin chilled margin on lava.

<u>Sampling:</u> 032733: 424 -425m. A: Petrology. B: W.R.Geochem.

<u>433.5 - 440.8m: FELDSPATHIC SANDSTONE & SHALE</u>
<u>Lithology:</u> Dark grey.
Mainly fine feldspar-rich sandstone, with lesser black carbonaceous shale.
Sst gen fairly massive, with grains all <1mm in partly-carbonaceous matrix that also contains minor sericitic/chloritic volcanic material.
Sst contains tiny frags of black shale.
<u>Alteration:</u> Mod-strongly pervasively carbonatised. Relatively few calcite veinlets.
<u>Structure:</u> Fine regular bedding in places: 68o/LCA @ 439m; 65o/LCA @ 439.7m (with fining uphole).
Unbroken except for mild fracturing in uppermost 1.5m, with these fracts centered on shear @ 433.8m: 40o/LCA (same sense as bedding). Shear & fracts

MINERALISATION

404.5 -407.5m:
Minor dissem pyrite.

407.5 - 416.7m:
1-2% pyrite, fi gr dissem.

416.7 -420.5m:
3% fi gr dissem pyrite, dec with depth. Some py in qtz-calcite veins & rimming frags in breccia zones.
Trace sp in qtz-calcite veins.
420.5 -423m:
2% dissem pyrite, dec with depth. Trace dissem sp.
423 -429m:
1-2% dissem po & py, with trace sp & rare unidentified black mineral (not magnetite).
429 -432.2m:
Minor dissem py.
432.2 -433.5m:
2% dissem py.

432.2 -440.8m:
1% pyrite - mostly as fi gr dissem. Varies from minor to 2% (gen inc towards base).
Minor dissem sp in 100mm sst band at 439.7m.
Trace sp in calcite veinlets in basal 1.2m.

CODES

LITHO | STRUCT | ALTN | MIN

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1 :

Page 9 of 21

CORE RECOVERY

From m	To Interval m	%	RQD	From m	Interval m
314·0	317·0	100			
317·0	319·8	96			
319·8	322·9	100			
322·9	326·0	97			
326·0	329·0	100			
329·0	332·0	100			
332·0	335·0	100			
335·0	338·0	100			
338·0	341·0	100			
341·0	344·0	100			
344·0	347·0	100			
347·0	350·0	100			
350·0	353·0	100			
353·0	356·0	100			
356·0	359·0	100			
359·0	362·0	100			
362·0	365·0	97			
365·0	367·3	93			
367·3	370·3	100			
370·3	371·0	93			
371·0	371·8	87			
371·8	372·3	100			
372·3	373·7	86			
373·7	376·8	100			
376·8	379·9	100			
379·9	383·0	97			
383·0	386·0	100			
386·0	389·0	100			

DESCRIPTION

(incl. LITHOLOGY, STRUCTURE & ALTERATION) | Depth | Graphic Lithology | Struct.

contain minor talc-carb(?) material.
Basal contact sharp, 65o/LCA (// bedding in shale adjacent to contact).

<u>440.8 -447.75m: MASSIVE MAFIC VOLCANIC (DOLERITE DYKE?)</u>
<u>Lithology:</u> Greenish-grey. Med gr, even-grained. Massive & uniform.
Ophitic-textured, with abund fine mineral with sl fibrous habit.
Small equant feldspar grains visible in places.
Characteristic abund very fine carbonate flecking throughout.
Small silif (or baked?) irreg vein-like inclusions of pyritic black shale above 443.5m.
<u>Alteration:</u> Very strongly carbonatised. Weak-mod chlorite alteration.
Abund highly irreg veins & veinlets of calcite(+-qtz) throughout.
<u>Structure:</u> Gen unbroken except for series of small shears 443.5 -446m, centered on fault 20o/LCA @ 445.7m.
Basal contact sharp & very irreg. Shale below is silif or baked for 10mm adjacent to contact.

<u>447.75 - 453.0m: BLACK SHALE</u>
<u>Lithology:</u> Carbonaceous black shale. Gen non-calcareous, except for zone 450 -451.75m, where shale is calcareous & contains numerous thin beds of limestone.
250mm intercalation of mafic volc (similar in appearance to unit above). 451.75 -452m, with sharp but irreg contacts.
<u>Alteration:</u> Mafic volc intercalation very strongly carbonatised. Common veins & veinlets of calcite (+-qtz), mostly almost // LCA, some of net-vein tectonic breccia-fill type
<u>Structure:</u> Essent unbroken.
Finely bedded, with some variation in attitude (esp above 449.25m where minor v open folding evident - bedding here gen almost //LCA).
At 449.5m, bedding 68o/LCA with cleavage 15o/LCA in opp sense.
Orientated core @ 452.4m (bedding): 60o/LCA (dip 13o to 125oM).
Basal contact highly irreg - two rock types are mixed together from 452.9 -453.15m, with some brecciation of shale at base.

<u>453.0 - 461.7m: CLEAVED, SERICITISED & PYRITIC FINE MAFIC BRECCIA</u>
<u>Lithology:</u> Khaki-green.
Strongly altered & mineralized zone at top of main mafic sequence (see units below). Zone has strong shearing or cleavage fabric & may be a major ductile fault.
Alteration & shearing fabric strongest 454.6 -459.5m.
Unit appears to be a mafic lava clastic that has been further brecciated tectonically.
Rock comprises angular to sub-angular, sometimes irreg, frags & clasts of mafic lava. Lava is gen amygdaloidal, except in uppermost 1m where lava is finely feldspar-phyric.

MINERALISATION

440.8 -447.75m:
Minor dissem pyrite.

447.75 - 453.0m:
2% dissem pyrite - v fi gr in shale, coarser xylline blebs in calcite veinlets.
Sp>gn in calcite veinlets, overall minor but more than in units above.

453.0 - 461.7m:
5 -10% pyrite.
Fi gr dissem, both in matrix & in some clasts. Occ clasts almost totally replaced by py. Others have massive py rims up to 2mm thick.
Trace sp-gn in calcite veinlets.
Py dec to 2% at base.

CODES

LITHO	STRUCT	ALTN	MIN

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD3

PROJECT HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1 :

Page 10 of 21

CORE RECOVERY

From m	To ~~Interval~~ m	%	RQD
389·0	392·0	100	
392·0	393·7	94	
393·7	395·0	100	
395·0	398·0	100	
398·0	401·0	100	
401·0	403·9	100	
403·9	407·0	100	
407·0	412·2	94	
412·2	415·2	107	
415·2	418·2	100	
418·2	419·0	100	
419·0	422·0	100	
422·0	425·0	100	
425·0	428·0	100	
428·0	431·0	100	
431·0	434·0	100	
434·0	437·0	100	
437·0	440·0	100	
440·0	443·0	100	
443·0	446·0	100	
446·0	449·0	100	
449·0	452·0	100	
452·0	455·0	100	
455·0	458·0	100	
458·0	461·0	100	
461·0	464·0	100	
464·0	467·0	100	
467·0	470·0	87	

DESCRIPTION

(incl. LITHOLOGY, STRUCTURE & ALTERATION)

Overall, adjacent clasts are similar but not identical, which indicates they have been transported relative to each other.
Gradual inc in clast size with depth: above approx 459m clasts av 5 -10mm with max size 30mm, below 459m clasts up to 100mm.
Clasts occur in sericitic matrix with fine fragmental texture.
Alteration: Mod-strong sericitization. Patchy carbonatisation - locally strong. Only minor calcite-qtz veining.
V minor local patchy silif. Rare trace fuchsite alt.
Structure: Shearing (cleavage) @ 454.7m: 18o/LCA (dips 88o to 280oM).
Cleavage @ 457.5m: 38o/LCA.
Largely unbroken. Mild breaking around shears @ 456.55 & 457.45m (both 40o/LCA). Shears & adjacent fracts faced with greasy talc-carb(?) material.
Basal contact rather arbitrary - gradual die-out of alteration & pyritization.

Sampling: 032734 -032739 (Assay) 453 -460.7m.

461.7 - 498.3m: AMYGDALOIDAL MAFIC LAVA BRECCIA

Lithology: Grey-green.
Clasts of amygdaloidal mafic lava in tuffaceous matrix containing abund small angular frags of the lava & prob mafic glass.
Lava contains abund pale green ferromags & is occ finely feldspar-phyric.
Clasts vary from angular (common) to sub-rounded (uncommon), some have irreg shapes & others have delicate angular edges.
Av size of clasts approx 20mm, max +150mm, with clasts coarsest below 478m.
All clasts appear derived from the same basic lava type, but varying textural & alteration character in adjacent clasts indicates they have undergone some (prob v minor) transport. In other places brecciation is pepperitic & in situ.
Alteration: Mod-strong carbonatisation. Calcite veins, veinlets & patches scattered throughout. Most amygdales are calcite (others chlorite and/or sericite).
Mod chlorite>sericite alteration throughout.
Some lava clasts are silif, most notably in zone 485.25 - 498m, where creamy bleached & intensely silif amygdaloidal mafic lava clasts are most abund clast type. Rims of these clasts are affected by chloritisation of breccia matrix, indicating bleaching/silif pre-dates the chloritisation. Matrix of breccia gen not silif.
Structure: No visible cleavage or preferred orientation to clasts.
Mostly unbroken, except for mod to bad breaking in faulted &fractured zone 467 -477m, centered on strong faults each with 200mm chloritic shattered zones: @ 469.7m (10o/LCA), 471.4m (15o/LCA) & 472.5m (25o/LCA). Many of the fracts in this zone faced with greasy talc-carb(?) material.
Basal contact rather arbitrary - a very gradational merging into more-solid lava below.

Sampling: 032740: A -(Petrology), 465m; B -(W.R.Geochem), 464 -465m.
032741 - 745: (Assay), 466.5 - 474.0m.
032746: A -(Petrology), 488m; B -(W.R.Geochem), 487 -488m.

MINERALISATION

461.7 - 466.5m:
1% pyrite, dissem but gen conc in certain clasts.

466.5 - 467.2m:
5-10% pyrite, dissem.

467.2 - 470.0m:
2% pyrite, dissem & gen conc in certain clasts.

470.0 - 474.0m:
2-3% pyrite, trace cp.
Dissem throughout, but conc in certain altered clasts.

474.0 - 483.0m:
1% dissem pyrite.

483.0 - 498.3m:
V minor dissem pyrite.
Rare dissem cp & sp.

CODES

LITHO	STRUCT	ALTN	MIN

HOLE No. BHD 3

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

PROJECT: HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1:

Page 11 of 21

CORE RECOVERY

From m	To Interval m	%	RQD
470·0	473·0	103	
473·0	476·0	103	
476·0	479·0	97	
479·0	482·0	100	
482·0	485·0	100	
485·0	488·0	98	
488·0	491·0	100	
491·0	494·0	103	
494·0	497·0	100	
497·0	500·0	100	
500·0	503·0	97	
503·0	506·0	100	
506·0	509·0	97	
509·0	512·0	103	
512·0	515·0	103	
515·0	518·0	97	
518·0	521·0	100	
521·0	524·0	97	
524·0	527·0	100	
527·0	530·0	100	
530·0	533·0	100	
533·0	536·0	97	
536·0	539·0	100	
539·0	542·0	103	
542·0	545·0	80	
545·0	548·0	100	
548·0	551·0	100	
551·0	554·0	100	

DESCRIPTION

From m | Interval m | (incl. LITHOLOGY, STRUCTURE & ALTERATION) | Depth | Graphic Lithology | Struct.

<u>498.3 - 580m: BRECCIATED AMYGDALOIDAL MAFIC LAVA</u>

<u>Lithology:</u> Greyish green.
Blotchy, variably textured, coloured & altered sequence of amygdaloidal mafic lava identical to lava forming clasts in unit above. Appears to be an autobrecciated lava with occ zones of minimally-transported breccia as in unit above.
Lava contains small lime green epidotised ferromags, minor poss small feldspar laths, and abund calcite or chlorite amygdales.
Most amygdales are very fine (av 1mm or less), but some amygdales above 535m are up to 10mm in size.
Rock comprises a patchwork of highly-amygdaloidal lava (commonly carbonate -silica alt & sl bleached), and more chloritic & epidotised less-amygdaloidal lava.
These 'patches' range from angular frags <10mm up to zones of several metres.
Where rock is finely brecciated, the highly- amygdaloidal lava occurs as frags in 'matrix' of chloritic less-amygdaloidal lava type.

<u>Alteration:</u> Strongly carbonatised throughout, becoming very strong below about 540m.
Abund calcite (+-qtz) veins, veinlets & breccia-fill, esp 543 -561m, & 569 -577m.
Other alteration is patchy and controlled by the brecciation:
Mod to locally strong chlorite-epidote alteration and lesser silif.
Chlorite-epidote alt inc below approx 540m, & silif largely absent 541 -572m.
Chloritisation strong around fault @ 511-513.5m.
Silif tends to pick out certain amygdaloidal lava blocks or clasts, but also occurs in diffuse net vein-like zones (sometimes with assoc pyrite).
Below 525m minor pink to red albitisation & hematisation occurs in patches, often in assoc with silif or as pink/red colouration of calcite veinlets (latter very conspicuous 548 -558m).

<u>Structure:</u> Gen unbroken. Minor broken zones due to shears & fracts at low angle to LCA.
508m: shear 10o/LCA.
512.1 -513.1m: Badly broken zone due to fault & fract set 15o/LCA.
528.5 -530m: mod broken due to fracts 30 -40o/LCA in opposing senses.
541m: shear 15o/LCA.
568.2 -569.2m: strong ductile fault 10-35o/LCA, with mod broken zone 568.5 -569m. Texture of lava breccia is lineated & disturbed 567 -573m and orientated core at 572m indicates fault dips to west.
Feldspar-phyric lava clasts of unit below appear @ 574.5m & inc rapidly in abund, while amygdaloidal lava clasts dec. Amygdaloidal lava clasts in this basal section are gen silif. Basal 'contact' placed at last appearance of amygdaloidal lava clasts.

<u>Sampling:</u> 032747: (A)-Petrology @ 535m; (B)-W.R.Geochem @ 534 -535m

MINERALISATION

498.3 - 580m:
Minor pyrite, dissem & occ veinlets, patchy & dec with depth - trace only in basal 10-20m.
Trace cp - some in amygdales.
V rare small grains of sp in upper 10-15m of unit.

CODES

LITHO | STRUCT | ALTN | MIN

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

PROJECT: HIGH POINT, BULGOBAC HILL EL

HOLE No. BHD 3

Graphic Scale 1:

Page 12 of 21

CORE RECOVERY

From m	To m	%	RQD	From m	Interval m
554·0	557·0	98			
557·0	560·0	100			
560·0	563·0	97			
563·0	566·0	103			
566·0	569·0	100			
569·0	572·0	98			
572·0	575·0	100			
575·0	578·0	100			
578·0	581·0	97			
581·0	584·0	97			
584·0	587·0	97			
587·0	590·0	100			
590·0	593·0	100			
593·0	596·0	100			
596·0	599·0	100			
599·0	602·0	97			
602·0	605·0	107			
605·0	607·0	80			
607·0	609·9	83			
609·9	611·0	100			
611·0	614·0	100			
614·0	617·0	100			
617·0	620·0	100			
620·0	623·0	100			
623·0	626·0	100			
626·0	629·0	100			
629·0	632·0	100			
632·0	635·0	100			

DESCRIPTION

(incl. LITHOLOGY, STRUCTURE & ALTERATION)

580 - 587.85m: PARTLY-BRECCIATED FELDSPAR-PHYRIC MAFIC LAVA

Lithology: Dark greyish green. Massive.
Characterised by abund small white feldspar phenos, av 1mm. Lesser small ferromag laths.
In places lava is very finely amygadaloidal, with these gen elongate & filled with chlorite (lesser calcite-filled).
Alteration: Strongly carbonatised. Mod chlorite>epidote alt.
Common thin regular calcite (+-qtz & epidote) veins throughout.
V weak patchy silif, mainly above 583m.
Structure: Unbroken.
Gradational change at base.

Sampling: 032748: (A)-Petrology @ 586m; (B)-W.R.Geochem @ 585 -586m

587.85 - 646.4m: PARTLY-PEPPERITIC FELDSPAR-PHYRIC MAFIC (TO DACITIC?) LAVA BRECCIA

Lithology: Dark grey-green. Fi-med gr.
Above base of faulted zone @ 611m, breccia is obvious pepperite with angular frags (some with delicate edges) of same finely feldspar-phyric mafic lava as in unit above, in v fi gr tuffaceous matrix that is sometimes siliceous. In places matrix has net-vein form, and occ 'veins' of cherty tuffaceous silica extend into lava blocks. Lava contains v small chloritic amygdales in places. Occ frags with larger qtz amygdales occur in this zone, & minor qtz grains to 2-3mm (loose amygdales?) first appear within faulted section at about 605m.
Below 611m, texture of breccia is indistinct due to inc alt but appears basically similar to upper part of unit except matrix is not as fi gr. However, composition of many lava frags in this lower section of the unit appears more andesitic to possibly dacitic, with sl coarser feldspars (commonly albitised and/or silif), more common qtz-amygdaloidal frags & loose qtz grains, and rare flow-banded zones in lava: @ 630m (40o/LCA) & 637.7m (57o/LCA), latter contains large ovoid qtz amygdale.
Throughout breccia, lava frags range from 1-2mm up to +500mm.
Alteration: Pervasive mod-strong chlorite >>sericite alt, inc below 616m where it partly detextures the rock. Sericitisation is strongest in faulted zone 600 -616m, and at base of unit.
Mod carbonatisation (less than in units above), with scattered veins, veinlets & v minor breccia-fill of calcite (+-qtz & chlorite). Most larger veins almost //LCA (some pink calcite in these).
Patchy silica (+-albite) alt, v weak at top of unit inc gradually with depth.
Below 616m many feldspars are silif and/or albitised.
Strong sericite-bleaching+-silica alt with minor fuchsite, around fault @ 609 -611m.
Structure: Gen no cleavage visible, but weak lineation @ 644.3m: 42o/LCA - prob cleavage.
Gen largely unbroken (occ fracts at low angle to LCA).
However, mod-badly broken 601 -603m, 606 -608m, & 610 -611m, around strong brittle faults as follows:

Depth	Graphic Lithology	Graphic Struct.

MINERALISATION

580 - 587.85m:
Trace dissem pyrite & cp.

587.85 - 600m:
Minor to 1% fine dissem pyrite (1-2% py 595 -597m).
V minor dissem leucoxene.

600 - 646.4m:
Minor dissem pyrite.

CODES

LITHO	STRUCT	ALTN	MIN

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT: HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1:

Page 13 of 21

CORE RECOVERY

From m	To Interval m	%	RQD
635·0	638·0	100	
638·0	641·0	100	
641·0	644·0	100	
644·0	647·0	100	
647·0	650·0	98	
650·0	653·0	98	
653·0	656·0	100	
656·0	659·0	100	
659·0	662·0	100	
662·0	665·0	100	
665·0	668·0	100	
668·0	671·0	100	
671·0	674·0	100	
674·0	677·0	100	
677·0	680·0	100	
680·0	683·0	100	
683·0	686·0	100	
686·0	689·0	100	
689·0	692·0	100	
692·0	695·0	100	
695·0	698·0	100	
698·0	701·0	100	
701·0	704·0	100	
704·0	707·0	100	
707·0	710·0	100	
710·0	713·0	98	
713·0	716·0	100	
716·0	719·0	100	

DESCRIPTION

From m | Interval m | (incl. LITHOLOGY, STRUCTURE & ALTERATION) | Depth | Graphic Lithology | Struct.

10o/LCA @ 601 -602.65m;
5o/LCA @ 605.8 -607.8m (v strong);
5o/LCA @ 610.1 -611.05m (v strong, with assoc minor fuchsite).
These faults prob all part of single major structure almost //LCA 601 -611m.
641 -645m core sl broken by series of small shears & fracts //LCA - prob one single minor structure.
Fairly abrupt change in breccia type at base - no clear 'contact'.

Sampling:
032750: (Petrology) @ 597.5m (qtz-amygdaloidal lava clast - dacitic?).
032751: (Petrology) @ 637.75m (flow-banded zone in lava - dacitic?).

646.4 - 666.5m: STRONGLY ALTERED DACITIC TO ANDESITIC REWORKED VOLCANIC BRECCIA

Lithology: Dark grey-green with pink patches at top, cream below 658.5m. Hard to v hard.
Silicified & bleached probable epiclastic, with blotchy appearance due to strong alt overprint of primary breccia texture. Primary texture is heavily obscured by alteration and deformation, rendering rock difficult to identify.
Unit characterised by:
* Variable (poss polymict) nature of adjacent clasts (indicating clasts have undergone some transport).
* Silicified & albitised orange-pink feldspar-porphyritic lava clasts (prob dacite).
* Larger & much more abund feldspars than in unit above.
* Apparent 'washing' (depletion of fines) in parts of the breccia matrix.

Unit comprises angular to subrounded & diffuse, frags and clasts from 2mm to 100mm, of: very common apparent dacitic lava (both coarsely feld -porphyritic & fi gr non-porphyritic types); lesser finely feldspar-phyric mafic lava similar to that in unit above; qtz-amygdaloidal (dacitic?) lavas; & (vein?) qtz.
Clasts coarsest in middle sections of unit & finest towards base.
Clasts occur in silif or chloritised matrix containing felds. (albitised &/or silif), to 3mm, av 1-2mm, & v minor qtz grains same size (loose amygdales?).
In places (eg: 650.5m), matrix contains abund densely-packed loose feld xyl grains & small lithics, and is almost certainly epiclastic.
From 650.8 - 652.2m breccia matrix contains blobs of deformed grey shaley chert.
Above 650m there are occ zones of mafic breccia identical to unit above.
Alteration: Strong silica-albite alt, with silicification, bleaching & sericitisation of both clasts & matrix becoming v strong 658.5 -665m.
Mod chlorite>sericite alt above 658.5m, with chlor dec with depth.
Weak carbonatisation, strongest towards both contacts. V little veining.
Structure: Unbroken.
In places rock is lineated & deformed by flow-like fabric (poss 1o with cleavage overprint?):
10o/LCA @ 651.4 -652.2m; 30o/LCA @ 653m; 20o/LCA @ 658m;
Definite cleavage: 42o/LCA @ 650.6m; 10o/LCA @ 659.5m; 10o/LCA @ 663m.
Basal 'contact' not a lithological change. Put at base of v strongly silif & bleached zone.

MINERALISATION

646.4 - 666.5m:
V minor dissem pyrite.
Rare trace cp & gn.

CODES

LITHO | STRUCT | ALTN | MIN

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT: HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1:

Page 14 **of** 21

CORE RECOVERY

From m	To Interval m	%	RQD
719·0	722·0	100	
722·0	725·0	100	
725·0	728·0	100	
728·0	731·0	102	
731·0	734·0	98	
734·0	737·0	100	
737·0	740·0	100	
740·0	743·0	100	
743·0	746·0	100	
746·0	749·0	100	
749·0	752·0	100	
752·0	755·0	100	
755·0	758·0	100	
758·0	760·6	100	
760·6	763·7	100	
763·7	766·8	100	
766·8	769·9	97	
769·9	773·0	94	
773·0	776·0	103	
776·0	779·0	100	
779·0	782·0	103	
782·0	784·4	96	
E.O.	H.		

DESCRIPTION

From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Graphic Struct.	MINERALISATION

CODES

LITHO	STRUCT	ALTN	MIN

<u>Sampling:</u>
032749: (A: - Petrology, @ 650.5m); (B: - W.R.Geochem, @ 650.5 -651.4m).
032752: (Petrology), @ 653.6m (dacitic lava clast?).
032753: (A: - Petrology, @ 659m); (B: - W.R.Geochem, @ 659 -660m).

<u>666.5 - 695.4m: FINE POLYMICT EPICLASTIC? VOLCANIC BRECCIA</u>

<u>Lithology:</u> Greyish-green. Hard.
A debris-flow deposit of probable epiclastic origin given its conspicuously -polymict nature, although no layering or obvious reworking.
Lithologically appears similar to unit above, but 1o texture is more distinct due to reduced alteration and deformation.
Rock comprises angular to (less commonly) subrounded altered variable volcanic clasts to 75mm, av approx 5 -20mm, in altered tuffaceous matrix with sandy (feld) xyl-lithic component. Clast size dec towards base.
Sl rounding of clasts appears due to clastic transport.
Clasts & matrix are feldspar-phyric, with felds av 1-2mm. Gen matrix is more feld xyl-rich & chloritic (poss andesitic), than the clasts which incl much *sparsely* feldspar-porphyritic dacite.
Dacite clasts highly silif (+-alb), pale apricot, cream or khaki-grey, gen sparsely feldspar-porph but also fi gr & non-porph. Some clasts have radial cracks, or are cut through by thin regular comb-structured qtz-carb veinlets *which do not extend beyond clast margins.*
Rarely, the dacite exhibits flow-banding.
Other clasts are mainly chloritic abund feld-porph lava (prob andesite).
Similar material makes up much of the matrix & variable alt of this forms 'pseudoclasts', similar in appearance to the *chloritic lava clasts.*
Rare clasts of qtz or calcite-amygdaloidal lavas.
670.4 -670.9m: Fi-med gr chloritised mafic dyke with calcite-filled amygdales & v irreg contacts almost //LCA.

<u>Alteration:</u> Mod-strong silif (+-albite) alt of both clasts & matrix above 674m, dec gradually with depth to weak at base.
Mod-strongly carbonatised (sl patchy & weakest at top of unit).
Mod chlorite>sericite altsmall fault //LCA 689.9 -691m.
Basal contact fairly abrupt but gradational. Flow lineation in breccia just above contact is 35o/LCA.

666.5 - 695.4m:
Minor dissem pyrite (more than in unit above).
V minor dissem leucoxene.

<u>Sampling:</u>
032754: (A: -Petrology @ 687.6m, of flow-banded poss dacite lava clast);
(B: -W.R.Geochem @ 687 -688m).

<u>695.4 - 709.8m: FELDSPAR-PHYRIC (ANDESITIC?) LAVA</u>

<u>Lithology:</u> Grey-green.
Very difficult to identify rock type due to alteration & lack of distinguishing features.
Massive, med gr, feldspar-phyric volc with abund white or pale pink feldspar laths (av 1mm) in altered groundmass. Occ v small irreg qtz patches & grains (to 3-5mm) - these prob amygdales.

695.4 - 709.8m:
V minor dissem pyrite.
V minor dissem leucoxene
(leucoxenised mafics?).

PASMINCO EXPLORATIO.
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1 :

Page 15 of 21

CORE RECOVERY				DESCRIPTION							MINERALISATION	CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Struct.			LITHO	STRUCT	ALTN	MIN

Massive nature, relatively even texture, & poss amygdales, suggest rock is lava.
Variations in alteration pattern may indicate lava is brecciated in places.
Rare small (to 12mm) frags of fi gr silif & albitised dacite in uppermost 1.2m & lowermost 0.5m.
Alteration: Mod pervasive carbonate-chlorite-sericite alteration, with weak patchy silica-albite alt. Carbonatisation becoming strong at base.
Minor qtz-carb veins at all angles.
Structure: Unbroken except for mild breaking around small sericitic shears 10-15o/LCA @ 703.3 -704m, & 707.2 -707.6m.
Basal contact sharp, 15o/LCA.

Sampling: 032755: (A: Petrology @ 699m); (B: W.R.Geochem @ 699-700m).

709.8 - 729.1m: DEFORMED & ALTERED FELDSPAR-PHYRIC VOLCANIC (PROBABLY A POLYMICT VOLCANIC BRECCIA)

Lithology: Grey-green, with creamy patches. Hard.
Original rock type almost impossible to identify due to alt & deformation producing a blotchy 'pseudoclastic' texture.
Unit largely comprises an alt & lineated volc rock containing abund feld laths to 2mm - prob either coherent andesite lava or sizeable blocks & clasts of same.
But unit also contains minor identifiable angular frags (to approx 25mm) of silica-albite alt fi gr felsic lava (prob dacite).
These features suggest unit is a polymict volc (lava) breccia.
Alteration: Mod-strong chlorite-silica-carb-sericite alt, often in small patches - poss overgrowths on original clasts.
Silif is patchy and strongest in the creamy ble zones. Silif sometimes accompanied by trace albitisation.
Mod carbonatised, except for basal 1.3m which is v strongly carbonatised & characterised by unusual purplish-brown colouration.
Below 720m carb incl dolomite(?) as well as the ubiquitous calcite. Minor qtz -carb veins & veinlets.
Structure: Mod lineated throughout (poss a primary flow feature overprinted by a weak cleavage): 30o/LCA @ 711m; 20o/LCA @ 715.5m; 35o/LCA @ 725.5m.
Unbroken except for mild fracturing 20o/LCA @ 715.8 -716.8m.
Basal contact irreg & indistinct, 728.95 -729.15m (approx 20o/LCA).

Mineralisation: 709.8 - 729.1m:
V minor dissem pyrite.
V minor leucoxene.

729.1 - 730.8m: MAFIC DYKE

Lithology: Grey-green.
Massive, med gr, with abund small (<1mm) dark green & light green ferromag laths in chloritic groundmass.
Finer-gr & non-amygdaloidal upper & lower selvages up to 300mm wide.
Conspicuous ovoid calcite amygdales to 15mm concentrated in central part of dyke, elongated 50o/LCA.
Alteration: V strongly carbonatised. Mod chloritised.
Numerous calcite veinlets.
Structure: Basal contact sharp but irreg, extends from 730.55 -730.85m.

Mineralisation: 729.1 - 730.8m:
V minor pyrite.

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD3

PROJECT : HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1:

Page 16 of 21

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Graphic Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN

<u>730.8 - 747.0m: DACITIC VOLCANIC BRECCIA</u>

<u>Lithology:</u> Greenish-grey with pink tinge, & fine blotchy appearance.
Poss similar to unit above 729m. However, 1o texture heavily modified by alteration & rock v difficult to identify.
Scattered sparsely feld-phyric, pink (silica-alb alt), dacite lava frags occur in poss more-andesitic chloritic volcanic material containing abund felds to 2mm & occ small lithic grains.
Similar feld-porph material also occurs occ as frags. Rare fi gr grey silic frags - poss tuffaceous volcs.
Frags are gen angular, often diffuse, av <30mm, up to 150mm max & coarsest below 742m.
True frags are vastly out-numbered by blotchy 'pseudoclasts' of alt material, poss overgrowths on smaller frags.
732.8 - 733.35m: Irreg mafic dyke almost //LCA, of similar composition to unit above: fi-med gr & chlor-carb alt.

<u>Alteration:</u> Mod-strong carb-chlorite-silica-albite alt, often as small patches and as diffuse overgrowths on frags, commonly producing 'pseudoclastic' texture.
Carb alt strong above 735m, mod below this. Chlor conc above 738m.
Silif (+-alb) patchy & strongest in dacite frags & in blotchy overgrowths on these.

<u>Structure:</u> V weak lineation - poss cleavage (lineation nowhere near as strong as in unit above 729m). 50o/LCA @ 734m.
At 742.9m: 1o(?) clast orientation, 55o/LCA.
Unbroken except for mild fracturing at basal contact.
Calcite-cemented thin fault breccia zone //LCA, 738.3 -741.4m.
At base, a sericitised & brecciated zone at top boundary of mafic dyke - no clear contact evident.

<u>Sampling:</u>
032756: (A - Petrology @ 742.7m); (B - W.R.Geochem 742.5 -743.5m).

MINERALISATION:
730.8 - 747.0m:
V minor pyrite.

<u>747.0 - 752.3m: MAFIC DYKE</u>

<u>Lithology:</u> Dark grey-green. Fi-med gr.
Identical to dyke @ 730m.
Abund calcite amygdales to 10mm (av 1-2mm) in chloritic groundmass containing abund small ferromag laths.
Minor small feldspar phenos and occ small amygdales of feldspar. Occ qtz amygdales.
Upper & lower dyke margins are non-amygdaloidal and upper margin is finer-gr than rest of dyke.

<u>Alteration:</u> V strongly carbonatised. Mod-strongly chloritised, with trace sericite & epidote.
Common veins & veinlets of calcite (rarely + qtz). Rarely, calcite veinlets contain minor magnetite - dyke is otherwise non-magnetic.

<u>Structure:</u> Small shear 15o/LCA @ 747.6m, otherwise unbroken.
Uppermost 0.6m is highly brecciated with calcite cement (an old brittle fault apparently at low angle to LCA).
Basal 0.5m lineated (apparently laminar flow shear) approx 50o/LCA, // to basal contact (sharp but sl indistinct).

MINERALISATION:
747.0 - 752.3m:
Minor dissem pyrite.
Trace leucoxene.

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT : HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1:

Page 17 of 21

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Graphic Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						752.3 - 754.05m: DACITIC BRECCIA Lithology: Greenish-grey with pink blotches. Appears the same as unit above 747m except sl finer, with angular sparsely feldspar-phyric silica-albite altered dacitic lava frags av <15mm, to 50mm max. 1o texture again indistinct due to alt. Frags and similar-sized *silica-albite blotches (poss alt 'pseudoclasts'* overgrowing original frags), are scattered through sandy-textured qtz-chlorite matrix containing feld xyls and lithic grains - these most clearly visible in basal 0.2m. Alteration: Mod carbonate & chlorite alt, with patchy silif(+-albite). Some frags are sericitised. Structure: Unbroken. Basal contact sharp, 50o -70o/LCA.				752.3 -754.05m: V minor pyrite.				
						754.05 - 755.15m: MAFIC DYKE Lithology: Dark green. Med gr. Identical to dykes above, with abund ferromags in chloritic groundmass. Calcite amygdales only in central part of dyke, which has finer-gr non -amygdaloidal selvages up to 0.3m wide. Alteration: Mod-strong carbonate-chlorite alt. Some calcite(+-qtz) veinlets. Structure: Unbroken. Basal contact sharp but variable: 10 -30o/LCA.				754.05 - 755.15m: Minor dissem pyrite.				
						755.15 - 757.7m: HIGHLY ALTERED & DETEXTURED VOLCANIC -PROBABLE DACITIC BRECCIA Lithology: Creamy-pink, except for top 0.6m which is grey-green. Hard. Vague blotchy appearance. A highly altered, deformed & detextured volc, almost unidentifiable. The lesser-alt upper part of unit appears similar to breccia above 747m. Here, a few silica-alb alt dacitic frags to 30mm occur in a feldspar-bearing matrix. Elsewhere the unit comprises occ qtz frags to 10mm and shadowy feldspars, in cleaved silica-albite-sericite-carbonate rock. Alteration: Strong ble-albite-silica-sericite-carb alt, with mod chlorite alt in top 0.6m. Minor qtz-carb veins at high angle to LCA. Structure: Unbroken. Mod cleaved, 20o/LCA. Basal contact indistinct & sl arbitrary.				755.15 - 784.4m: Minor dissem pyrite. Minor but ubiquitous small grains of leucoxene.				
						757.7 - 784.4m: PEPPERITIC FELDSPAR-PHYRIC LAVA BRECCIA Lithology: Grey-green; creamy-pink in places above 765m. A volc breccia, characterised by highly-angular frags (av <30mm, max 60mm), of feld-phyric lava (abund porph feld laths av 1-2mm), in fi gr siliceous tuffaceous breccia matrix containing numerous tiny frags of non-porph lava material (glass?).								

PASMINCO EXPLORATION
DIAMOND DRILL CORE LOG

HOLE No. BHD 3

PROJECT: HIGH POINT, BULGOBAC HILL EL

Graphic Scale 1:

Page 18 **of** 21

CORE RECOVERY				DESCRIPTION							CODES			
From m	Interval m	%	RQD	From m	Interval m	(incl. LITHOLOGY, STRUCTURE & ALTERATION)	Depth	Graphic Lithology	Graphic Struct.	MINERALISATION	LITHO	STRUCT	ALTN	MIN
						Breccia appears to have formed by fragmentation of an andesitic (to dacitic?) lava - prob during quenching by cold water. Most rock above 762m is detextured by major fault & is unidentifiable. Alteration: Mod chlorite>sericite alt, with patchy silif - gen affects matrix but in many places lava frags are also silif. Trace alb with silif. Strong sericite-ble-silif-albite alt above 765m assoc with major fault. *Patchy carbonatisation - very little around faulted zone in upper part of unit.* Scattered qtz-carb veins & veinlets, gen conc around structures. Minor magnetite in carb vein @ 778.8m, otherwise unit is non-magnetic. Structure: Regular flow-banding in places in intervals 769.4 -770.75m (50o/LCA), and 783 -783.5m (40o/LCA). Major brittle fault 5-10o/LCA 759.65 -760.6m, with assoc ble-sericite-silica -alb alt, carb-chlor filled fracts, detexturing & cleaving of adjacent volc (cleavage 20o/LCA @ 765m). Badly broken in fault zone, with some pug. Sl broken in places elsewhere (mainly above 763.6m & 773-776m), by sericitic fracts & small shears assoc with the major structure. Sampling: *032757: (A - Petrology @ 770.35m);* (B - W.R.Geochem @ 770 -771m). END OF HOLE								

PASMINCO EXPLORATION
DIAMOND DRILL CORE ASSAY DATA

HOLE No. BHD 3

PROJECT: HIGH POINT, BULGOBAC HILL EL

Page 19 of 21

SAMPLE						ASSAYS (ppm unless specified)									%							COMMENTS
Number	Type	From m	To m	Interval m	Recovered m	Cu	Pb	Zn	Ag	Au	As / Ba	Rb / Sr	V / Nb	Y / Zr	Al_2O_3 / SiO_2	TiO_2 / Fe_2O_3	MnO / Na_2O	CaO / K_2O	MgO / P_2O_5	LOI / SO_3	Cr	
032731B	SPLIT NQ	284.0	285.0	1.0		60	254	315	<0.5		18 / 210	8 / 280	140 / 7	20 / 140	15.49 / 55.3	0.50 / 6.24	0.13 / 6.33	3.93 / 0.20	4.72 / 0.201	5.42 / 1.59	140	
732B	" "	338.0	339.0	1.0		32	53	223	<0.5		3 / 1050	30 / 330	160 / 6	20 / 150	13.65 / 57.3	0.66 / 6.81	0.20 / 4.15	4.97 / 1.29	5.10 / 0.318	5.68 / 0.24	280	
733B	" "	424.0	425.0	1.0		64	9	222	<0.5		5 / 1900	20 / 510	120 / 3	18 / 100	11.45 / 50.6	0.33 / 6.87	0.28 / 3.20	11.14 / 0.94	7.25 / 0.127	6.46 / 1.37	780	
032734	SPLIT NQ	453.0	454.5	1.5		109	125	1740	0.8	0.008												
735	" "	454.5	456.0	1.5		114	629	1220	1.3	<0.008												
736	" "	456.0	457.5	1.5		121	240	560	1.0	<0.008												
737	" "	457.5	459.0	1.5		125	29	67	0.7	<0.008												
738	" "	459.0	460.5	1.5		136	26	57	<0.5	<0.008 <0.008												
739	" "	460.5	461.7	1.2		143	17	91	<0.5	<0.008												
032740B	SPLIT NQ	464.0	465.0	1.0		116	5	104	<0.5		6 / 250	35 / 580	260 / 6	20 / 140	16.93 / 49.9	0.66 / 6.79	0.12 / 4.83	5.09 / 0.89	6.15 / 0.360	6.13 / 1.84	110	
032741	" "	466.5	467.5	1.0		130	95	168	<0.5	0.008												
742	" "	467.5	469.0	1.5		110	40	133	<0.5	<0.008												
743	" "	469.0	470.5	1.5		39	<5	154	<0.5	<0.008												
744	" "	470.5	472.0	1.5		95	<5	108	<0.5	<0.008 <0.008												
745	" "	472.0	474.0	2.0		71	<5	142	<0.5	<0.008												
032746B	" "	487.0	488.0	1.0		118	72	285	<0.5		3 / 1650	35 / 510	250 / 5	20 / 130	15.21 / 53.4	0.58 / 7.39	0.16 / 4.06	5.97 / 1.75	5.57 / 0.347	5.58 / 0.39	210	
747B	" "	534.0	535.0	1.0		124	218	491	<0.5		5 / 160	5 / 420	170 / 7	20 / 120	9.79 / 45.0	0.47 / 6.56	0.30 / 3.16	17.16 / 0.18	5.96 / 0.630	10.02 / 0.33	660	
748B	" "	585.0	586.0	1.0		43	<5	153	<0.5		2 / 950	35 / 330	250 / <3	15 / 55	15.80 / 51.8	0.44 / 8.94	0.26 / 4.10	6.21 / 0.89	4.70 / 0.125	6.66 / 0.13	20	
749B	" "	650.5	651.4	0.9		12	<5	42	<0.5		25 / 470	85 / 120	6 / 9	35 / 190	4.66 / 65.8	0.38 / 4.64	0.18 / 4.09	2.24 / 2.11	1.52 / 0.093	3.96 / 0.58	10	
032753B	" "	659.0	660.0	1.0		17	<5	13	<0.5		<2 / 320	75 / 80	<5 / 11	30 / 200	13.39 / 68.7	0.41 / 2.26	0.26 / 4.66	2.86 / 1.90	0.90 / 0.103	4.17 / 0.19	5	
754B	" "	687.0	688.0	1.0		6	<5	25	<0.5		4 / 510	95 / 150	<5 / 12	35 / 190	13.53 / 67.0	0.37 / 4.08	0.21 / 3.88	3.57 / 2.07	0.91 / 0.091	4.39 / 0.17	5	
755	" "	699.0	700.0	1.0																		
756	" "	742.5	743.5	1.0																		
757	" "	770.0	771.0	1.0																		
Laboratory	ANALABS COBEE + PERTH			Analytical-Method		AAS	AAS	AAS	AAS	F/A	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	
Job-No. 0175, 0174		Date JANUARY 1992		Detection-Limit		5	5	5	0.5	0.008	2 / 10	5 / 5	5 / 3	5 / 5							5	

(111310-60-08526/27- ANALABS JOB Nº)

HOLE No. BHD 3

PASMINCO EXPLORATION
DIAMOND DRILL HOLE SUPPLEMENTARY DATA
MAGNETIC SUSCEPTIBILITY READINGS

PROJECT: HIGH POINT
BULGOBAC HILL EL

Page 20 of 21

PAGE 1

DDH No	From	To	Reading
BHD 3	3.5m		.05
	5.5		.06
	6.7		.11
	9.0		.04
	10.0		.04
	11.0		.04
	13.2		.05
	14.1		.05
	15.7		.04
	18.7		.05
	20.0		.03
	22.2		.04
	25.2		.06
	26.4		.32
	29.0		.05
	32.0		.06
	34.1		.10
	37.2		.01
	40.2		.08
	43.2		.08
	46.2		—
	49.3		.10
	50.1		.05
	52.6		.06
	53.8		.16
	56.7		.14
	59.7		.07
	62.0		.07
	64.5		.08
	65.9		.14
	68.0		.06
	68.4		.17
	68.9		.17
	70.1		.12
	71.2		.22
	72.0		.04
	74.8		.20
	77.0		.14

PAGE 2

DDH No	From	To	Reading
BHD 3	80.0		.13
	80.7		.11
	82.6		.09
	85.5		.13
	86.7		.13
	89.0		.37
	92.0		.10
	95.0		.09
	98.0		.13
	101.0		.08
	104.0		.13
	107.0		.09
	108.4		.08
	110.9		.10
	112.2		.11
	113.5		.11
	114.0		.12
	116.0		.13
	119.0		.12
	120.7		.10
	122.0		.11
	126.4		.08
	127.2		.18
	130.2		.04
	130.9		.10
	134.0		.11
	135.6		.08
	136.9		.09
	[illegible]		.14
	143.0		.11
	146.0		.32
	147.3		.13
	149.0		.08
	150.4		.12
	150.8		.12
	152.0		.11
	154.7		.11
	[illegible]		.11

PAGE 3

DDH No	From	To	Reading
BHD 3	158.0		.11
	160.3		.09
	161.3		.10
	164.0		.13
	166.7		.13
	168.1		.34
	170.0		.10
	173.0		.10
	176.0		.11
	179.0		.02
	182.0		.19
	185.0		.12
	188.0		.11
	189.0		.09
	191.0		.09
	194.0		.10
	197.0		.24
	200.0		.14
	201.5		.14
	202.5		.19
	303.6		.22
	204.2		.12
	206.0		.02
	206.4		.02
	207.9		.04
	210.9		.02
	212.0		.07
	215.0		.09
	218.0		.04
	220.1		.10
	221.1		.07
	224.0		.25
	227.0		.15
	228.8		.07
	231.0		.12
	231.7		.12
	233.1		.10
	235.0		.09

PAGE 4

DDH No	From	To	Reading
BHD 3	237.5		.07
	238.3		.12
	241.3		.12
	242.0		.11
	245.0		.09
	246.6		.07
	247.7		.04
	248.6		.07
	249.3		.06
	249.9		.03
	252.9		.08
	255.9		.08
	257.0		.08
	259.5		.06
	262.6		.10
	265.6		.11
	270.3		.26
	272.0		.07
	273.0		.12
	276.2		.18
	278.0		.21
	281.0		.12
	284.0		.15
	287.0		.06
	290.0		.24
	293.0		.22
	296.0		.23
	299.0		.25
	302.0		.23
	308.0		.17
	314.0		.20
	317.0		.24
	319.9		.14
	322.9		.18
	326.0		.27
	329.6		.13
	332.0		.33
	335.0		.18

PAGE 5

DDH No	From	To	Reading
BHD 3	338.0		.17
	341.0		.17
	344.0		.26
	347.0		.31
	350.0		.25
	353.0		.32
	356.0		.11
	359.0		.07
	362.0		.08
	365.0		.10
	367.5		.10
	370.3		.07
	371.8		.08
	372.3		.10
	373.7		.06
	376.8		.12
	379.9		.11
	383.0		.12
	386.0		.13
	389.0		.14
	392.0		.08
	393.7		.03
	395.0		.07
	395.0		.10
	401.0		.09
	403.9		.07
	407.0		.04
	412.2		.09
	415.2		.11
	418.2		.20
	419.0		.21
	422.0		.18
	425.0		.38
	425.0		.27
	431.0		.28
	434.0		.10
	437.0		.07
	440.0		.24

PAGE 6

DDH No	From	To	Reading
BHD 3	443.0		.19
	446.0		.24
	449.0		.10
	452.0		.11
	455.0		.05
	458.0		.12
	461.0		.09
	464.0		.14
	467.0		.19
	470		.21
	473		.23
	476		.16
	479		.10
	482		.24
	485		.18
	488		.16
	491		.22
	494		.27
	497		.29
	500		.31
	503		.30
	506		.25
	509		.12
	512		.17
	515		.20
	518		.30
	521		.25
	524		.45
	527		.16
	530		.16
	533		.22
	536		.26
	539		.21
	542		.19
	545		.13
	548		.19
	551		.26
	554		.23

HOLE No. BHD 3

PASMINCO EXPLORATION

DIAMOND DRILL HOLE SUPPLEMENTARY DATA

PROJECT :

MAGNETIC SUSCEPTIBILITY READINGS

Page 21 of 21

7

DDH No	From	To	Reading
BHD 3	557		·35
	560		·16
	563		·33
	566		·32
	569		·27
	572		·21
	575		·31
	578		·33
	581		·31
	584		·34
	587		·26
	590		·36
	593		·27
	596		·23
	599		·26
	602		·33
	605		·39

PAGE 8

DDH No	From	To	Reading
BHD3	605·0	605·0	0·30
BHD3	607·3	601·5	0·20
BHD 3	609·9	609·9	0·18
BHD 3	611·0	611·0	0·00
BHD3	614·0	614·0	0·16
BHD3	617·0	617·0	0·17
BHD3	620·0	620·0	0·24
BHD3	623·0	623·0	0·39
BHD3	626·0	626·0	0·24
BHD3	629·0	629·0	0·25
BHD3	632·0	632·0	0·30
BHD3	635·0	635·0	0·26
BHD3	638·0	638·0	0·29
BHD3	641·0	641·0	0·27
BHD3	644·0	644·0	0·18
BHD3	647·0	647·0	0·18
BHD3	650·0	650·0	0·16
BHD3	653·0	653·0	0·20
BHD3	656·0	656·0	0·13
BHD3	654·0	659·0	0·04
BHD3	662·0	662·0	0·08
BHD3	665·0	665·0	0·03
BHD3	668·0	668·0	0·09
BHD3	671·0	671·0	0·15
BHD3	674·0	674·0	0·11
BHD3	677·0	677·0	0·20
BHD3	680·0	680·0	0·15
BHD3	683·0	683·0	0·16
BHD3	686·0	686·0	0·23
BHD3	689·0	659·0	0·16
BHD3	692·0	692·0	0·13
BHD3	645·0	695·0	0·15
BHD3	698·0	698·0	0·14
BHD3	701·0	701·0	0·22
BHD3	703·0	703·0	0·11
BHD3	707·0	707·0	0·00
BHD3	710·0	710·0	0·14
BHD3	713·0	713·0	0·00

PAGE 9

DDH No	From	To	Reading
BHD3	716·0	716·0	0·13
BHD3	719	719	0·07
BHD3	722	722	0·13
BHD3	725	725	0·25
BHD3	728	728	0·50
BHD3	731	731	0·23
BHD3	734	734	0·17
BHD3	737	737	0·16
BHD3	740	740	0·25
BHD3	743	743	0·21
BHD3	746	746	0·18
BHD3	749	746	0·55
BHD3	752	752	0·59
BHD3	755	755	0·38
BHD3	758	758	0·19
BHD3	760·6	760·6	0·12
BHD3	763·7	763·7	0·11
BHD3	766·8	766·8	0·43
BHD3	769·9	769·9	0·20
BHD3	773·0	773·0	0·15
BHD3	776·0	776·0	1·06
BHD3	779·0	779·0	0·17
BHD3	782·0	782·0	0·19
BHD3	784·4	784·4	0·10

END OF HOLE

S G READINGS

DDH No	DEPTH	DRY weight	WET weight	Volume	S G	Comment
BHD 3						
SAMPLE ONLY		259		96		NQ WHOLE CORE
	3·5m	737		335		HQ WHOLE CORE
	40·0m	891		341		" " "
	80·0	267		97		NQ WHOLE CORE
	120·0	354		130		
	160·0	361		131		
SAMPLE	—	259		96		
	200·0	598		218		
	240·0	597		218		
	280·0	580		214		
	320·0	685		247		
	360·0	474		175		
SAMPLE	—	259		95		
	400·0	583		214		
	440·1m	474		175		
BHD3	440	301	109	2·26		
BHD3	480	132	48	2·75		
BHD3	521	418	145	2·35		
BHD3	563	624	220	2·53		
BHD3	599	187	69	2·71		
BHD3	640	570	207	2·75		
BHD3	680	649	255	2·66		
BHD3	719·7	490	180	2·72		
BHD3	740	597	219	2·78		
BHD3	780	666	245	2·71		
BHD3						

APPENDIX 4

SAMPLE RESULT LEDGER - ROCKS & BHP DRILLCORE,

HIGH POINT

PASMINCO EXPLORATION
GEOCHEMICAL ANALYSES RECORD

PROSPECT HIGH POINT

PROJECT BULGOBAC HILL EL

Sample Type DRILLCORE

Sample No.	Sample Type	Location	METAL CONTENT (ppm unless specified)															Cr	Mn	Ni	COMMENTS
			Cu	Pb	Zn	Ag	Au	As / Ba	Rb / Sr	Y / Nb	Y / Zr	Al_2O_3 / SiO_2	TiO_2 / Fe_2O_3	MnO / Na_2O	CaO / K_2O	MgO / P_2O_5	LOI / SO_3				
DBS 15	CORE	BHP HOLE HP1, 396·7m						15 / 290	20 / 300	310 / 6	25 / 130	14·08 / 51·1	0·97 / 8·23	0·35 / 4·38	7·73 / 0·57	3·68 / 0·350	8·09 / 0·64	44	2650	32	
DBS 16	"	" " HP1, 436·7m						9 / 790	30 / 240	200 / 4	20 / 140	16·13 / 54·7	0·54 / 8·79	0·53 / 4·17	2·41 / 1·03	5·74 / 0·24	5·25 / 0·26	116	4050	54	
DBS 17	"	" " HP1, 476·7m						15 / 240	20 / 280	350 / 7	25 / 140	15·68 / 45·4	1·07 / 8·80	0·28 / 5·57	7·67 / 0·47	4·35 / 0·426	6·56 / 4·31	55	2150	34	
DBS 18	"	" " HP2, 404·5m						<2 / 2800	35 / 200	190 / <3	15 / 65	11·48 / 49·5	0·49 / 9·01	0·17 / 1·26	7·63 / 1·11	14·60 / 0·105	4·97 / 0·03	215	715	308	
DBS 19	"	" " HP2, 487·0m						20 / 100	<5 / 200	210 / <3	15 / 70	11·63 / 41·8	0·43 / 7·42	0·19 / 2·41	12·76 / 0·07	8·52 / 0·094	13·39 / 1·13	456	1450	267	
DBS 20	"	" " HP4, 165·0m						20 / 580	170 / 20	9 / 8	30 / 210	11·80 / 73·0	0·24 / 2·87	0·12 / 0·14	1·81 / 3·71	1·43 / 0·038	4·26 / 1·72	7	1060	25	
DBS 21	"	" " HP4, 217·2m						30 / 610	170 / 70	270 / <3	20 / 95	12·35 / 41·4	0·57 / 5·11	1·28 / 0·14	11·63 / 3·87	4·97 / 0·352	17·76 / 0·26	60	9800	69	
DBS 22	"	" " HP4, 246·0m						35 / 290	65 / 110	290 / <3	20 / 80	11·37 / 41·2	0·54 / 8·13	0·53 / 0·72	13·33 / 1·65	5·98 / 0·356	15·27 / 0·57	266	4180	116	
DBS 23	"	" " HP4, 305·9m						2 / 55	<5 / 95	210 / 5	15 / 110	9·22 / 45·7	0·50 / 9·83	0·69 / 0·56	8·55 / 0·11	10·98 / 0·279	12·77 / 1·93	477	5280	255	
DBS 24	"	" " HP4, 471·8m						3 / 1300	40 / 160	170 / <3	15 / 80	12·74 / 55·0	0·31 / 8·60	0·35 / 2·27	5·40 / 1·49	5·86 / 0·077	7·64 / 0·10	232	2790	109	
DBS 25	"	" " HP4, 518·9m						2 / 600	30 / 170	150 / 5	20 / 120	14·47 / 59·3	0·35 / 8·77	0·28 / 3·56	1·87 / 0·97	5·73 / 0·096	4·41 / 0·37	153	2130	89	
DBS 26	"	" " HP4, 588·4m						7 / 160	20 / 140	210 / <3	20 / 190	9·54 / 41·2	0·59 / 8·66	0·38 / 0·50	14·70 / 0·43	8·39 / 0·364	15·44 / 0·08	295	2820	202	
ANALYSED BY		ANALABS COOEE + PERTH (111310·60·08185).				METHODS:		XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	AAS	AAS	AAS	PASMINCO JOB Nº 0159
			Cu	Pb	Zn	Ag	Au	Ba		V	Zr		Ti	Na	Ca	K	Mg				
	CORE	HP1, 238·4 – 239·4m	90	2100	5000	1	<0·008	150		210	110		2350	2·03	4·90	0·51	4·50				
	"	HP1, 308·6 – 309·6m	15	10	75	<1	↓	330		189	60		1700	0·05	13·70	2·57	1·84				
	"	HP1, 572·6 – 573·6m	20	1025	1950	1		1750		169	150		2200	2·56	3·15	1·54	3·31				
	"	HP2, 392·7 – 398·9m	50	<5	75	<1		1150		204	55		2000	1·09	5·36	0·83	8·17				
		HP2, 197·7 – 198·7m	20	30	75	<1		520		112	130		2850	0·051	3·49	2·97	1·81				
		HP4A, 274·0 – 275·0m	5	5	50	<1		540		202	85		2450	0·123	6·10	3·98	2·50				
		HP4A, 399 – 401m	30	10	4150	1		440		131	80		1600	3·52	2·54	0·56	2·57				
	CORE	SK12, 139 – 139·5m	<5	15	190	<1		150		236	30		2450	3·00	2·87	0·36	3·58				SOCK CREEK
	"	SK12, 140·5 – 141·5m	<5	5	265	1		140		107	45		1950	0·101	3·67	0·46	1·37				DRILLHOLE
	"	SK12, 158 – 159m	<5	<5	50	<1	↓	110		24	260		970	1·873	12·50	0·47	0·493				(COMSTAFF)
ANALYSED BY		ANALABS COOEE + PERTH	PPM	PPM	PPM	PPM	PPM	PPM		PPM	PPM		PPM	(%)	%	%	%				
JOB Nº 111320·60·07700																					
PASMINCO JOB Nº 0203, FEB 1991.																					
		ANALYTICAL METHOD:	AAS	AAS	AAS	AAS	F/A	XRF		ICP-OES	XRF		XRF	ICP-OES	ICP-OES	ICP-OES	ICP-OES				

59

A 18625

APPENDIX 5

SAMPLE RESULT LEDGER-SOILS, HIGH POINT

PASMINCO EXPLORATION
GEOCHEMICAL ANALYSES RECORD

Sample Type SOILS PAGE 1

PROSPECT HIGH POINT

PROJECT BULGOBAC HILLEL

Sample No.	SOIL Sample Type HORIZON	Location (BHP GRID)	METAL CONTENT (ppm unless specified)															COMMENTS
			Cu	Pb	Zn	Ag	Au	Ba	Cr	Mn	Ni							
31060	A	7800N / 4200E	12	108	62	0.7	<0.008	406	41	34	6							ORIENTATION SAMPLING
61	B	" "	13	96	27	0.6		498	47	37	4							(LINE 7800N ONLY)
62	A	4175E	5	7	15	0.6		265	<10	39	2							
63	B	" "	7	13	33	0.8		410	12	57	4							JULY 1991
64	A	4150E	3	6	13	0.5		206	<10	33	<2							SAMPLES ANALYSED BY ANALABS
65	B	- -	3	5	11	0.9		260	<10	33	<2							COBEE + PERTH -JOB No. 111310.60.08057
66	A	4125E	4	9	12	0.6		144	<10	32	<2							PASMINCO JOB No. 0206
67	B	" -	4	6	15	0.6		181	<10	33	<2							
68	A	4100E	4	9	12	0.8		154	<10	33	<2							
69	B	" "	3	4	14	0.8		238	<10	39	4							
31070	A	4075E	4	5	7	0.5		136	<10	29	2							
71	B	" "	3	5	11	0.6		186	<10	27	5							
72	A	4050E	7	18	29	0.7	(All	255	15	67	6							
73	B	" "	5	6	9	0.8	Samples analysed	137	<10	33	3							
74	A	4025E	5	9	11	0.8	for Au.	205	14	43	3							
75	B	- -	3	6	9	0.7	All	152	<10	37	3							
76	A	4000E	5	15	15	0.6	<0.008)	293	<10	45	4							
77	B	" "	10	20	37	0.6		388	<10	87	7							
78	A	3975E	9	33	27	0.4		455	18	55	6							
79	B	" "	11	36	45	0.6		486	13	81	9							
31080	A	3950E	9	29	42	1.0		432	17	93	6							
81	B	" "	8	22	44	2.0		484	14	97	6							
82	A	3925E	8	23	31	0.7		344	10	64	4							
83	B	" "	6	22	40	0.5		328	<10	114	5							
84	A	3850E	7	58	48	0.6		306	12	238	4							
85	B	" "	6	43	46	0.6		342	12	54	4							
86	A	3800E	11	75	39	0.5		302	27	265	7							
87	B	" "	11	62	59	0.7		434	26	72	9							
88	A	3750E	9	62	14	0.3		200	41	32	7							
89	B	" "	6	43	12	0.2		254	36	30	15							
31090	A	3650E	4	19	14	0.3		107	222	39	13							
91	B	" "	9	45	38	0.2		148	452	68	41							
92	A	3600E	7	17	11	0.4	↓	115	136	23	16							

A 18625

PASMINCO EXPLORATION
GEOCHEMICAL ANALYSES RECORD

PROSPECT HIGH POINT

PROJECT BULGOBAC HILL EL

Sample Type SOILS PAGE 2

Sample No.	SOIL Sample Type HORIZON	Location (BHP GRID)	Cu	Pb	Zn	Ag	Au	Ba	Cr	Mn	Ni	Bi	As	Sb	Hg	Sn		COMMENTS
			METAL CONTENT (ppm unless specified)															
31093	B	7800N / 3600E	5	17	15	0.4	<0.008	187	175	26	33							
94	A	3550E	8	35	17	0.6	|	118	133	44	11							
95	B	" "	84	162	40	0.5	|	288	186	99	60							
96	A	3500E	9	23	18	0.7	|	93	61	42	6							
31097	B	" "	6	16	13	0.4	↓	158	71	26	7							END OF ORIENTATION SURVEY
		SAMPLE METHODS:	ICPMS	ICP MS	ICP MS	ICP MS	F/A		ICP OES	ICP MS	ICP MS							
32201	B	8200 N / 3700 E	6	6	61			660	10			<20	<2	<3	3	<3		MAIN SURVEY – AUGUST 1991
02	B	3650E	4	<5	5			130	20			|	<2	<3	<3	<3		SAMPLES ANALYSED BY ANALAB
03	B	3600E	6	23	109			450	8			|	<2	3	<3	<3		COOEE + PERTH. JOB N°
04	B	3550E	2	5	10			360	5			|	2	<3	<3	<3		111310·60·08160.
05	B	3500 E	3	10	28			340	15			|	2	<3	<3	<3		PASMINCO JOB N°. 0209.
06	B	3450 E	4	107	26			300	45			|	<2	<3	<3	<3		
07	B	3400E	2	<5	5			75	10			|	<2	3	<3	<3		
32208	B	8100N / 3315 E	5	164	15			270	120			|	<2	<3	<3	<3		
32211	B	3700 E	3	<5	17			510	10			|	<2	<3	<3	<3		
12	B	3350 E	22	10	1765			7550	110			|	65	<3	25	3		
13	B	3400 E	11	36	58			370	40			|	9	3	<3	<3		
14	B	3450E	4	22	38			370	20			|	<2	<3	<3	<3		
15	B	3500 E	11	17	32			170	20			|	<2	4	<3	<3		
16	B	3550E	4	5	23			330	25			|	<2	<3	<3	3		
17	B	3600E	7	9	17			320	20			|	<2	<3	<3	<3		
18	B	3650 E	6	9	16			290	25			|	<2	<3	<3	<3		
19	B	7900 N / 3500E	6	8	30			210	280			|	20	5	<3	<3		
32220	B	3500 E	9	6	58			230	300			|	20	3	<3	7		
21	B	3550 E	7	7	70			200	290			|	6	<3	<3	<3		
22	B	3600 E	6	35	31			320	45			|	15	<3	<3	<3		
23	B	3650 E	9	388	38			360	80			|	7	<3	<3	4		
24	B	3700 E	8	20	55			340	35			|	40	<3	<3	<3		
25	B	3750 E	9	31	40			280	25			|	3	<3	<3	<3		
26	B	3800E	7	21	32			380	15			|	4	<3	<3	<3		
27	B	3850E	9	<5	188			360	9			↓	<2	5	<3	<3		

PASMINCO EXPLORATION
GEOCHEMICAL ANALYSES RECORD

PROSPECT HIGH POINT

PROJECT BULGOBAC HILL EL

Sample Type SOILS PAGE 3

Sample No.	Soil Sample Type Horizon	Location (BHP GRID)	Cu	Pb	Zn	Ag	Au	Ba	Cr	Mn	Ni	Bi	As	Sb	Hg	Sn		COMMENTS
			METAL CONTENT (ppm unless specified)															
32228	B	7900 N / 3900 E	7	17	87			400	6			<20	4	<3	<3	<3		
32229	B	7700 N / 4000 E	15	824	17			420	95				<2	4	<3	<3		
30	B	3950 E	13	196	24			290	110				40	7	<3	3		
31	B	3900 E	20	109	34			300	170				25	<3	<3	<3		
32	B	3850 E	12	66	31			320	110				15	<3	<3			
33	B	3800 E	20	111	125			230	390				110	<3	5			
34	B	3750 E	7	63	16			240	230				7	<3	<3			
35	B	3700 E	5	24	10			240	480				<2	<3	<3			
36	B	4050 E	4	9	9			390	35				2	<3	3			
37	B	4100 E	6	13	19			490	30				<2	<3	<3			
38	B	4150 E	7	18	21			580	90				<2	<3	<3			
39	B	4200 E	38	200	60			630	180				15	5	<3			
32240	B	7600 N / 3700 E	7	41	14			160	340				5	<3	<3			
41	B	3750 E	5	39	8			170	200				<2	<3	<3			
42	B	3800 E	16	214	118			250	680				6	<3	<3			
43	B	3850 E	8	69	16			120	260				9	3	<3			
44	B	3900 E	14	69	29			270	270				20	<3	<3			
45	B	3950 E	11	18	43			280	470				10	<3	<3			
46	B	4000 E	5	44	9			50	270				<2	3	<3			
47	B	4050 E	8	34	38			120	620				7	<3	<3			
48	B	4100 E	7	28	12			260	150				<2	<3	<3			
49	B	4150 E	8	70	18			270	75				<2	<3	<3			
50	B	4200 E	10	37	25			580	100				<2	3	<3			
32251	B	7400 N / 4000 E	6	22	34			130	390				<2	<3	<3			
52	B	4050 E	7	26	25			110	620				<2	6	<3			
53	B	4100 E	6	<5	221			200	390				4	<3	<3			
54	B	4150 E	6	7	15			140	140				2	<3	<3			
55	B	4200 E	5	11	10			200	120				4	<3	<3			
56	B	4250 E	6	10	13			120	180				2	4	<3			
32257	B	7500 N / 4000 E	6	43	75			270	400				6	<3	<3			
58	B	4050 E	5	108	82			340	360				10	<3	7			
59	B	4100 E	2	<5	13			120	270				5	<3	<3			
32260	B	4150 E	4	31	27			210	210			↓	7	<3	<3	↓		

A 18625

PASMINCO EXPLORATION
GEOCHEMICAL ANALYSES RECORD

PROSPECT HIGH POINT

PROJECT BULGOBAC HILL EL

Sample Type SOILS PAGE 4

Sample No.	SOIL Sample Type HORIZON	Location (BHP GRID)	METAL CONTENT (ppm unless specified)															COMMENTS
			Cu	Pb	Zn	Ag	Au	Ba	Cr	Mn	Ni	Bi	As	Sb	Hg	Sn		
32261	B	7500 N / 4200 E	3	<5	24			130	300			<20	2	<3	<3	<3		
32262	B	4250 E	2	6	29			140	490			↓	<2	<3	<3	<3		
32301	B	8000 N / 3300 E	5	5	42			95	40				5	4	<3	<3		
02	B	3350 E	5	<5	29			90	40				10	<3	<3	3		
03	B	3400 E	9	7	58			110	50				10	<3	<3	<3		
04	B	3450 E	3	<5	12			210	200				3	3	<3	<3		
05	B	3500 E	2	<5	5			260	10				<2	<3	<3	<3		
06	B	3550 E	2	<5	8			190	55				<2	<3	<3	<3		
07	B	3600 E	3	<5	15			320	50				15	<3	<3	<3		
08	B	3650 E	3	<5	26			210	5				<2	<3	<3	<3		
09	B	3700 E	4	<5	31			270	30				<2	<3	<3	<3		
32310	B	3750 E	5	<5	40			210	7				3	<3	<3	3		
		ANALYTICAL METHODS:	AAS	AAS	AAS			XRF	XRF			AAS	XRF	XRF	XRF	XRF		

A 18625

APPENDIX 6

SAMPLE RESULT LEDGER-ROCKS,
BULGOBAC HILL
TULLABARDINE GORGE
AND SOCK CREEK

PASMINCO EXPLORATION
GEOCHEMICAL ANALYSES RECORD

PROSPECT BULGOBAC HILL

PROJECT BULGOBAC HILL EL 37/89

Sample Type ROCK CHIPS

Sample No.	Sample Type	Location (AMG)	METAL CONTENT (ppm unless specified)													→ %										COMMENTS
			Cu	Pb	Zn	Ag	Au	As	Ba	Bi	Cr	Rb	Sr	Y	Nb	[illegible]	Zr	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	Na_2O	CaO	K_2O	MgO	P_2O_5	
031384B	Sub o/c	5389940mN/386500mE	30	43	304	<0.5	<0.008	9	1130			135	359	25	3	76	224	11.22	75.2	0.36	3.73	0.11	2.23	0.40	3.49	0.84	0.051	Vitric & siliceous tuffaceous sediment. Minor
031385B	" "	5389900mN/386380mE	40	34	147	<0.5	<0.008	9	287			27	416	15	9	34	199	11.86	78.3	0.27	1.65	0.02	5.57	0.41	0.95	0.25	0.036	Siliceous volcaniclastic sst. 2-3% py.
031386B	" "	5389820mN/386330mE	41	50	113	<0.5	<0.008	9	1398			213	344	54	9	39	275	13.29	70.1	0.56	4.31	0.11	2.24	0.86	4.60	1.16	0.076	Silic & vitric bedded tuffaceous sediment. 1-2% py+;
031387 B	" "	5390190mN/386240mE	51	17	464	<0.5	<0.008	7	1070			161	139	29	14	37	139	11.89	75.6	0.30	2.58	0.06	2.80	0.20	3.57	1.04	0.028	Silic & vitric tuffaceous siltst. Trace sp-gn on fracts.
031388B	o/c	(BHP: 4000N/3685E)						5	1160			121	169	68	18	23	255	13.41	70.9	0.59	3.86	0.10	3.10	0.19	3.08	2.07	0.077	Silic volcaniclastic sst.
031389B	"	(BHP: 4000N/3750E)						2	858			96	94	39	14	28	164	11.61	76.0	0.40	2.55	0.08	3.93	0.24	2.52	1.14	0.049	Cherty volcaniclastic sst. Minor py.
032713B	Float	(BHP: 4000N/3840E)	14	<5	35	<0.5		7	840		29	100	120	20	12	15	170	10.40	77.5	0.34	3.54	0.09	2.60	0.16	2.29	1.20	0.039	Silic tuffaceous siltstone. Trace py.
032714B	Sub o/c	(BHP: 4000N/3935E)	24	63	884	<0.5		25	1160		56	160	160	60	13	30	250	12.20	71.5	0.50	3.63	0.10	2.90	1.30	3.89	1.60	0.105	Silic tuffaceous fine sst. Minor py, sp.
032715B	" "	(BHP: 4000N/4050E)	15	181	627	<0.5		35	1300		21	210	180	35	9	40	280	12.70	71.6	0.50	3.89	0.09	1.75	0.63	5.52	1.05	0.079	Black cherty tuffaceous siltstone. 1% py + po.
032716B	" "	(BHP: 4000N/4056E)	27	12	46	<0.5		30	1000		114	150	300	110	9	40	370	15.00	63.3	0.73	5.70	0.09	3.20	2.18	3.85	3.15	0.264	Volcaniclastic sst. 1% py + po.
032717B	o/c	(BHP: 4000N/4390E)	7	5	56	<0.5		11	1600		7	200	420	30	12	30	280	15.60	68.4	0.51	4.38	0.21	1.55	1.87	4.38	0.70	0.091	Pumiceous feldspar-phyric sst.
032718B	Float	(BHP: 4000N/4235E)	8	5	139	<0.5		7	1900		17	150	200	25	11	30	210	10.70	77.5	0.39	2.34	0.05	1.65	0.62	5.20	0.12	0.067	Silif pumiceous feldspar xyl sst. 1% py.
032719B	"	(BHP: 4000N/4182E)	6	11	85	<0.5		13	1650		7	240	230	30	6	35	240	12.80	74.1	0.46	2.86	0.11	0.90	1.15	4.68	0.90	0.088	Silif pumiceous feldspar xyl sst. Minor py.
LABORATORY: ANALABS																										
		ANALYTICAL METHODS:	AAS	AAS	AAS	AAS	F/A	XRF	XRF	AAS	AAS	XRF		XRF		XRF		XRF		XRF		XRF		XRF		XRF		

PASMINCO EXPLORATION ORDER N^os: 0165 + 0173

ANALABS JOB N^os: 111310-60-08344 + 111310-60-08459

PASMINCO EXPLORATION
GEOCHEMICAL ANALYSES RECORD

PROSPECT TULLABARDINE GORGE

PROJECT BULGOBAC HILL EL 37/89

Sample Type ROCK CHIPS

Sample No.	Sample Type	Location (AMG)	METAL CONTENT (ppm unless specified)									% →						COMMENTS
			Cu	Pb	Zn	Ag	As / Ba	Bi / Cr	Rb / Sr	V / Nb	Y / Zr	Al_2O_3 / SiO_2	TiO_2 / Fe_2O_3	MnO / Na_2O	CaO / K_2O	MgO / P_2O_5	LOI / SO_3	
032724B	Sub O/c	5385620N / 385440E	9	10	49	<0.5	14 / 1100	/ 19	120 / 260	45 / 12	25 / 250	15.70 / 66.8	0.67 / 4.91	0.10 / 3.40	0.31 / 3.35	1.70 / 0.143	2.89 / 0.04	Volcaniclastic sandstone. Unaltered.
032725B	Float	5385775N / 385530E	9	<5	19	<0.5	10 / 930	/ 6	200 / 180	25 / 17	50 / 160	12.80 / 74.6	0.32 / 2.49	0.04 / 2.35	0.55 / 4.42	0.65 / 0.028	1.28 / 0.16	Vitric + siliceous tuffaceous siltstone
032726B	Float	5385800N / 385570E	8	26	64	<0.5	7 / 1150	/ 8	220 / 380	20 / 8	35 / 250	15.20 / 67.2	0.69 / 4.36	0.07 / 2.10	2.74 / 4.09	1.10 / 0.126	2.45 / 0.14	Pumiceous feldspathic sst. Weakly altered.
032727B	O/c	5385880N / 385620E	7	<5	44	<0.5	9 / 1000	/ 11	130 / 100	9 / 9	25 / 190	13.30 / 73.6	0.27 / 3.17	0.04 / 2.55	0.10 / 4.96	0.35 / 0.038	1.47 / 0.03	Dacitic lava. Fine sericite veinlets.
032728B	Float	5386030N / 385730E	7	<5	70	<0.5	12 / 560	/ 9	95 / 210	30 / 13	25 / 210	13.40 / 71.5	0.42 / 5.03	0.14 / 2.95	0.42 / 2.75	0.85 / 0.046	2.37 / 0.03	Volcanic breccia. Some clasts altered.
032729B	Float	5386030N / 385730E	7	5	51	<0.5	9 / 900	/ 8	180 / 150	9 / 14	25 / 170	10.60 / 78.6	0.25 / 2.02	0.03 / 1.80	0.23 / 4.17	0.25 / 0.015	1.57 / 0.07	Vitric + siliceous tuffaceous siltstone. Minor py.
032730B	O/c	5385000N / 384780E	15	6	72	<0.5	10 / 840	/ 15	170 / 380	55 / 11	30 / 230	15.40 / 63.8	0.67 / 5.12	0.12 / 2.45	4.07 / 3.11	1.80 / 0.148	2.87 / 0.28	Feldspar-phyric pab ignimbrite. Trace py.
LABORATORY:		ANALABS																
		ANALYTICAL METHODS:	AAS	AAS	AAS	AAS	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	
PASMINCO EXPLORATION ORDER Nº:			0173															
ANALABS JOB Nº: 111310·60·08459																		
								SOCK CREEK										
032721	O/c	5393040N / 385980E	64	1271	353	2.3	130 / 440	/ 120	110 / 14	160 / 9	17 / 130	12.20 / 65.9	0.84 / 8.78	0.06 / 0.10	0.07 / 2.79	2.40 / 0.133	5.99 / 2.92	Fractured black shale c̄ limonitic veinlets.
(ASSAY DETAILS AS ABOVE)																		

APPENDIX 7

PETROLOGICAL REPORTS,
BULGOBAC HILL
TULLABARDINE GORGE
AND SOCK CREEK

0110

Report To Pasminco Exploration on Samples From

- Bulgobac Hill Area
- Sock Creek Area
- Tullabardine Gorge Area

for Gerald Purvis

by Joe Stolz
20 Bath St.,
Battery Point,
Tas. 7004.

18th January 1992

SOCK CREEK

032720 **Albitised Volcaniclastic Sandstone**

Mineralogy	%
quartz	18
plagioclase	50
albite-chlorite matrix	15
sericite	2
secondary Fe oxides	<1
zircon	trace

This rock is a generally grain supported volcanic-derived crystal-rich sandstone with a chlorite-albite-rich matrix. The clastic nature of this specimen is evident from the closely packed nature of the angular quartz grains (0.3 - 3 mm) and angular subidiomorphic plagioclase grains (0.3 - 4 mm). The latter display multiple twinning and are characterised by pervasive weak sericite alteration. The quartz grains are typically fractured and display strained extinction.

The matrix between these grains is filled by very fine grained chlorite, albite and minor sericite in which occurs more coarse grained aggregates (0.05 - 0.3 mm) of intergrown albite and chlorite. The albite displays weak clay alteration, which distinguishes it from the sericite altered clastic grains. The chlorite occurs in randomly oriented platy aggregates.

There are also a few idiomorphic grains of zircon and minor granular rutile associated with secondary Fe oxides throughout the matrix.

The later nature of the albitic matrix is clearly indicated where it has produced overgrowths on, and filled in fractures within some plagioclase grains. These are distinguished by the absence of sericitic alteration.

BULGOBAC HILL AREA

032713A **Tuffaceous Siltstone**

Mineralogy	%
quartz	25
plagioclase	10
sericite	1
quartz-chlorite matrix	63
secondary Fe oxides	1
zircon	trace

This sample is composed of fine angular quartz and plagioclase grains (0.02 - 0.1 mm) and sparse sericite crystals in a very fine grained matrix of chlorite, quartz, and minor secondary Fe oxides.

The quartz grains are commonly unstrained and the plagioclase displays little or no alteration. Much of the matrix material may be devitrified and recrystallised vitriclastic debris. The fine chlorite and quartz aggregates appear to define arcuate fragments which probably represent original volcanic glass (ash). The arcuate nature of the fragments and their random orientations suggest the vitric material was cool when deposited.

This rock probably represents the reworked fine portion of a subareal or submarine silicic volcanic eruption.

The rock is traversed by an irregular network of quartz and quartz-albite veins varying from 0.05 to 2 mm wide.

032714A **Fine Tuffaceous Sandstone**

Mineralogy	**%**
quartz	15
plagioclase	15
siliceous matrix	68
sericite	<1
chlorite	<1
carbonate	1
secondary Fe oxides	<1
zircon	trace

This sample is composed of angular quartz and plagioclase grains (0.02 - 0.04 mm) in a siliceous ash-rich matrix which contains minor sericite, chlorite, carbonate and a few scattered euhedra of zircon.

The quartz grains are typically unstrained, and the plagioclase displays weak sericitic and clay alteration.

The matrix is dominated by elongate, angular, randomly oriented fragments of volcanic glass (up to 0.4 mm long). Most of these consist of very fine grained recrystallised quartz and feldspar with minor chlorite, and some are distinctly banded.

There are very fine aggregates of carbonate and isolated crystals of sericite scattered throughout the matrix, the latter occurring in random orientation.

This sample is very similar to 032713A except that it contains a coarser grained ash fraction, and coarser detrital quartz and feldspar.

032715A Tuffaceous Siltstone

Mineralogy	%
quartz	2
plagioclase	5
silicic matrix	90
sericite	3
opaques	<1
chlorite	<1

This is an extremely fine grained tuffaceous siltstone. It is composed of sparse angular grains of plagioclase, quartz (0.05 - 0.1 mm), and anhedral opaques (pyrite - 0.05 - 0.5 mm) in an extremely fine grained matrix of quartz, chlorite and minor sericite. The matrix is likely to be recrystallised silicic ash but elongate vitriclastic fragments (up to 0.2 mm long) are less obvious than in 032713A and 032714A.

Fine isolated crystals of sericite are sparsely disseminated through the recrystallised silicic matrix.

This rock is a finer grained equivalent of 032713A and 032714A and would have had a similar source and depositional history.

032716A Volcaniclastic Sandstone

Mineralogy	%
quartz	15
plagioclase	35
hornblende	3
pyroxene	<1
chloritic matrix	35
lithic fragments	10
apatite	1
opaques	<1
carbonate	<1
zircon	trace

This is a very distinctive clastic rock composed of subidiomorphic grains of plagioclase and apatite, angular grains of quartz, amphibole, and pyroxene together with silicic and mafic lithic fragments in a fine grained chloritic matrix.

The quartz grains (0.05 - 0.5 mm) are sometimes unstrained and sometimes display undulose extinction. The plagioclase shows weak to moderate sericitic and carbonate alteration, whereas the hornblende and pyroxene appear quite fresh, the former displaying only minor replacement by carbonate. Both the hornblende and pyroxene display twinning. The hornblende is pleochroic from brownish-green to dark tan to beige, whereas the pyroxene is a pale green colour suggesting a diopside-augite composition.

Euhedral apatite crystals (typically 0.1 - 0.2 mm) are unusually abundant.

The lithic fragments are predominantly recrystallised siliceous volcanic glass. They commonly occur as angular, (often arcuate), to subrounded, fine grained xenoblastic to spherulitic aggregates of quartz and feldspar. Some fragments also exhibit axiolitic devitrification.

There are also some mafic volcanic fragments with interlocking plagioclase laths and disseminated opaque grains in a chloritic groundmass.

The matrix seems to be predominantly composed of fine chlorite, albite and quartz. There are also a few grains of pyrite, and euhedra of zircon disseminated throughout the rock.

The detrital minerals and the lithic fragments comprising this sample suggest at least two principal source components. These are likely to be a siliceous volcaniclastic rock which contributed quartz, silicic lithic fragments and possibly some plagioclase. On the other hand, the pyroxene, hornblende, plagioclase and basaltic lithic fragments are likely to have been contributed by a basaltic to andesitic volcaniclastic source.

The presence of pyroxene and apatite are consistent with derivation from andesitic/basaltic rocks similar to the Hellyer hangingwall basalts or shoshonites. A characteristic of these rocks is strong relative enrichment in P_2O_5 (apatite), and the presence of Cr-rich diopsidic pyroxene phenocrysts. The composition of the latter could only be confirmed by microprobe.

The presence of hornblende phenocrysts in abundance is a more common feature of the calcalkaline andesites of the Central Volcanic Complex. In summary this is a distinctive unit which would be useful for correlation purposes if it is widespread.

032717A Pumiceous Sandstone

Mineralogy	%
pumice fragments	88
quartz	
albite	
sericite	
chlorite	
plagioclase	10
epidote	<1
secondary Fe oxides	2
zircon	trace

This is a volcaniclastic rock composed predominantly of recrystallised silicic pumice fragments. These fragments vary from 0.2 mm to > 5 mm and some contain subhedral plagioclase phenocrysts which are characterised by pervasive moderate sericite alteration.

The tubular pumice fragments are characterised by distinctive alternating layers of chlorite and quartz + albite after original silicic glass. These fragments appear to be quite closely packed, and if there is a significant matrix component it has similar mineralogical and grain size characteristics to the recrystallised pumice fragments.

Some fragments are also characterised by perlitic fractures along which selective chlorite and sericite alteration has occurred. Secondary Fe oxides are probably after original magnetite.

The clastic nature of this rock is most obvious in plane polarised light where the random orientation of the banded pumice can be most readily observed.

The relative abundance of plagioclase phenocrysts in a silicic matrix, and the absence of quartz as a phenocryst phase suggests a broadly dacitic composition for the volcaniclastic precursor.

032719A **Pumiceous Sandstone**

Mineralogy	%
pumice fragments	89
quartz	
albite	
sericite	
chlorite	
plagioclase	10
epidote	<1
secondary Fe oxides	<1
rutile	<1

This is a volcaniclastic rock composed predominantly of siliceous pumice fragments and which is almost identical to 032717A.

The tubular pumice fragments are similar in character and size as those described for 032717A, and this sample also contains silicic fragments with perlitic fracturing.

The principal difference in this sample is the presence of a discernible matrix component. This is characterised by a somewhat finer grain size (<0.05 mm) and less chlorite than the recrystallised pumice fragments.

Plagioclase with pervasive sericitic alteration occurs predominantly as phenocrysts within pumice fragments, but also as discrete detrital grains. There is also some rutile and secondary Fe oxides spread throughout the matrix.

The comments regarding the origin of 032717A also apply to this sample. It is an epiclastic rock derived by reworking of volcaniclastic debris associated with the explosive eruption of dacitic magma. It is uncertain if the eruption occurred in a subareal or submarine setting. However, the random orientation of the pumice fragments indicates they were cool when deposited.

TULLABARDINE GORGE

032724 **Volcaniclastic Sandstone**

Mineralogy	%
quartz	1
plagioclase	5
pumice fragments	20
lithic fragments	20
silicic matrix	45
sericite	2
chlorite	2

This is an epiclastic rock composed of a variety of pumiceous and siliceous to intermediate volcanic lithic fragments together with some detrital quartz and plagioclase in a very fine grained recrystallised siliceous matrix.

Angular quartz grains and subidiomorphic plagioclase crystals (0.5 - 2 mm) occur as discrete detrital grains within the matrix. These phases also occur as phenocrysts within the lithic fragments. Partially resorbed, subidiomorphic quartz phenocrysts and euhedral plagioclase phenocrysts occur together set in the very fine grained quartz-feldspar-rich groundmass of some silicic (rhyodacitic) lava fragments. The plagioclase crystals throughout the rock are extensively altered to sericite. Plagioclase also occurs as a phenocryst phase and as laths in chlorite-rich clasts which represent originally more mafic lava fragments.

Another common clast type is composed of alternating fine bands of chlorite and plagioclase plus quartz which have the appearance of pumiceous flow-banded material. Other chlorite-rich clasts have a vesicular character.

The matrix is composed of extremely fine grained quartz and feldspar, with chlorite and some secondary Fe oxides. Vitriclastic textures are frequently apparent within the matrix indicating the volcaniclastic (tuffaceous) nature of this component.

This sample has been derived by reworking of a variety of source materials including rhyolitic lavas and andesitic to basaltic volcaniclastic material. The variety of lithic fragments and the unwelded variable orientation of the pumice fragments precludes an origin as an ignimbrite.

TULLABARDINE GORGE AREA

032725A **Tuffaceous Siltstone**

Mineralogy	%
quartz	2
plagioclase	3
silicic matrix	89
pumice fragments	5
chlorite	<1
sericite	<1
rutile	trace
carbonate	1
zircon	trace
opaques (pyrite)	<1

This is a very fine grained silicic sedimentary rock. It is composed of angular quartz and plagioclase grains (0.02-0.1mm), and angular, recrystallised silicic pumice fragments in an extremely fine grained matrix of quartz, chlorite and feldspar with minor carbonate, sericite, pyrite and zircon.

The angular plagioclase grains are essentially unaltered, and the quartz grains are unstrained. The recrystallised pumice fragments (up to 0.3mm long) are composed of very fine grained quartz and chlorite in alternating bands which typify tubular pumice in these rocks.

The bulk of the matrix is probably recrystallised finer grained silicic ash dominated by fine quartz, feldspar and chlorite. There are small grains of carbonate, isolated crystals of sericite, large anhedra of pyrite, and minor zircon and rutile disseminated through the matrix.

This sample is very similar to 032715A, except that the latter sample contains slightly more sericite, and the tubular pumice fragments are more obvious in 032725A. Despite the slight differences, these rocks have essentially identical mineralogy and textures, and would have been derived from a very similar source.

032726A Pumiceous feldspathic sandstone

Mineralogy	%
quartz	<1
plagioclase	10
silicic matrix	60
pumice fragments	15
lithic fragments	7
chlorite	3
sericite	2
carbonate	3
zircon	trace

This is an epiclastic rock composed of a variety of silicic lithic fragments (including tubular pumice), together with detrital quartz and plagioclase in an extremely fine grained silicic matrix.

The quartz grains (0.2-0.5mm) are unstrained and some retain evidence of partial magmatic resorption. Plagioclase occurs as relatively large (0.3-3mm) subidiomorphic grains which are variably altered to sericite and carbonate.

There are two principal types of lithic fragments. The first are angular, randomly oriented, banded pumice fragments (0.3-3mm long). These are composed of alternating fine bands of chlorite, and fine recrystallised quartz and feldspar, with minor sericite, granular sphene and epidote.

The other lithic fragments generally occur as rounded to subangular clasts (0.3-2mm) composed of very fine grained recrystallised quartz and feldspar, slightly coarser grained (0.1mm) feldspar-rich aggregates with subordinate chlorite and carbonate, or chlorite-carbonate-rich aggregates which may have a more mafic volcanic parentage. A number of the silicic lithic fragments have either partially resorbed quartz, or plagioclase phenocrysts within them, and they may represent devitrified glassy lava fragments. There are also occasional angular lithic fragments of tuffaceous siltstone composed of fine angular quartz grains in a chlorite-quartz-rich matrix.

The matrix is composed of extremely fine grained quartz and feldspar with minor chlorite , and disseminated fine aggregates of epidote, carbonate and sphene.

The variety of lithic fragments and crystal detritus suggests a mixed source for this rock. The predominant source materials are dacitic to rhyolitic volcanics and volcaniclastics, with a minor more mafic component. The mixture of fine matrix, lithic fragments and crystal detritus suggests this is some sort of poorly sorted mass-flow deposit.

032727A Dacitic lava

Mineralogy	%
plagioclase	8
silicic groundmass	88
chlorite	1
sericite	1
secondary Fe oxides	2

Subhedral plagioclase phenocrysts (0.5-2mm) and smaller plagioclase laths (0.02-0.2mm) are fairly evenly distributed throughout a variably recrystallised silicic groundmass.

The plagioclase phenocrysts display generally minor alteration to sericite, chlorite and clay minerals. The groundmass features randomly oriented subhedral plagioclase laths and xenoblastic quartz and feldspar aggregates (typically 0.05-0.1mm) in a very fine grained Fe-stained groundmass consisting of very fine plagioclase laths, chlorite and quartz.

The relatively coarse xenoblastic quartz-plagioclase aggregates may be the result of patchy subsolidus recrystallisation, or recrystallised spherulites. Fine veinlets of sericite traverse the rock together with narrow (0.1mm wide) quartz-chlorite, and chlorite-sericite-rich veins.

The bulk of the textural evidence favours the interpretation of this sample as a lava. The dominance of plagioclase as a phenocryst phase, and a predominantly silicic groundmass suggests a dacitic composition. As such, this sample is not directly comparable with 032713A, 032714A or 032715A.

032728A Volcanic breccia

Mineralogy	%
lithic clasts	63
plagioclase	1
quartz	<1
silicic matrix	35
secondary Fe oxides	1

This is a coarse volcanic breccia composed of a variety of silicic and chloritised volcanic fragments (up to several cm diameter), with minor detrital plagioclase and quartz in a very fine grained silicic matrix.

The detrital quartz and plagioclase occur as small (0.1-0.3mm) angular to subidiomorphic grains, the plagioclase showing some clay alteration.

There is a considerable variety of lithic fragments. However, the dominant type appears to be devitrified glassy volcanic fragments. Some consist of relatively large (0.5-2mm) subhedral plagioclase phenocrysts in an extremely fine grained, devitrified quartz-feldspar-rich groundmass. Many of the clasts have well developed perlitic fractures and/or spherulites reflecting their original glassy nature.

Some other clasts are composed of plagioclase phenocrysts (0.5-1mm) and smaller plagioclase laths in a chlorite-rich groundmass which also features some aggregates of recrystallised albite. These are likely to be fragments of more mafic (andesitic-basaltic) volcanics.

In addition, there are fragments with the textural and mineralogical features of the tubular pumice fragments which have been described from a number of other samples in this suite.

The matrix is dominated by very fine grained quartz and feldspar, with minor sericite and chlorite, after original silicic volcanic ash. Much of the matrix displays relict vitriclastic textures.

Most of the clasts in this rock have analogues from the other clastic samples, particularly 032726A. The siliceous pumice from this sample is perhaps the most widely represented lithic type, being particularly well developed in 032717A and 032719A.

This rock does not display evidence of significant hydrothermal alteration in the form of sericite, chlorite or pyrite. However, there are secondary Fe oxides disseminated through the matrix and within many of the clasts which may be partly after original pyrite.

The matrix of this sample is very similar to 032715A, but contains more secondary Fe oxides and less sericite.

Report To Pasminco Exploration : Samples From Bulgobac Hill Area

for Gerald Purvis

by Joe Stolz
20 Bath St.,
Battery Point,
Tas. 7004.

7th November 1991

031384A

Mineralogy

- quartz
- plagioclase
- carbonate
- sericite
- chlorite
- kaolinite ?

This sample is a very fine grained, silicic, low-grade metasediment. It consists of tiny angular grains of quartz, cryptocrystalline fragments of volcanic ash, rare plagioclase (0.01 - 0.1 mm), fine carbonate, sericite, chlorite and possible clay minerals. Many of the fine quartz grains and devitrified ash fragments have shard-like forms reflecting an explosive volcanic origin. Carbonate occurs as very fine grains disseminated throughout the matrix and also in larger (up to 0.3 mm) more widely disseminated aggregates occasionally with subordinate quartz or chlorite.

Fine grains of sericite are weakly aligned in two principal orientations, at roughly right angles to each other. The finest components of the matrix include tiny grains of quartz, pale green chlorite and a higher relief, low birefringence phase which may be kaolinite. The fine angular shards of silicic volcanic ash have devitrified to low relief cryptocrystalline aggregates which are probably very fine grained quartz and feldspar.

This sample is a well sorted volcaniclastic which possibly represents the fines component of hyaloclastite material from a subvolcanic eruption of silicic magma. Alternatively it was erupted subaerially and deposited under relatively deep calm water conditions.

031386A

Mineralogy

- quartz
- plagioclase
- sericite
- chlorite
- carbonate
- graphite?

This sample is mineralogically identical to 031384A except that it exhibits good laminar bedding which is defined by concentrations of fine opaques (possibly graphite) with fine chlorite and sericite. These layers alternate with paler coloured layers which are relatively enriched in fine quartz and devitrified ash. This rock also contains some larger (0.2 - 0.3 mm) sparsely disseminated aggregates of ?graphite.

Apart from the well defined bedding this sample is identical to 031384A and would have originated in a similar manner.

031387A

Mineralogy

- quartz
- plagioclase
- sericite
- chlorite
- carbonate
- ?illite

This sample is also very similar mineralogically and texturally to 031384A. Its major difference is the presence of a slightly higher proportion of phyllosilicate material. It contains a similar amount of sericite and chlorite as 031384A, but also contains a significant amount of a pale-brown, high-birefringence sheet silicate - probably illite. These platy crystals are typically bent but broadly aligned with the sericite.

These three samples (031384A, 031386A and 031387A) would appear to have been deposited in a similar manner and may well be part of the same unit.

031385A

Mineralogy

plagioclase
quartz
lithic fragments
chlorite
carbonate
matrix
zircon

This sample is composed of angular grains of plagioclase (0.05 - 0.4 mm) and fine-grained, feldspar-rich lithic fragments in a very fine grained matrix dominated by recrystallised quartz and feldspar. The larger plagioclase grains exhibit albite twinning and only minor sericite and clay alteration.

There are some very fine grained lithic fragments composed of feldspar and chlorite, and variants rich in very fine chlorite or feldspar with minor chlorite. Some chlorite-rich examples also contain subordinate sericite.

The matrix is dominated by variably recrystallised xenoblastic feldspar and subordinate quartz. Much of the matrix is extremely fine grained xenoblastic aggregates (<0.02 mm), but there are numerous coarser grained patches of recrystallised xenoblastic feldspar (typically 0.05 mm) which grade into finer grained material. The coarser grained patches also occasionally have associated relatively coarse grained chlorite aggregates. The rock contains minor disseminated carbonate, a few rounded grains of zircon, minor sericite and graphite.

The dominance of feldspar in this sample indicates a different source to 031384A, 031386A and 031387A. The abundance of detrital plagioclase together with feldspar- and chlorite-rich lithics (probably after volcanic glass) implies an andesitic source. The relatively fine, sandy material was probably derived from an explosive submarine eruption and sorting of hyaloclastic material.

031388A

Mineralogy

plagioclase
quartz
sericite
chlorite
?illite
lithic fragments
matrix
zircon
secondary Fe-oxides

This sample has substantial similarities to 031385A both in terms of mineralogy and textures. The major difference is that this rock contains a significant proportion of detrital angular quartz grains (0.1 - 0.2 mm) in addition to the detrital plagioclase.

This sample has a similar range of fine grained quartzo-feldspathic and chloritic lithic fragments, and similar very fine grained xenoblastic matrix. This rock contains slightly more sericite as dispersed platy crystals which are weakly aligned, and another platy phyllosilicate (possibly illite). There are also fine secondary Fe-oxides scattered throughout this rock and a few subidiomorphic grains of zircon.

This rock is perhaps most similar to 031385A, but the increased proportion of detrital quartz implies a mixed source involving a more silicic volcanic precursor compared to the dominantly feldspathic (andesitic) source for 031385A.

031389A

Mineralogy

- plagioclase
- quartz
- lithic fragments
- chlorite
- sericite
- zircon
- clinozoisite/sphene

This sample is most similar to 031385A and 031388A in terms of mineralogy and texture. It consists of angular quartz and feldspar grains (0.05 - 0.2 mm) with minor fine grained chlorite-rich and feldspathic lithic fragments in a very fine grained matrix. The matrix is dominated by xenoblastic feldspar and quartz, but contains a significant proportion of fine chlorite and sericite, and a fine granular, high-relief, high-birefringence phase. This is possibly clinozoisite, but may be mixed with some sphene.

There are also a few subidiomorphic grains of zircon and a few opaque (graphite?) grains scattered throughout the rock.

The similar mineralogy and texture of this sample to 031388A, in particular, implies similar source materials and a similar origin. They may well comprise part of the same unit.

APPENDIX 8

UPDATED AEROMAGNETIC INTERPRETATION
OF
BULGOBAC HILL EL 37/89,
BY
D. LEAMAN, OCTOBER 1991

112136

0135 LEAMAN GEOPHYSICS

Survey Review, Specification, Reduction, Interpretation
Gravity, Magnetic and Seismic Methods
Structure and Prospect Evaluation

Registered office:
3 MALUKA STREET, BELLERIVE, TAS. 7018
All correspondence to:
GPO BOX 320 D, HOBART, TAS. 7001
Telephone: (002) 44 1233
Fax: (002) 44 6674

INTERPRETATION UPDATE NUMBER 1
BULGOBAC HILL EL 37/89

for

PASMINCO EXPLORATION

by

Dr. D.E. Leaman

October 1991

BULGOBAC

SUMMARY

The present review, revision and update of gravity-magnetic and structural interpretation in the Bulgobac Hill EL indicates some interesting relationships within the northern part of the area.

A: HIGH POINT

The Mt Charter Fault in the High Point - Mt Charter area is a complex structure consisting of at least two NNW-trending fault zones and linking NW-trending elements. The fault zone elements have been very active during volcanic episodes and deposition of the local Cambrian sequence. There is evidence for substantial variation in unit thickness (both sedimentary and igneous) across the faults.

A locally deep marginal rift developed along the enlarged fault zone - which is itself marginal to a larger rift structure. The other margin of the gross structure was, at one stage, the Henty Fault.

Mafic volcanics are piled against the western, mapped part of the Mt Charter Fault and similar piles and changes are buried along the eastern arm of the Mt Charter Fault - about 1 km to the east. Piles and trend changes can be related to transverse features.

One such concealed pile occurs near the intersection of the Que River ENE transform (?) and the intersection of the eastern Mt Charter Fault. Drilling of the least active part of this margin is recommended in order to test the stratigraphy, level of mineralisation if any and yet avoid extreme depths and thicknesses of material in an initial hole. The target has been derived from a balance of trend, gravity, magnetic and existing geological information.

B: SOCK CREEK

Known mineralisation at Sock Creek appears to lie at the intersection of the linking WNW arm of the Mt Charter Fault system (which appears to be an old structure) and the local faulting at Sock Creek. The site, itself, lies close to the Que River transform and its regional setting may be important (below).

A first attempt has been made to use available, subtle, magnetic data to detect differences in sequences. This work has shown that it is feasible and that the local porphyries are variable and dip west. The assessment remains rudimentary but can clearly be improved with additional local data and consideration of the transform position and its relationship to the local faults.

C: REGIONAL CONCEPTS

An evolving view of the gross setting of mineralisation in this area is forming which relates classic continental rift environments - including repeated superposition of tension and rifts with offsetting and inversions - in the same general region between the late Precambrian and Devonian.

The first developments predate the Penguin Orogeny but others have provided depositional environments for various sequences of volcanics and sediments in a sequence of graben and half graben relationships with inversion and uplift events during the Cambrian. Slight rotation of the stress field from the west to north west during this period accounts for the rotation in rift axes from N-S to NE. Although the picture remains sketchy all significant mineralised sites can be associated with rift margins (of various ages) and transforms.

INTRODUCTION

These update notes expand, detail and revise work previously reported by Leaman (1990) and (1991).
The first reference considers some of the regional implications of the large magnetic anomalies in the region and which have sources at moderate to large depths while the second considers some implications specific to the drilled High Point area. The aim of the latter was to check whether basalts occurred on both sides of the Mt Charter Fault and whether any thickness changes were implied.
Both studies were very preliminary but suggested that some additional data would be beneficial. It was established that magnetic data would provide assistance in appraisal of this complex area (High Point).

Gravity data were also thought to be essential for sound appraisal and might also provide a crisp view of the primary structures and trends in the region. Such a view was necessary since the extant aeromagnetic data suggested trends never previously detected in a subtle magnetic field with a large or deep source and negligible surface-derived character.

The present notes provide a first interpretation, albeit uncontrolled, of new gravity surveys and ground magnetic traverses which extend beyond the confines of aerial coverage in the High Point area. Both data sets are specific to the far NE of the EL only. Limits are still imposed by the current coverage but the substantial advances made and implied are described below.

HIGH POINT AND SOCK CREEK AREAS

Previous drilling in the vicinity of the Mt Charter Fault, as mapped and labelled by Komyshan (1986), has proven that the structure was active during mafic volcanism and subsequent deposition of shales. Varied thickness developments and interleaving of units is suggestive of growth faulting. All drilling has been concentrated in the area near 388 000 mE, 5392 500 mN. The fault zone has also been found to be complex and up to two hundred metres across.

The area is covered by a detailed aeromagnetic survey by Pasminco Exploration (reported by Leaman, 1990). Unfortunately the survey was terminated at, or very close to, the EL boundaries and the very large, long wavelength anomaly observed to the west of this area obscures true base levels. None of the local rocks are of high contrast and the magnetic field is subtle in character. Several gradient distortions are evident, however, and most of these are shown in Figure 3. These gradients are generally oriented NNW or ENE. Upward continued magnetic data, combined with the 1981 Mines Department survey, reveal the regional extent of some of these features and the limits of the large anomalies. These limits, or primary gradients, are also shown in Figure 3.

Gravity data provide a means of uniting these indicators and the extant geological control. Much of the area between the Mt Charter Fault, as mapped, and the Henty Fault is regionally positive in terms of residual anomalies. The zone, which includes Que River and Hellyer, contrasts with the surrounding areas which are negative. It is interesting that the regional magnetic responses are actually negative where the gravity is positive and this demonstrates that the origin of the fields is related to different geological elements; not simply a mafic pile.

Regional considerations and review of all previous interpretations provided for this area - as reported to Pasminco Exploration - indicate that the large magnetic anomaly to the west is related to ultramafic bodies in the section. These appear to be absent, or very much deeper, east of the Mt Charter Fault. The reduced gravity anomaly implies thinner Cambrian deposition to the west in association with the magnetic sources. This is consistent with the strong magnetic contrasts of the Eocambrian mafic and ultramafic sequences and the known densities of all Cambrian and Precambrian successions.
The regional anomaly pattern implies a thickened and denser sequence east of the Mt Charter Fault (to the Henty Fault). A possible Cambrian rift.
The increased residual anomaly may reflect presence of thick shale sequences or thickened mafic and general volcanic sequences. None of these formations possess any significant magnetic properties although the basalts can be discriminated in many instances even though the contrast is subtle. This has not been possible here due to the limited coverage of detailed magnetic survey. Possible residual

effects related to basalts near the highway can be inferred but these cannot be assessed since the anomaly cannot be fully defined.

Gravity data provide a much better approach since there is adequate regional coverage and limited areas of detailed coverage. The gravity data base defines a major local positive anomaly about 1 km east of the Mt Charter Fault. Most of it lies north of the Bulgobac EL and it extends southward toward Mt Charter.

It has been possible to model known geology, based on mapping and drilling, near the Mt Charter Fault and work eastward. Four models are shown in Figures 1 and 2 for E-W lines 500 m apart. Control is only available for the southern lines. Other components of the model have been inferred from unit distribution, lithology and pattern as shown by Komyshan (1986).
Densities used are based on observations from various sources and involve no extended presumptions. In each case, given the depth ranges and density assumptions employed the model fit criterion is +2 mGal and it is not difficult to consistently recover this shift.

At 5392 000 mN the observed data can be adequately fitted with no special features and thicknesses which are compatible with drilling. The mass balance does, however, depend on the felsic volcanics exposed in the fold.
This mass balance is stressed at 5392 500 mN where the mafic volcanics must be thickened near 389 000 mE. If the thickness of felsic volcanics is retained then the mafic pile shown represents the minimum volume. Drilling has shown that the units are variable at the Mt Charter Fault. The major thickening must be east of the fault and not close by. Review of the surface mapping shows that a pod of mafic lavas has been mapped near this northing. Modelling suggests that it thickens down limb. All models show that the denser rocks dominate in the other limb although the effect is not well defined and may be related to mass concentration in the syncline.
Similar effects and patterns can be inferred in more northern sections as shown in Figure 2. These are much more definitive and imply an increasing thickness of mafic volcanics northward. Even allowing for a conservative increase in shale density to the maximum feasible without mineralisation the basalts remain anomalous. The thickness indicated remains the likely minimum.

The pattern of the interpretation implies that the most active faulting during volcanism, if not deposition of the shales, occurred east of the clearly recognised Mt Charter Fault. Both felsic and mafic sequences may be involved.

Review of the all elements, including the gross regional trends, occurrences of dolerite (Cambrian?) and thickness variability north of Mt Charter - in both shale and basalts (e.g. near 389, 5393) - indicates an active growth fault system. The known Mt Charter Fault represents only one part of this; the western margin, although sympathetic fracturing may have occurred further west (see trend pattern) without any further development. The major rifting and extension is apparently east of the concealed fault, or developed along it, and opening out to the north. Complex volcanic piles and files are likely in this active environment.

I interpret this structure to be the active margin of a rift system. The mapped location of faults in this area represent rejuvenations of parts of it and the NW-SE link west of Mt Charter is part of more recent evolution.

It is interesting also to note that alteration near and north of Mt Charter is associated with this active zone which is now merely the site for two small streams. The dolerite of this zone also implies intra-depositional activity prior to deformation.

Only the funnel portion of the active rift can be assessed within the Bulgobac EL. This appears to be an important zone. Why has the structure fanned or split into several steps? Why do the regional gradients wrap around to the NNE and appear to extend toward the possible extension of the Jack Fault? Is the funnelling related to the inferred existence of a transform intersection as marked by the major ENE trends. The economic significance of this is evident at Que River, as are rejuvenations of the trend.

I conclude that the corridor was active and mineralised and that its intersection with an active rift margin during volcanism must make it highly prospective. This zone should be drilled.

These conclusions were reported by Memo on October 9.

Subsequent acquisition of ground magnetic data at line positions 8200, 8600, 9000 and 9400 N (see Figures 7, 8 and 9) with extensions east of the highway have enabled some comparison and integration with gravity data and compensation for the termination of the aerial coverage near the road.
The observed profiles are presented in Figures 4, 5 and 6 and are fully corrected for diurnal and base effects. The nominal station spacing was 12.5 m.

Figures 4 and 6 were based on the gravity concept and drilling control at HP3. The gravity models have been based on more extensive coverage and all existing drilling has been utilised.
It was found possible to account for the level and character of the observed profiles using a curve fit shift of 30 nT and credible, demonstrable properties for the mafic volcanics.
Consideration of the regional magnetic effects (Leaman, 1990), however, shows that this cannot be correct since it ignores the fact that these four profiles are parallel to each other and the regional anomaly grain. A dip line along 3500E is necessary to evaluate the base offset incorporated in each line modelled but this is not available.
The aerial data was used instead by selecting a profile whose position overlaid that of 3500 E (see Figure 7) and from this it was possible to estimate the regional gradient approximately as about 5 to 7 nT per 400 m. If allowance is now made for this base offset in each of the lines modelled some minor revisions are possible.

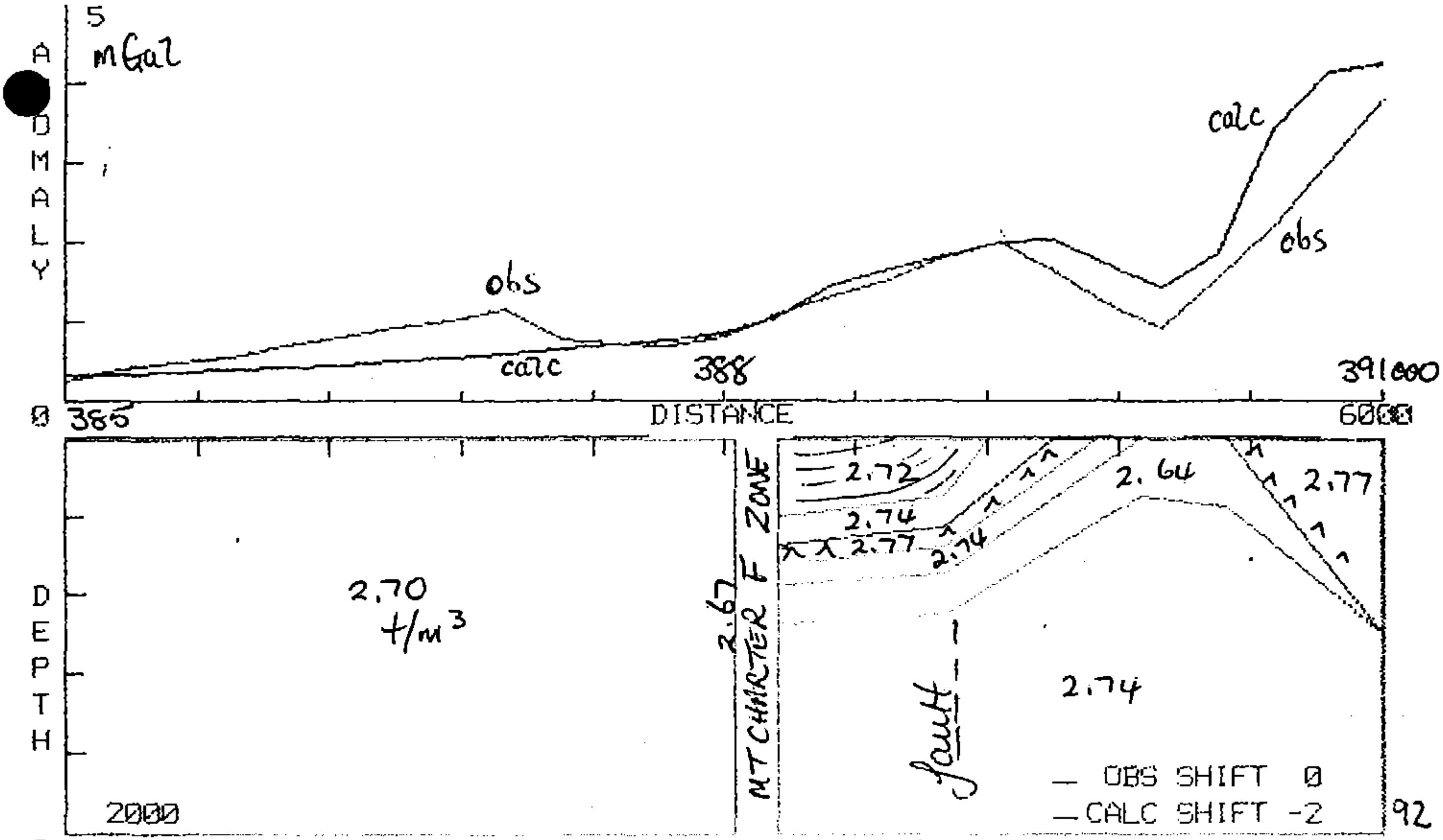
These are suggested in Figure 5 and may be compared with the original presumptions of Figure 4. The calculated shift offset augments by about 5 nT per line and this forces both a change in implied contrast and some variation in geometry of the mafic mass. In each case the contrast becomes consistent (and hence more credible than forced line by line variations) and the form is systematic.
In summary, the shift offset of 30 nT can only apply to the northern line (9400N) and an offset of 45 nT (at least) is required for the southern line (8200N). 9000N was not varied due to the small scale of changes implied but the presented model is not quite consistent with the others as a result. There is no value in over detailing at this stage since all the other assumptions employed may be found more seriously wanting after test.

The primary, original interpretation is summarised in Figures 7, 8 and 9. These diagrams present the estimated depths of the upper and lower surfaces of the mafic pile as though it were a smooth envelope (unlikely) and the likely thickness as isopachs.
Each diagram represents a balanced judgment based on all the information available. Some minor conflicts between the models and data sets have been integrated on the basis of consistency and some important warnings may have been missed.

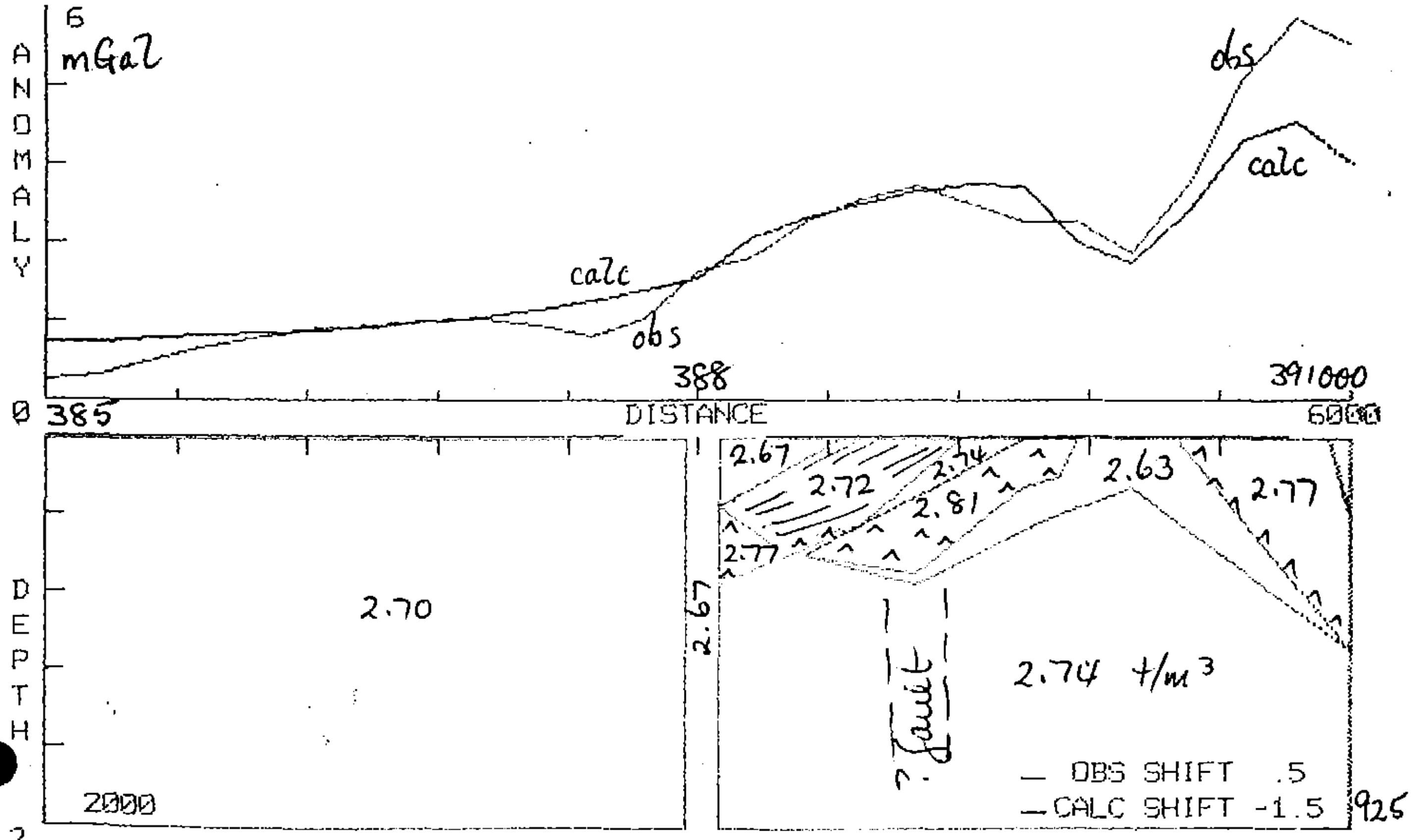
Figures 7 and 9 provide the essential summations for initial drilling purposes. These reveal that some deep drilling might be necessary but that the main volcanic piles are located along the two arms of the Mt Charter Fault. The largest is located near the edge of the EL within the Que River transform corridor. A vent is indicated.

Initial drilling should, in my view, seek to avoid the vent position for two reasons; the hole will need to reach more than 1200 m in order to test the sequence, and rapid volcanic accumulations of this type are likely to have led to dispersed mineralisation rather than ore body concentration. The close relationships between shale and basalts near the Mt Charter Fault imply rapid deposition and very active volcanism with perhaps little opportunity for accumulation of sulphides in either sequence.
Figures 7 and 9 show, however, that it would be possible to test the complete stratigraphy and any mineralised elements with a much shallower hole located near 389 100 E, 5393 600 N. This site remains in the presumed mineralising transform corridor adjacent to the vent and directly above the eastern arm of the Charter rift.

Some comment is also necessary about the spiky character of some of the magnetic profiles. Some of this response is due to the exposure or virtual exposure of the basalts. In other cases it appears to be related to flexure positions which seem to lie close to the eastern arm of the Charter Fault and rift. It is possible that there is additional fracturing in this belt and that oxides and fluids have passed into the structures. This would certainly generate such a pattern. The effects may also rim the vent position and may mark some type of alteration halo. The proposed drill site will also test these possibilities.



5392 000 mN

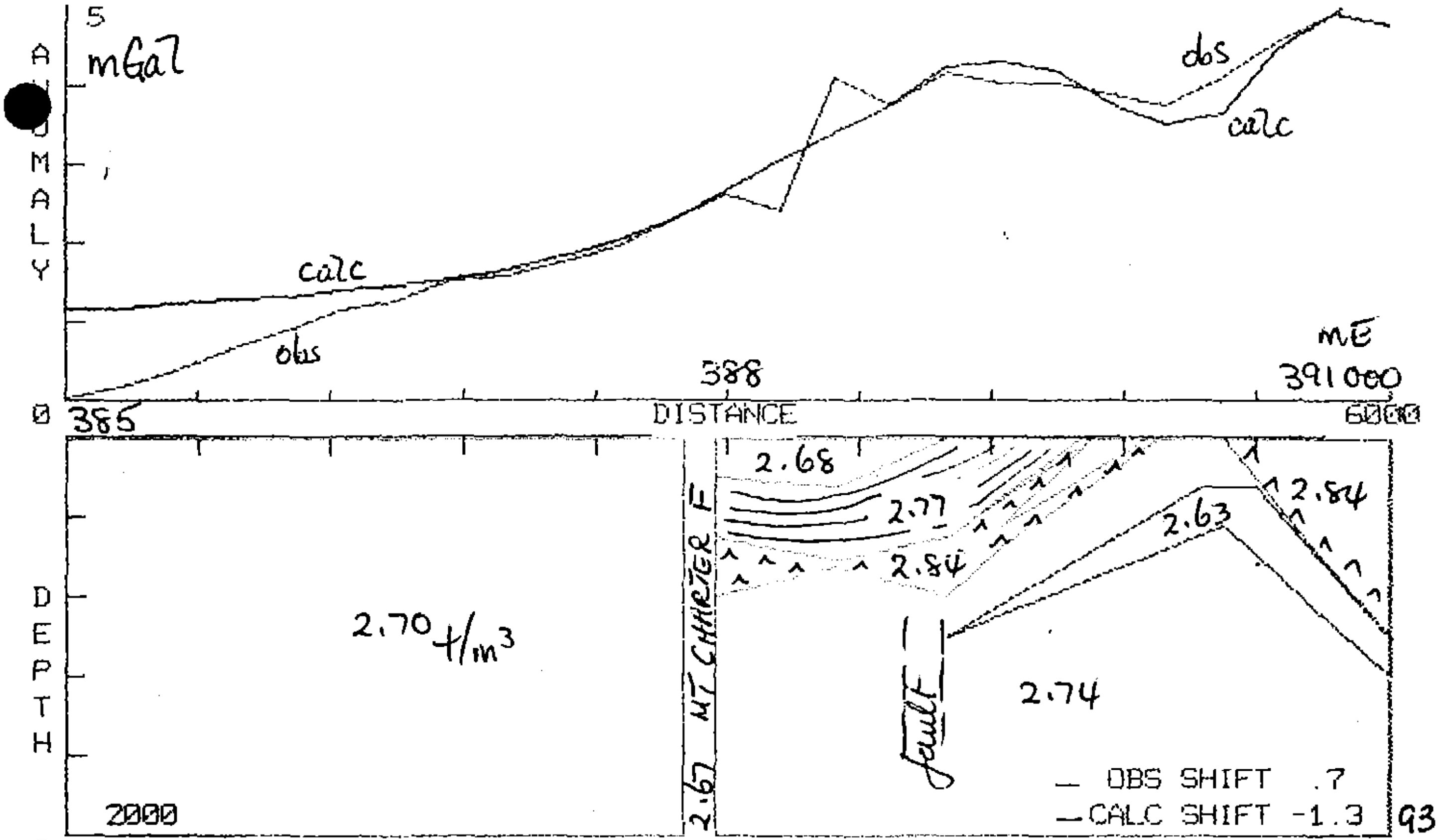


5392 500 mN

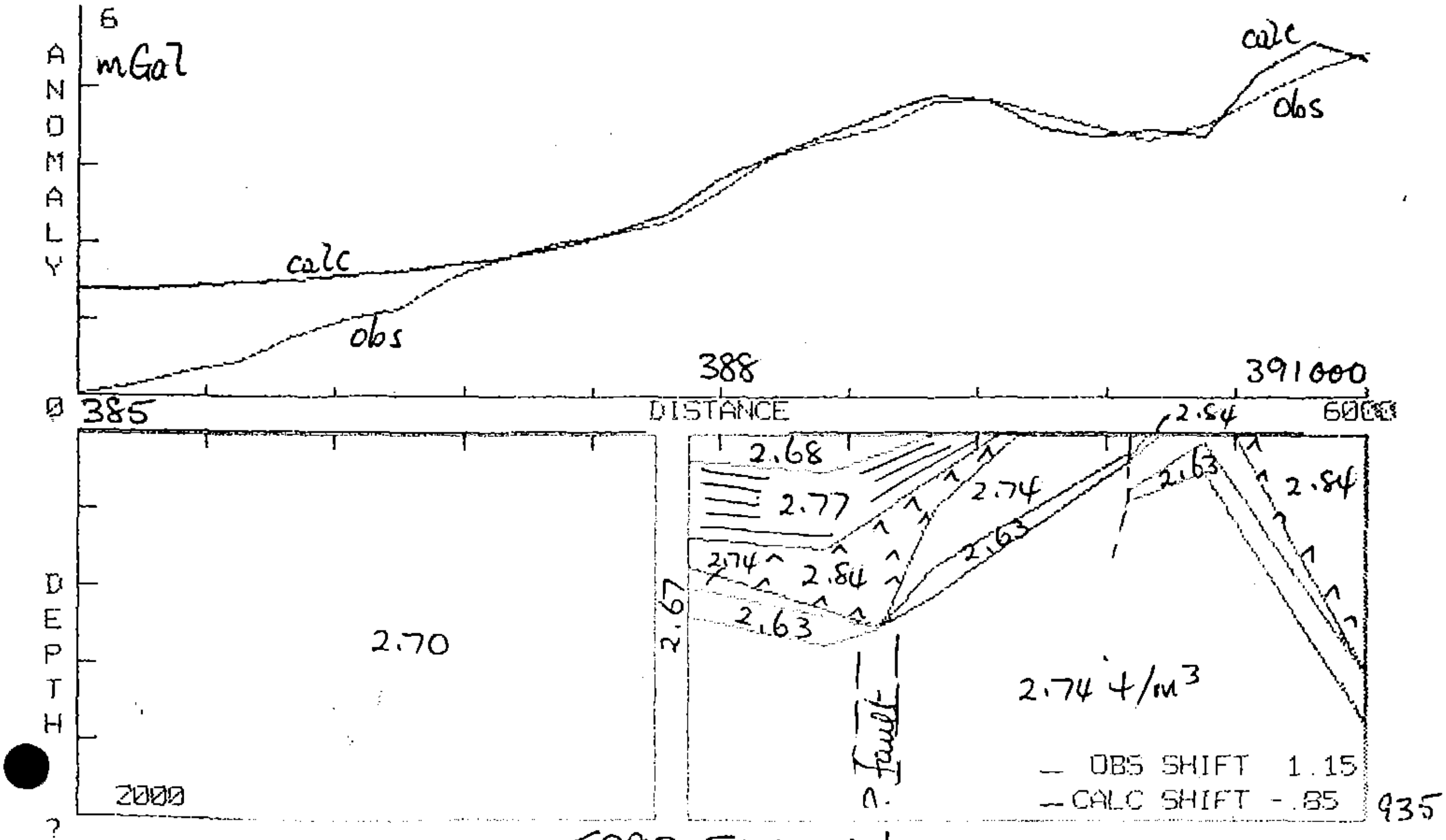
oct 91

GRAVITY INTERPRETATION

FIGURE 1

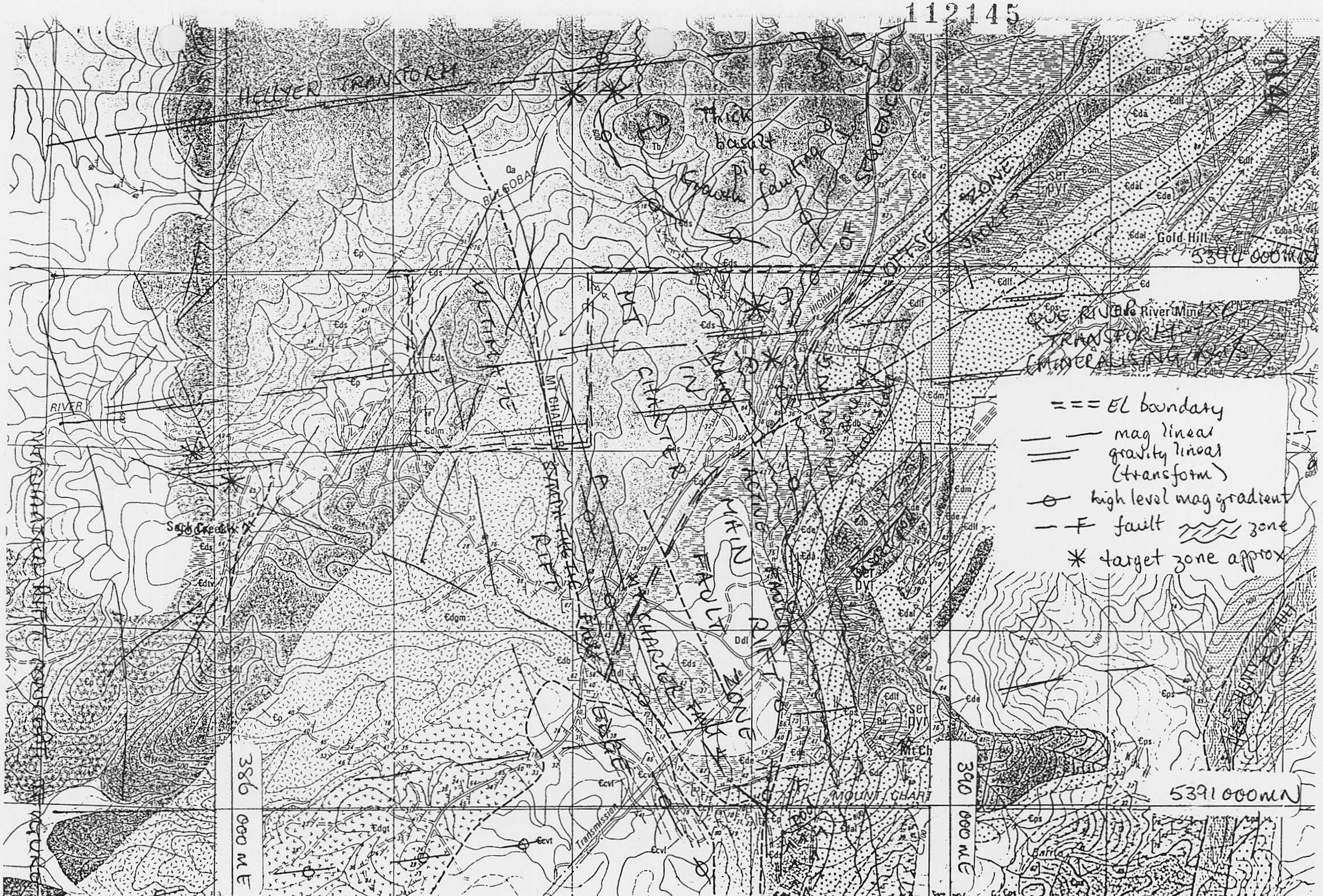


5393 000 mN



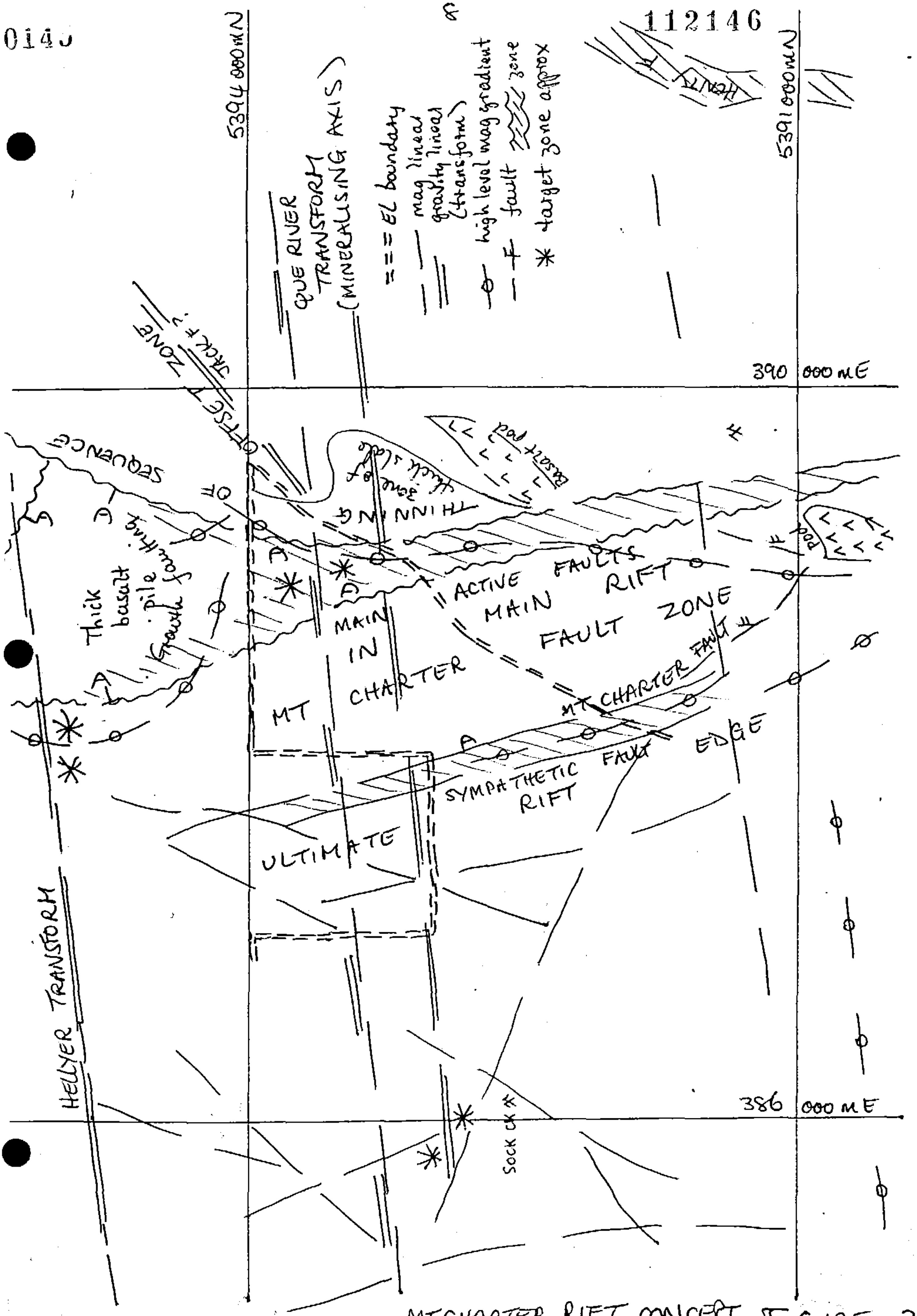
5393 500 mN

DG Oct 91 GRAVITY INTERPRETATION FIGURE 2

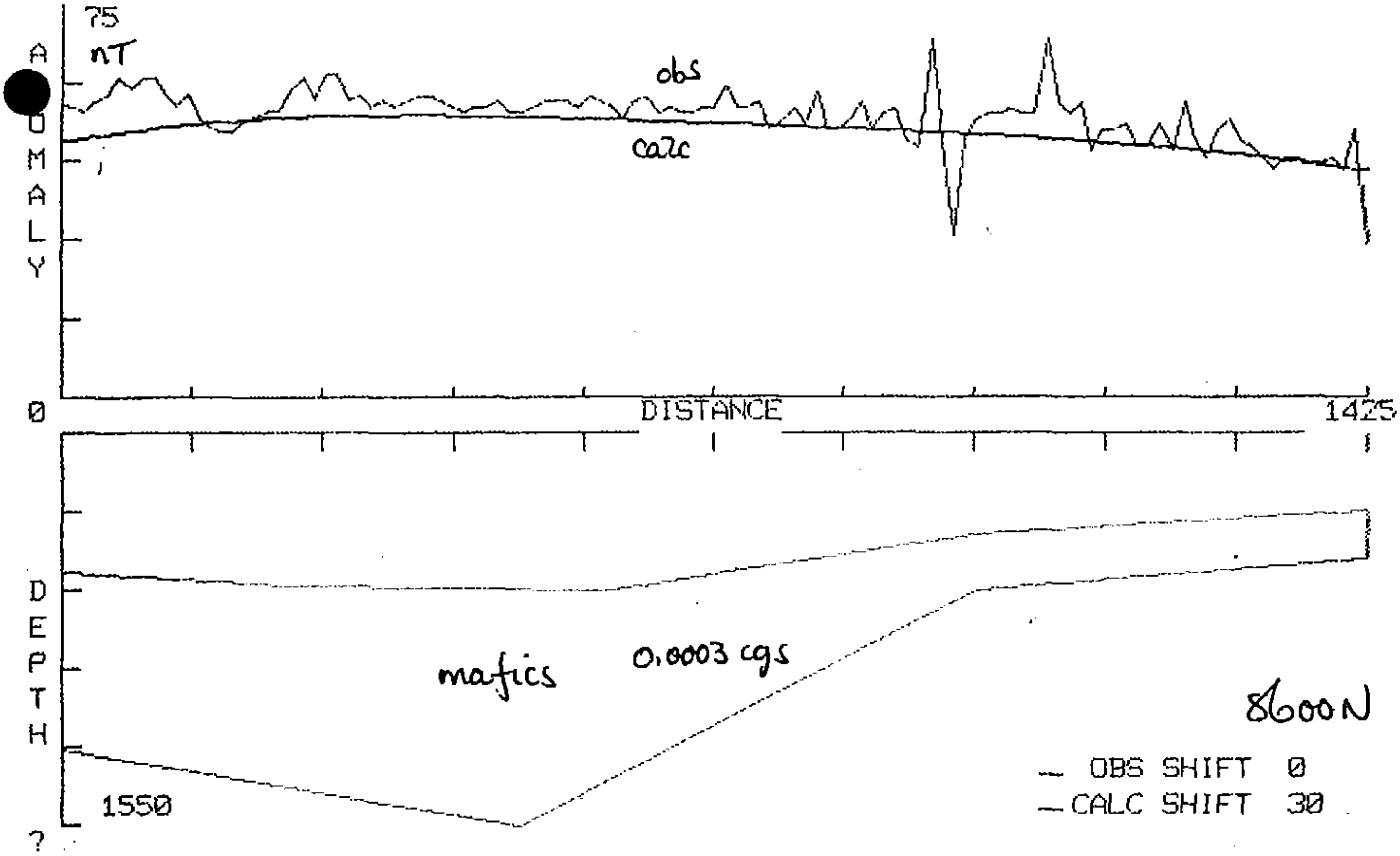

HELLYER TRANSFORM
thick basalt pile
growth faulting
OFFSET ZONE
Gold Hill
5394 000mN
Que River Mine
QUE RIVER TRANSFORM
(MINERALISING AXIS)
=== EL boundary
mag linear
gravity linear (transform)
high level mag gradient
fault
zone
target zone approx
MT CHARTER RIFT ZONE
MAIN FAULT
CHARTER FAULT
RIFT EDGE
Bulgobac
Mt Charter
River
386 000mE
390 000mE
5391 000mN
Mount Charter
Transmission
ser pyr
Ꞓdlf
Ꞓds
Ꞓp
Ꞓdgm
Ꞓcvl
Ddl
Tb
Qa

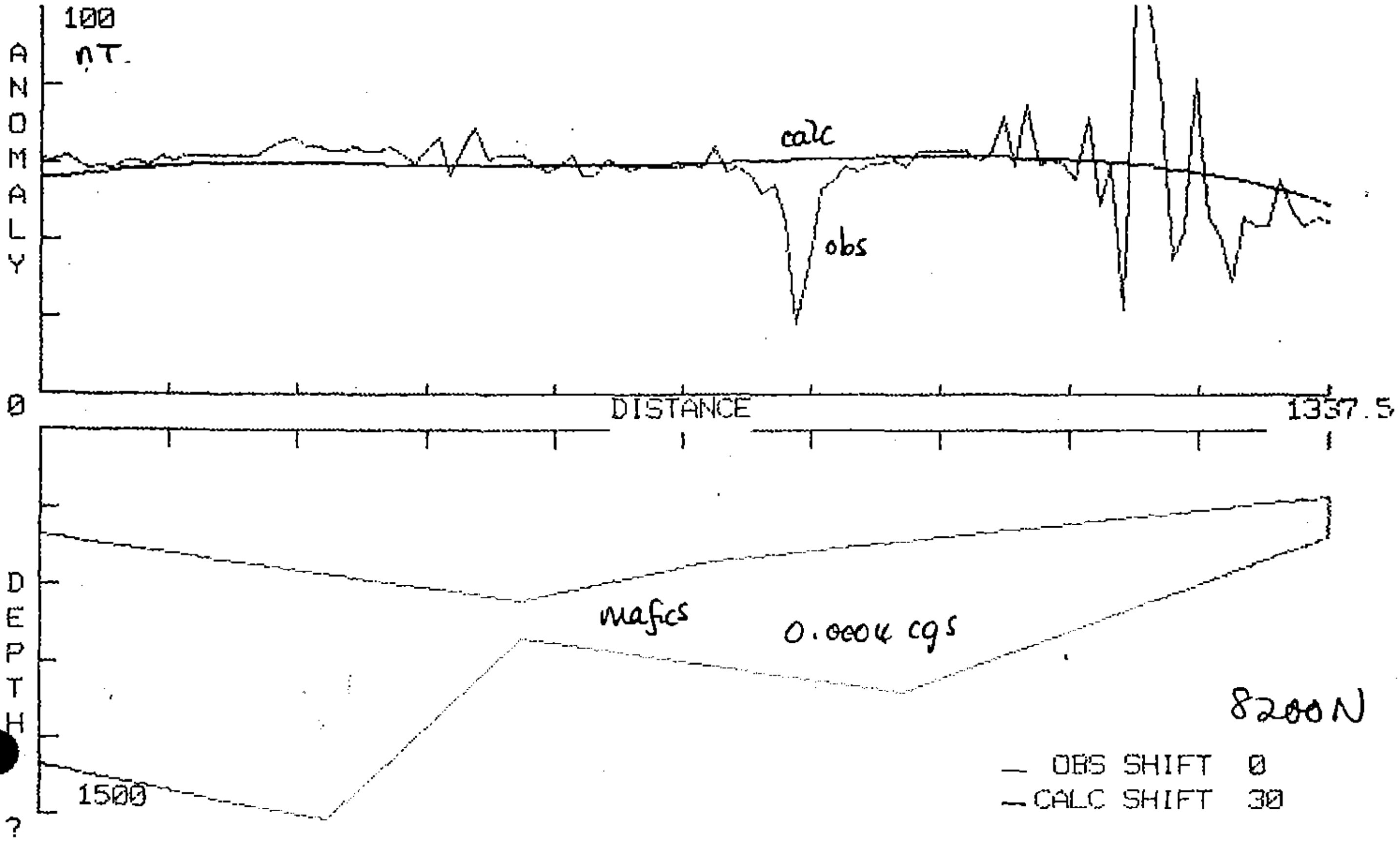
0145

112146



MTCHARTER RIFT CONCEPT FIGURE 3

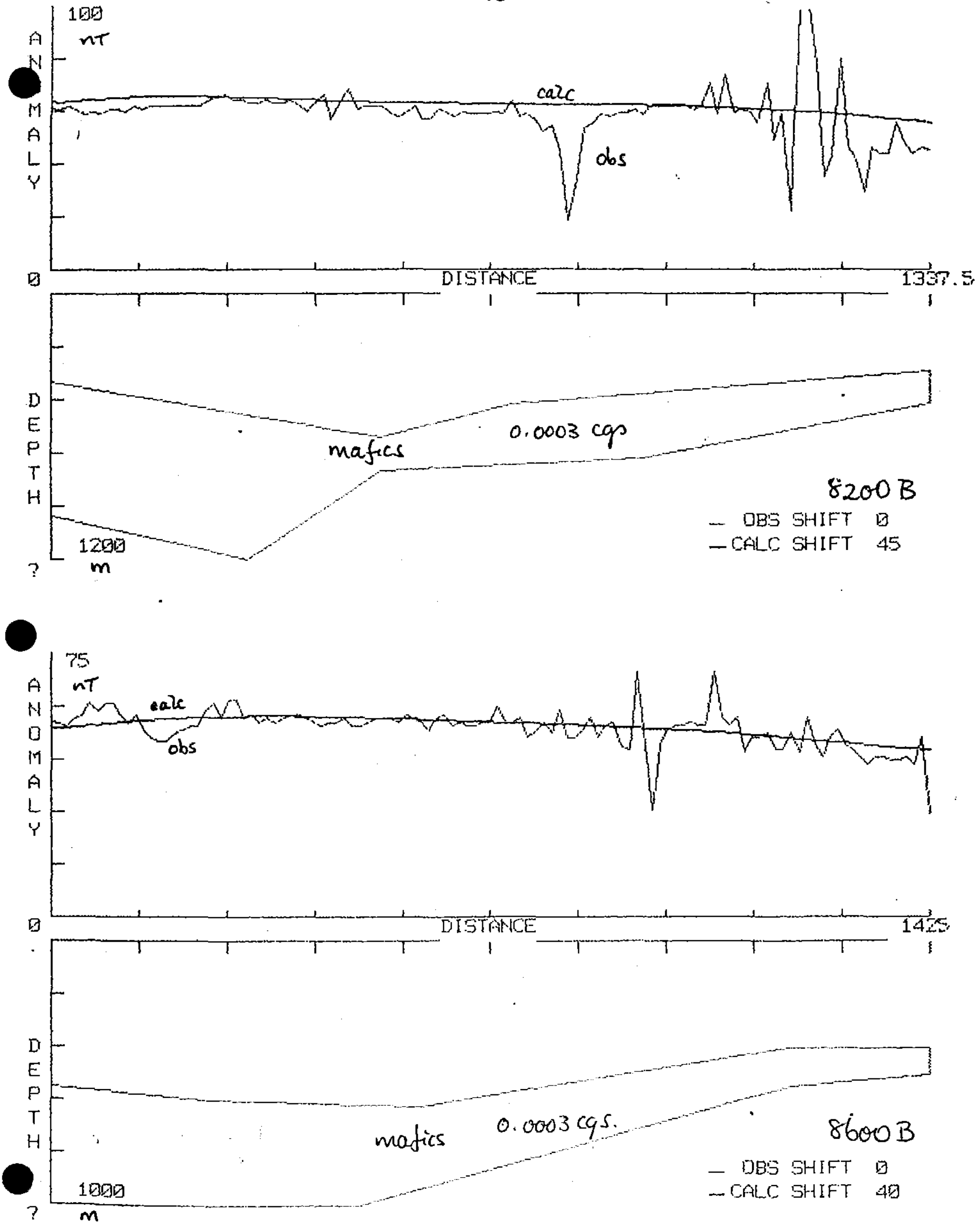




DE Oct-91

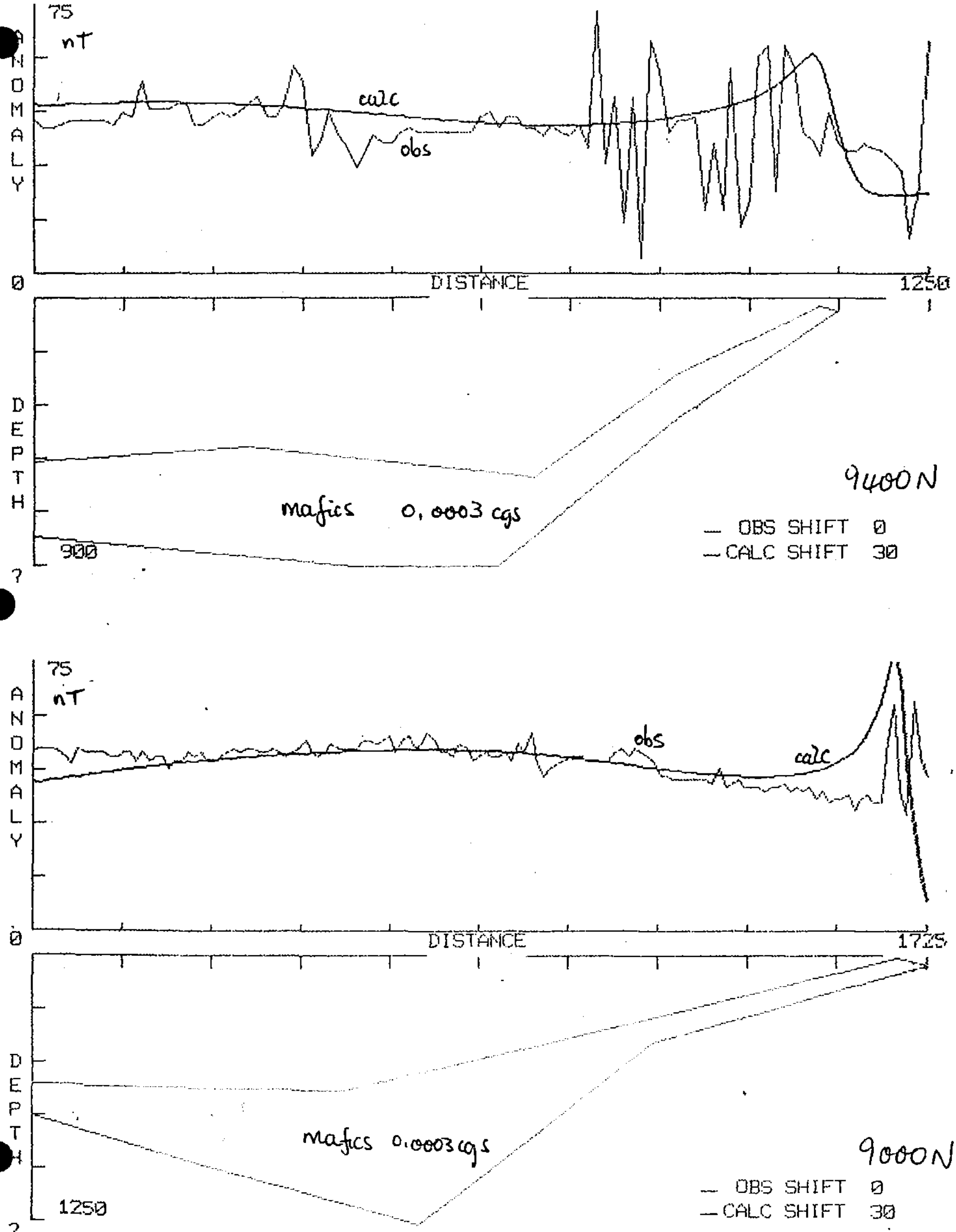
MAGNETIC INTERPRETATION

FIGURE 4



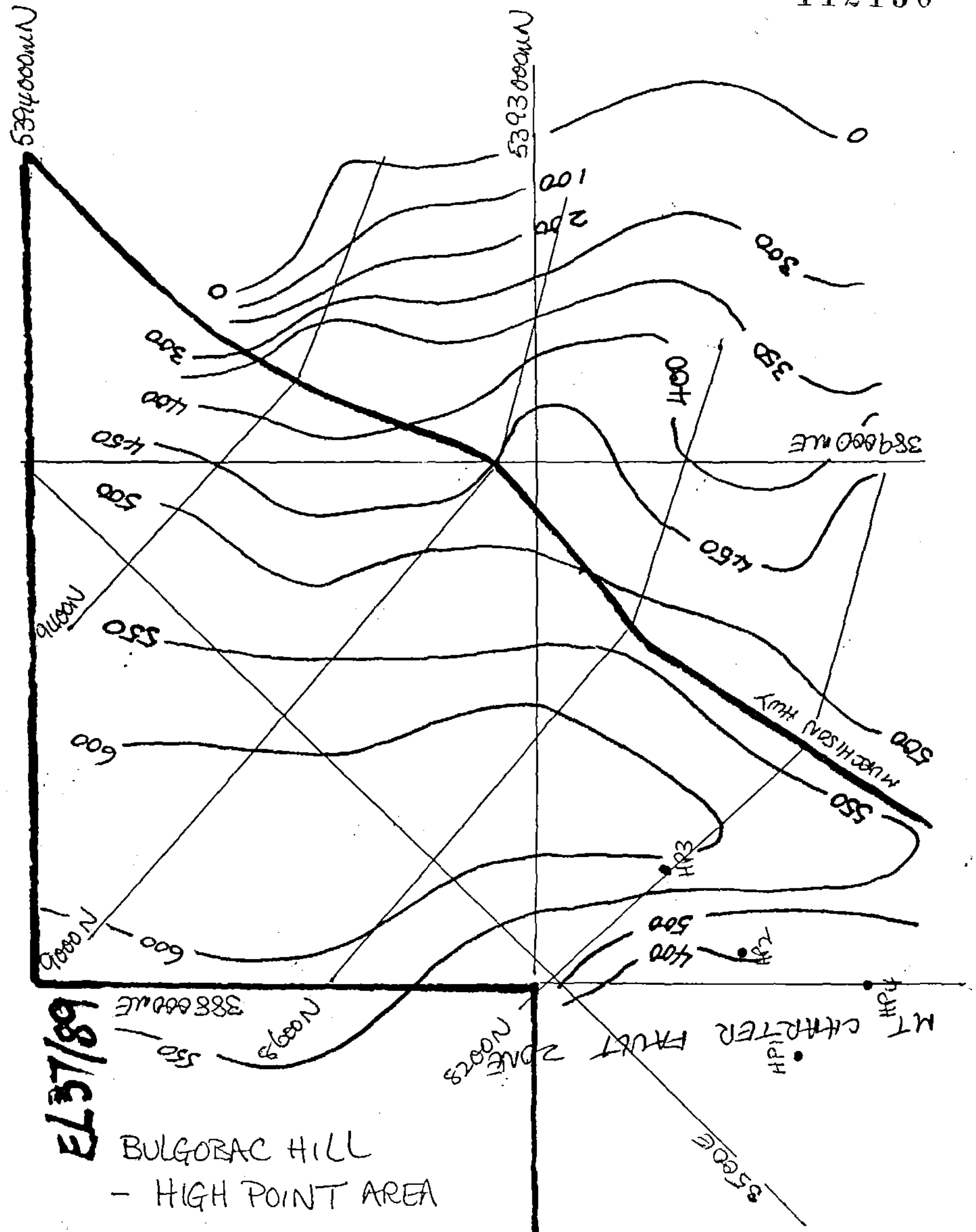
MAGNETIC INTERPRETATION FIGURE 5

11



TE Oct 91

MAGNETIC INTERPRETATION FIGURE 6



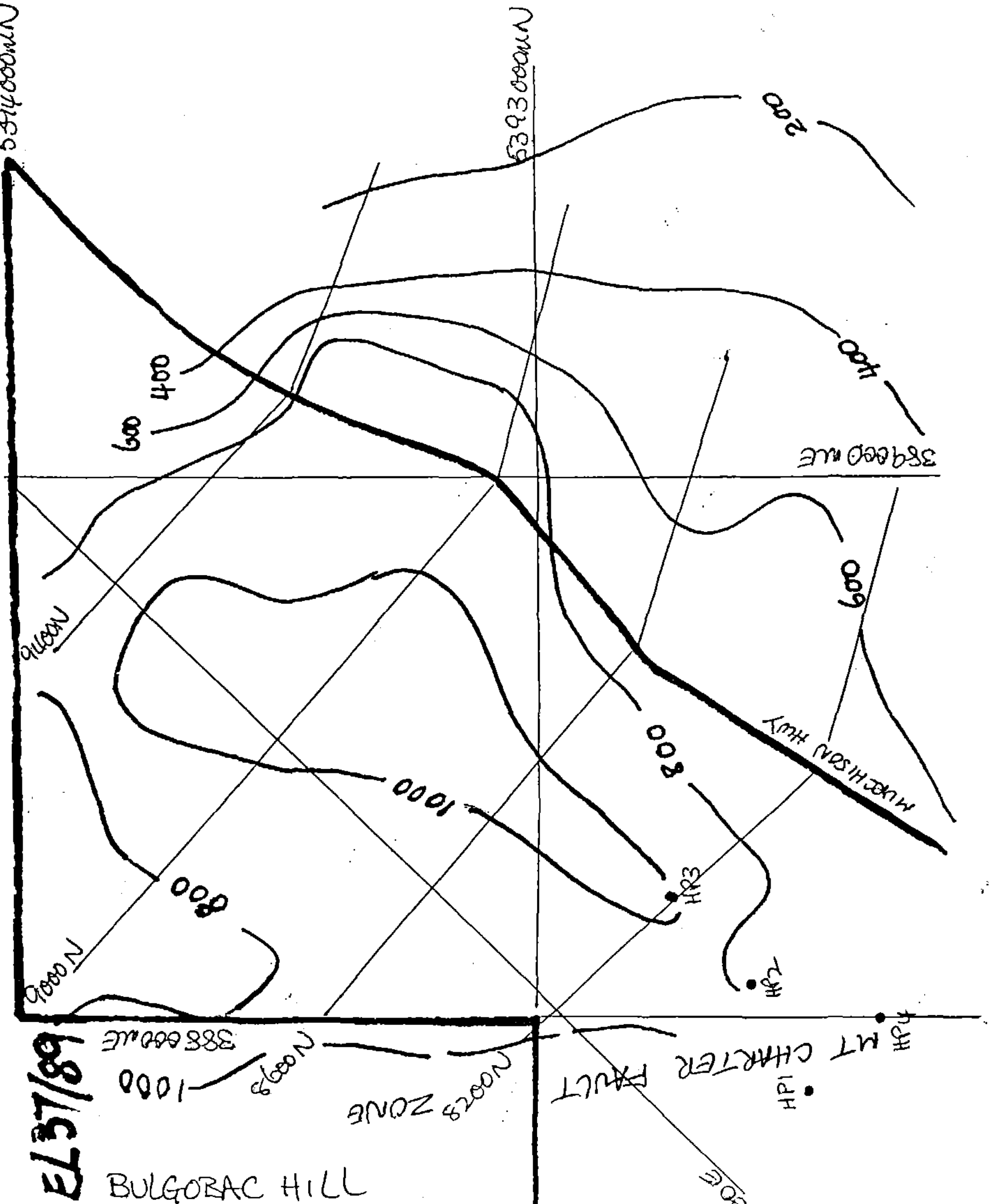
BULGOBAC HILL
- HIGH POINT AREA

INFERRED DEPTH BELOW SURFACE - UPPER MAFIC VOLCANICS INTERFACE

Current approximate/gen. uncontrolled interpretation

Oct 91

FIGURE 7



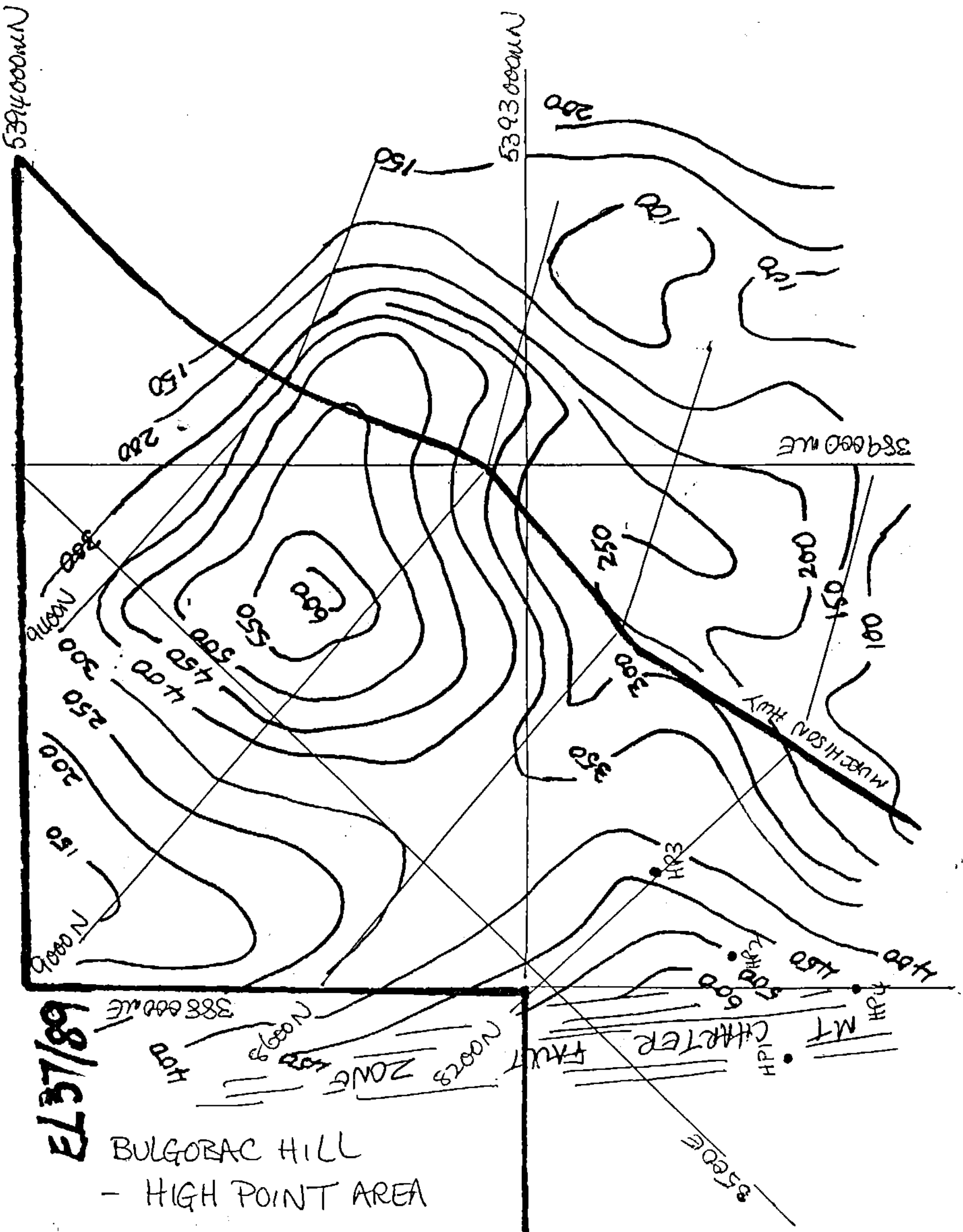
BULGOBAC HILL
- HIGH POINT AREA

INFERRED DEPTH BELOW SURFACE – LOWER MAFIC VOLCANICS INTERFACE

Current approximate/uncontrolled interpretation

DG Oct91

FIGURE 8



BULGOBAC HILL
- HIGH POINT AREA

INFERRED THICKNESS OF MAFIC VOLCANICS (m)

DIAGRAM based on current interpretation of local gravity and magnetic data. Subject to revision.

(Estimates based on all gravity & magnetic indications, and may not be wholly consistent with top/base contour plans) Oct 91

FIGURE 9

SOCK CREEK

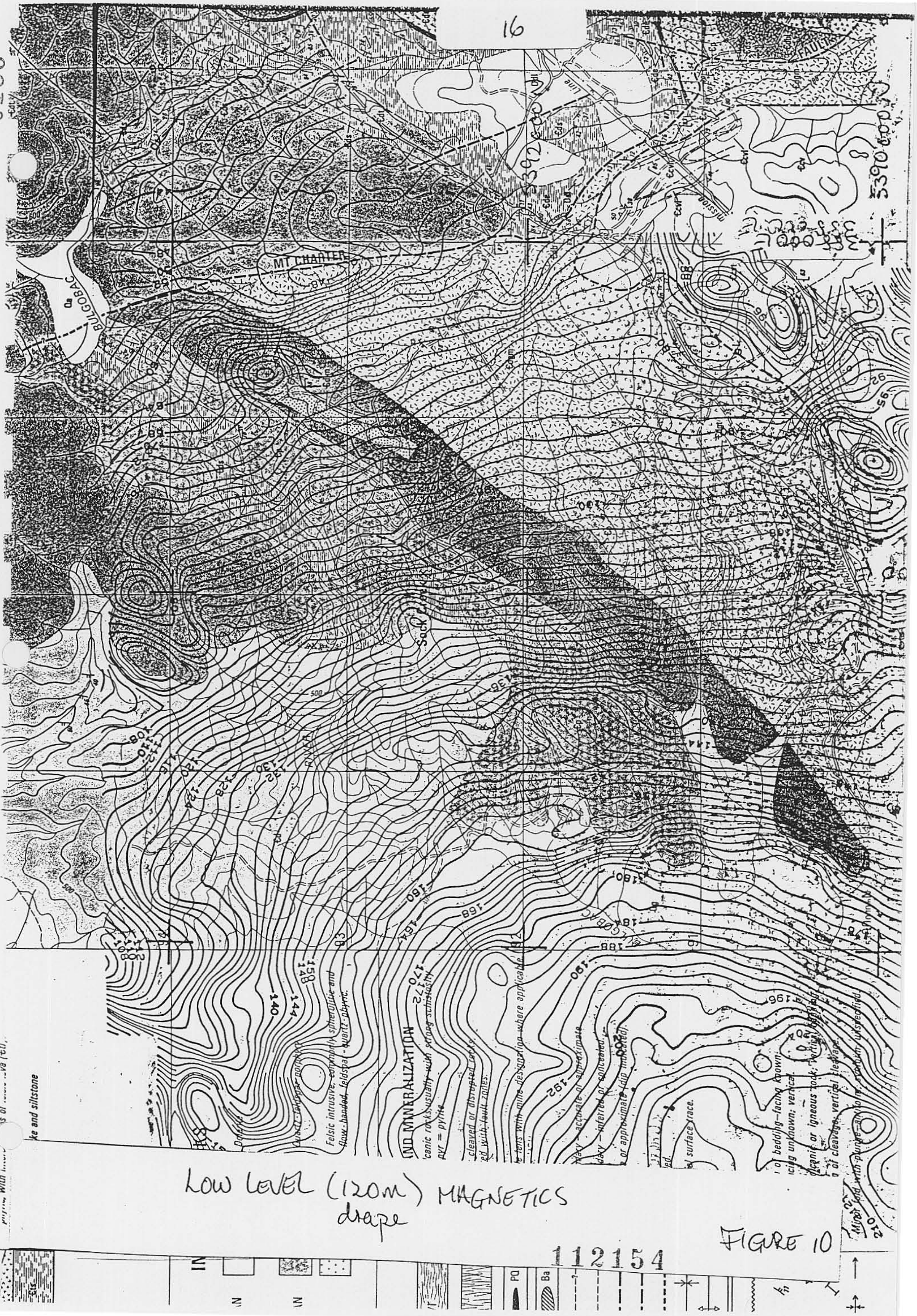
Figures 10 and 11 present low level (120 m drape) magnetic data and high level continuation (1300 m ASL) data in the Sock Creek area using the only basemap available to me (Komyshan, 1986). It will be noted that the gradients within the high level data totally ignore any mapped surface trends and are more consistent with some of the variations noted in the low level data (NNW) which also largely ignore the surface geology.
Leaman (1990) presented a first derivative presentation which showed that the NW elements of the Mt Charter Fault as mapped near High Point persist across the region to a point a little north of Sock Creek and this position and orientation is reflected by local drainage. The change in trends associated with these large faults must reflect some underlying or imposed controls and a NW-SE trending feature must be present. Unfortunately there is no gravity data coverage available which might shed light on these structures.

It is, however, relevant to note that the two holes of the old Sock Creek drilling programs to show significant traces of mineralisation (SK3, 5) are located on the projection of such a NW trend near the intersection with the local faults at Sock Creek itself.
Figure 3 suggests that the site might have potential since it lies in or near the Que River transform corridor - if only the local controls were understood. The presently inferred trends are summarised in Figure 3 and the critical node may lie a little north of the prospect.

Given that this area may well justify further examination I have reviewed what can be done with the existing data in order to assess the feasibility of making a useful interpretation were the detail to be improved.
There is no doubt that there is much to be gained from improving the gravity coverage as discussed in the following section on regional setting. The site is located at the margin of a relatively positive feature comparable to the larger Hellyer-Que River block and is structurally distinctive in a regional context. This coupling of setting with fracture nodes and established trace mineralisation should stress its value as a worthy prospect.

The only substantial data set presently available is the aeromagnetic survey and I have selected two dip lines (in terms of the anomaly itself) which extend across the area from SW-NE. The coordinates are labelled in Figure 12.
Each profile was sampled in detail and plotted at large scale in order to expose any base level patterns in each constituent variation on the gross effect. It must be noted that the major Anomaly has an amplitude of about 200 nT while the variations rarely exceed 10 nT.
Virtual residual profiles were extracted and are shown, with an interpretation, in Figure 12. There are undoubted imperfections in this process but viable results have been achieved which should not be underestimated or overinterpreted. It is clearly possible to map variations in the sequence, whether porphyries or not, and infer dips. More extensive application of magnetic data is feasible.

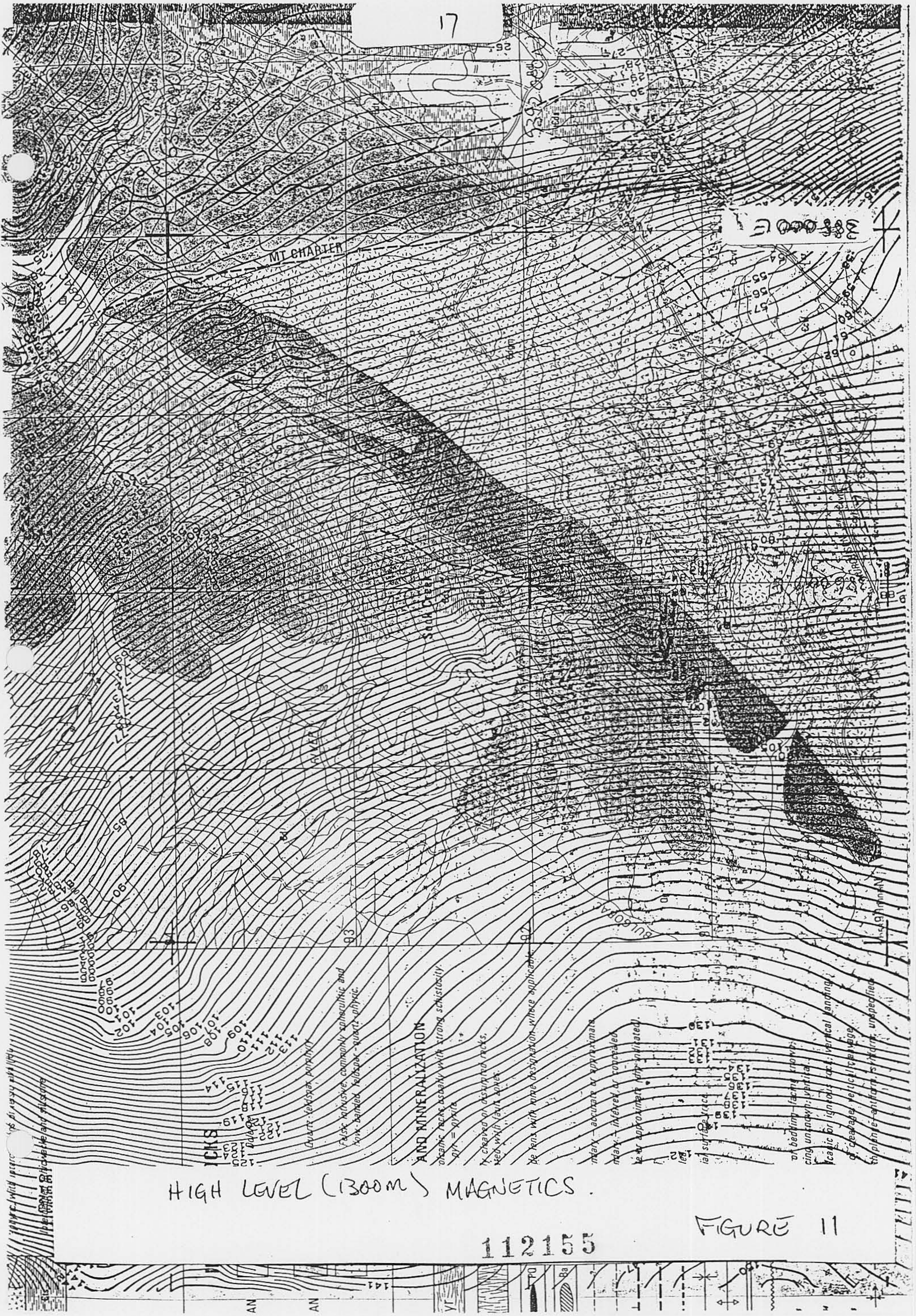
0153



LOW LEVEL (120M) MAGNETICS
drape

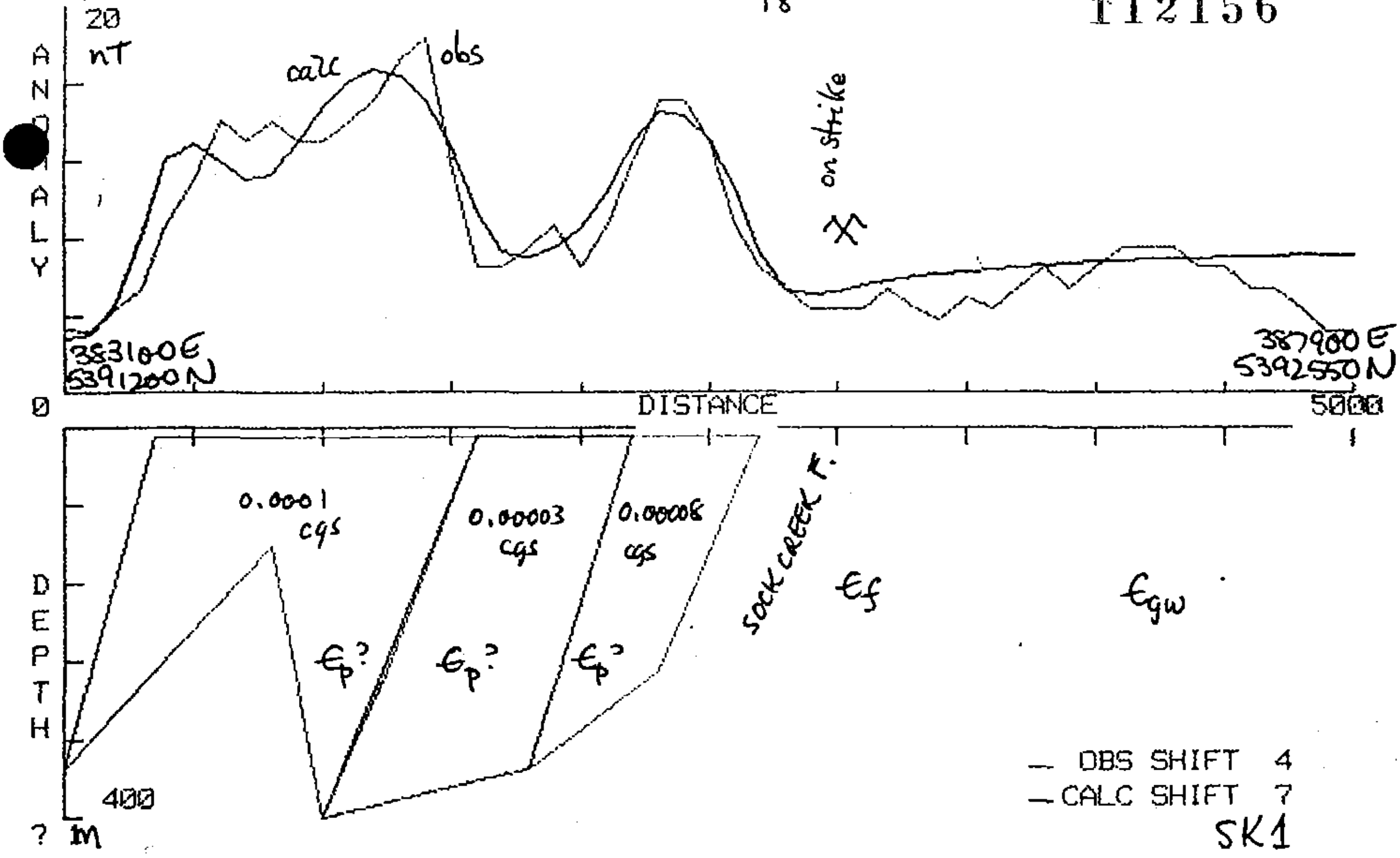
FIGURE 10

112154

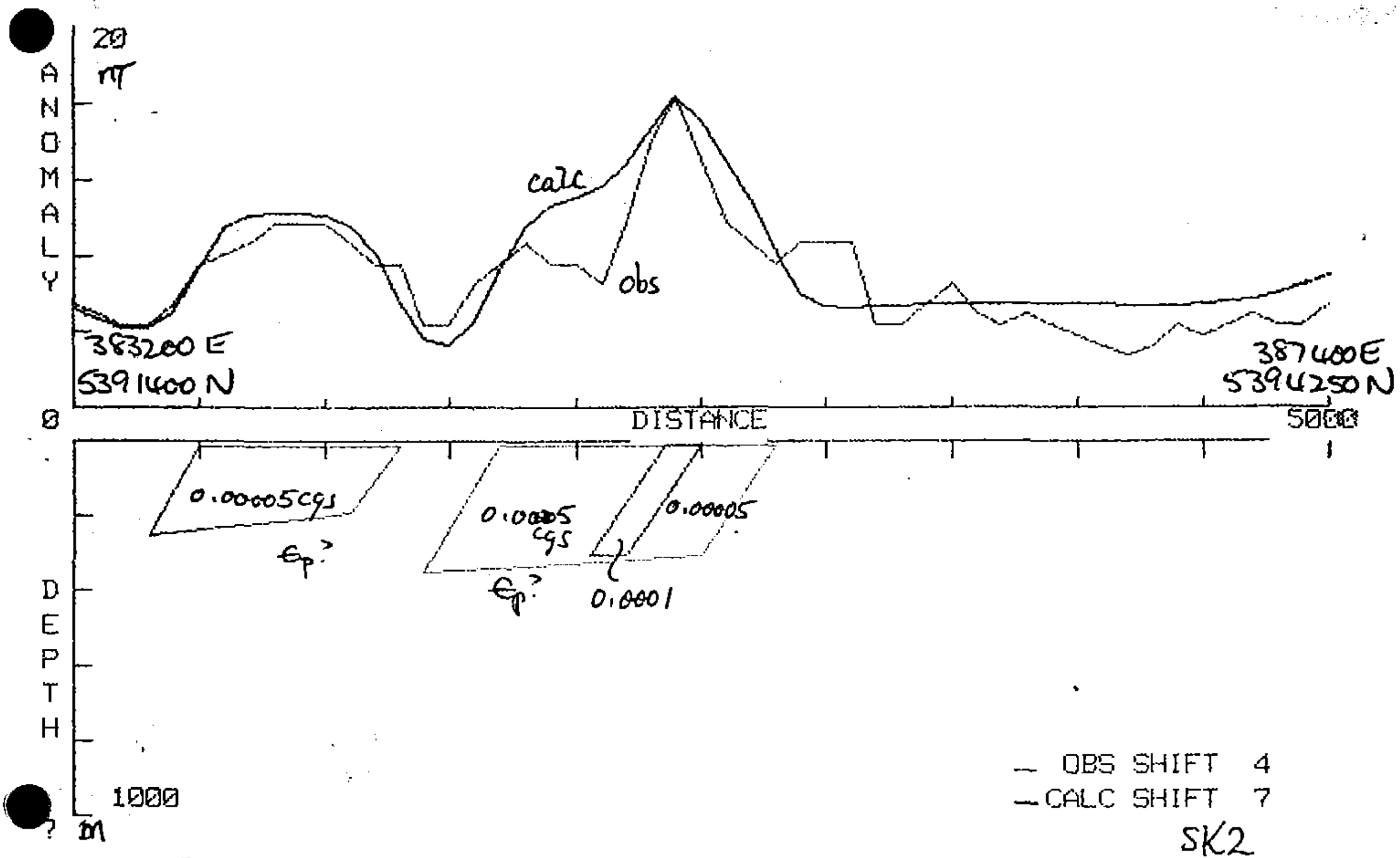


HIGH LEVEL (1300M) MAGNETICS.

FIGURE 11



SK1



SK2

oct 91

MAGNETIC INTERPRETATION FIGURE 12

REGIONAL CONCEPTS

The following comments attempt to summarise current thinking on the implications of long line modelling in the region and the nature of setting controls upon mineralised sites.

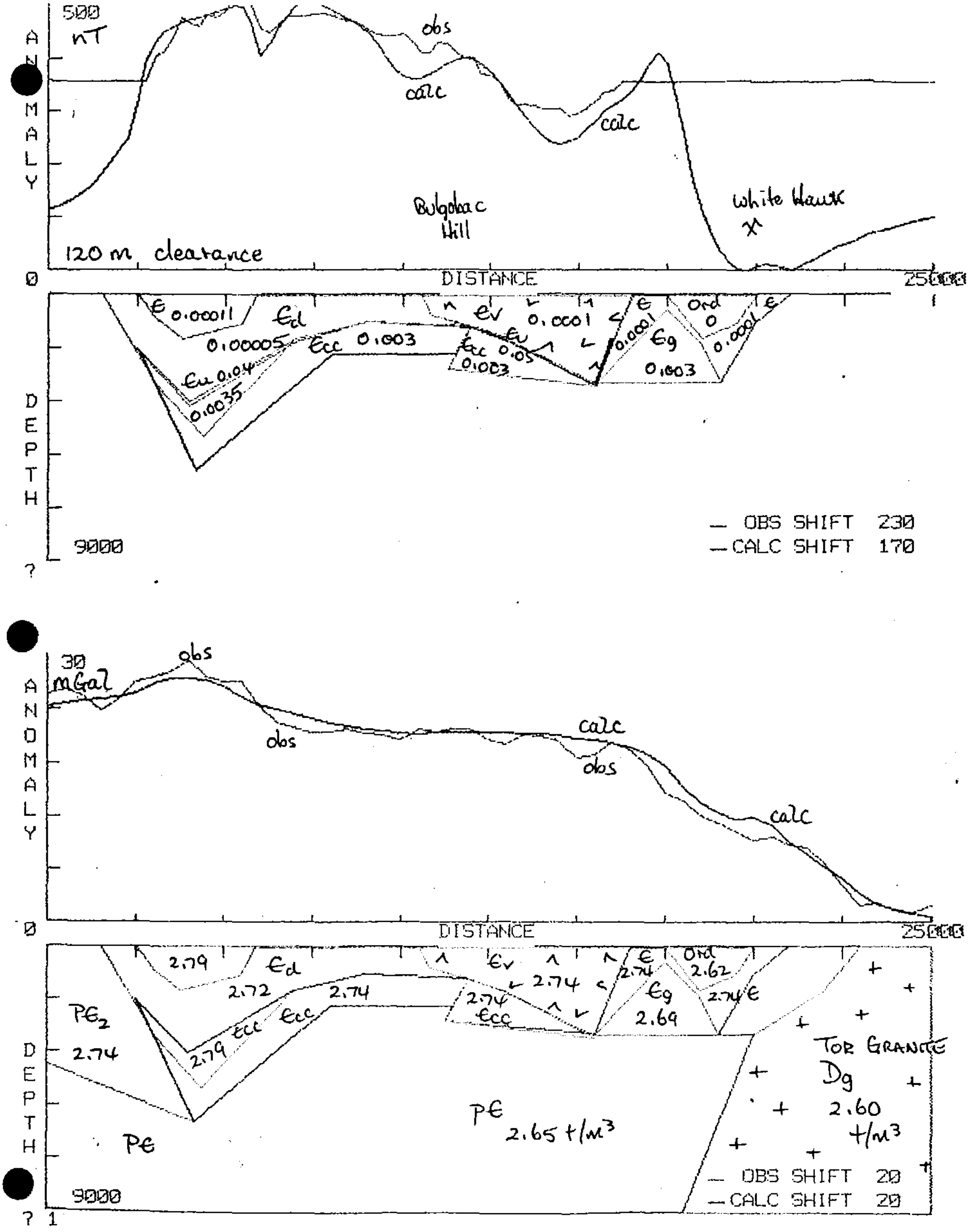
Three long line models prepared by me in the past year are indicated in Figure 15. These have yielded general forms of the type illustrated in Figures 13 and 14. The line illustrated was modelled as part of the present evaluation and is the first to use the high level presentation of the magnetic data.
All three versions of the interpretation, whether using Mantle91 corrected residual gravity or 120 m drape or 1300 mASL magnetic data, yield the same consistent relationships.

These include a relatively shallow siliceous basement until the major faults near the Hatfield and Coldstream Rivers are crossed. There is then a substantial cover of Oonah type Precambrian on the siliceous base. This may imply an older deep basin fill which predates the Penguin Orogeny (see Leaman, 1988).
All subsequent history is lateral and subparallel to these old basins.
The sections in Figures 13 and 14 can be transformed and seen in terms of old grabens and half grabens formed prior to emplacement of ultramafics - which act as a marker (as in the folds of the Huskisson Syncline) - and further graben and half graben developments subsequent to this primary early Cambrian deformation and temporary termination of basin development.
When seen in these terms the Dundas Trough is the redevelopment of the western side of this extensional zone and the Mt Read Volcanics occupy half graben and perhaps local graben positions adjacent to the early formed eastern edge.
These developments have been deformed and inverted in the late Cambrian and further rift development has taken place near the primary margins to east and west. In the east the new basin wedges contain the Ordovian conglomerates and in the west the deepened Dundas Trough section of the Que River near its confluence with the Hatfield River. The Charter Rift zone is thus seen to be related to both older and younger extensional regimes. The rotation of extension is also implied.

Figure 16 suggests how volcanic piles and fundamental relationships can arise in this wholly episodic extensional regime. Inversion of any of the basins or piles can lead to complex flower structures and reverse faulting which can account for structures of the type observed. Devonian magmatism with emplacement of granitoids and associated deformation completes this process and can generate enhanced reversals and thrusts. The latter are possible at any change in the extension sequence where inversions may occur.
Normal faults are transformed into reverse faults in critical locations.
Rift patterns need not be extensive on strike and may box out according to the presence of transform faults.
Although these ideas need much more development two things emerge.

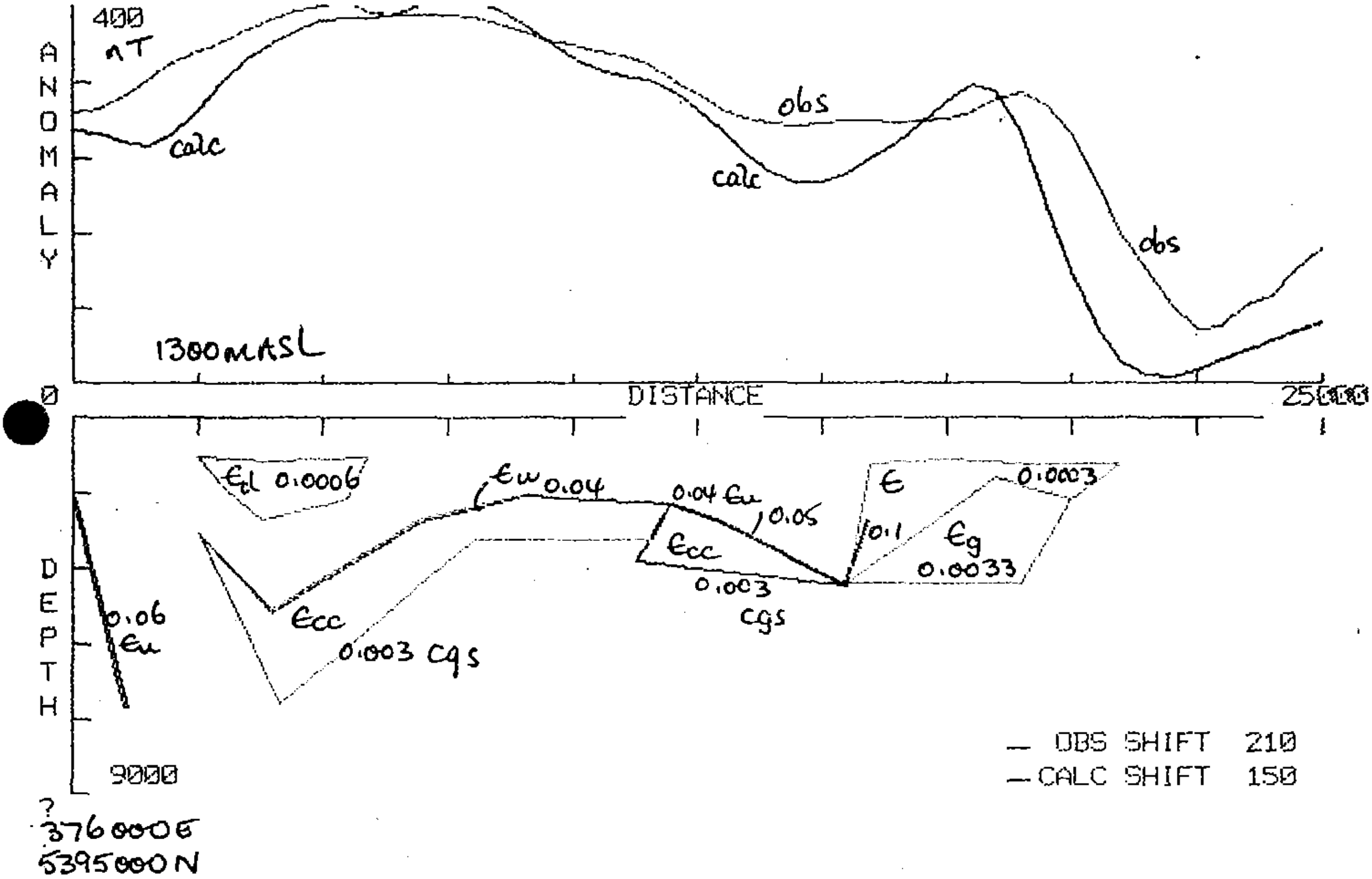
It is possible to explain the basic elements of west Tasmanian geology in this well established manner by basin evolution and that the key structures (transforms and old rift edges) never die. They are regularly resurrected either as inversion faults, stress controls or are locally wrenched to form complex fault patterns. Certain of them, namely those which have long periods of activity and which have avoided simple lystric forms due to extensive rejuvenations and reversal, tap deep into the crust or upper mantle. Transforms are of this type. We should therefore expect that if such fracture controls exist in western Tasmania that nodes and intersections upon them would prove crucial to mineralisation. Figure 17 suggests that this is indeed the case and furthermore that some other nodes exist which might well possess exploration significance.

Much more thought is required on these topics.



REGIONAL SECTION

FIGURE 13

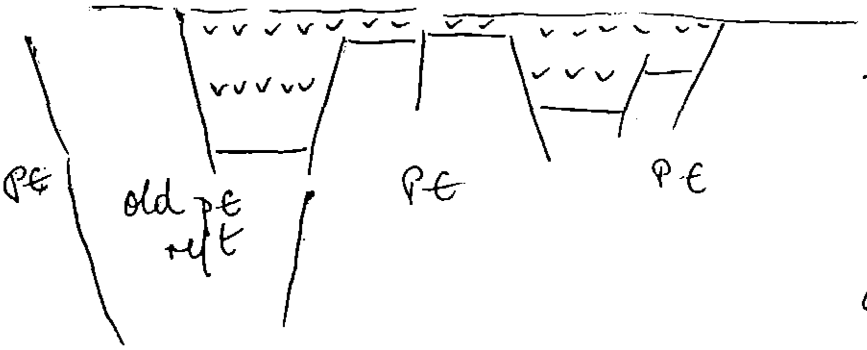


REGIONAL SECTION . FIGURE 14

AMIRA and BOCO sections AND
BULGOBAC SECTION.

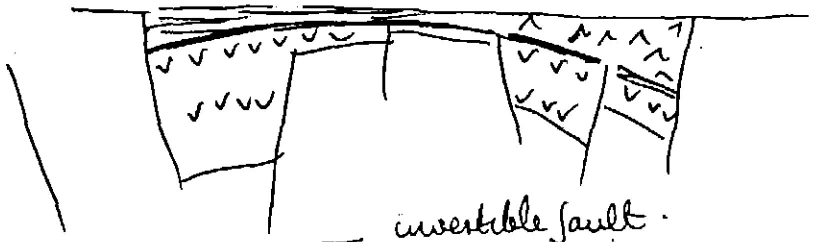
112161

FIGURE15

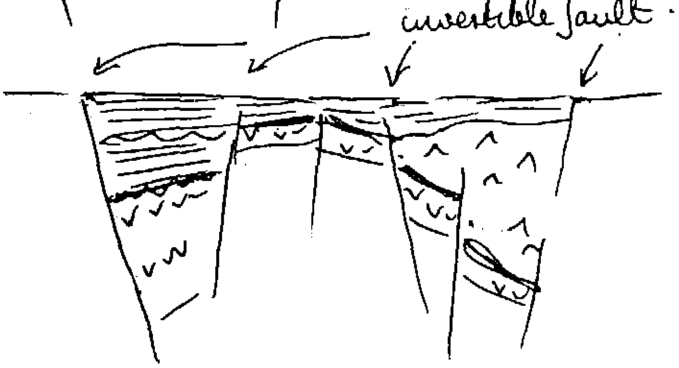


pre ultramafic stage
Ꞓcc + sc

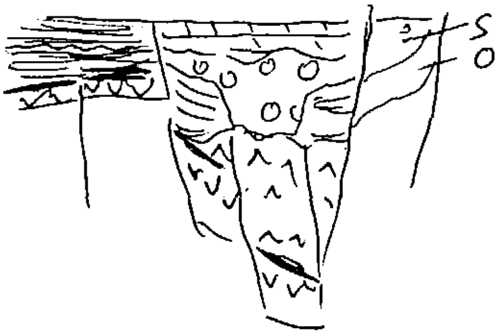
disruption
Ꞓu



further extension
half graben stage
onset Ꞓdg + Ꞓv.
e-m Ꞓ



continued extension
m-u Ꞓ
Volcs in calderas / ½ grabens
etc



uꞒ - Ord.
east side

Diagrams exclude
deformations due to
folding/intrusion

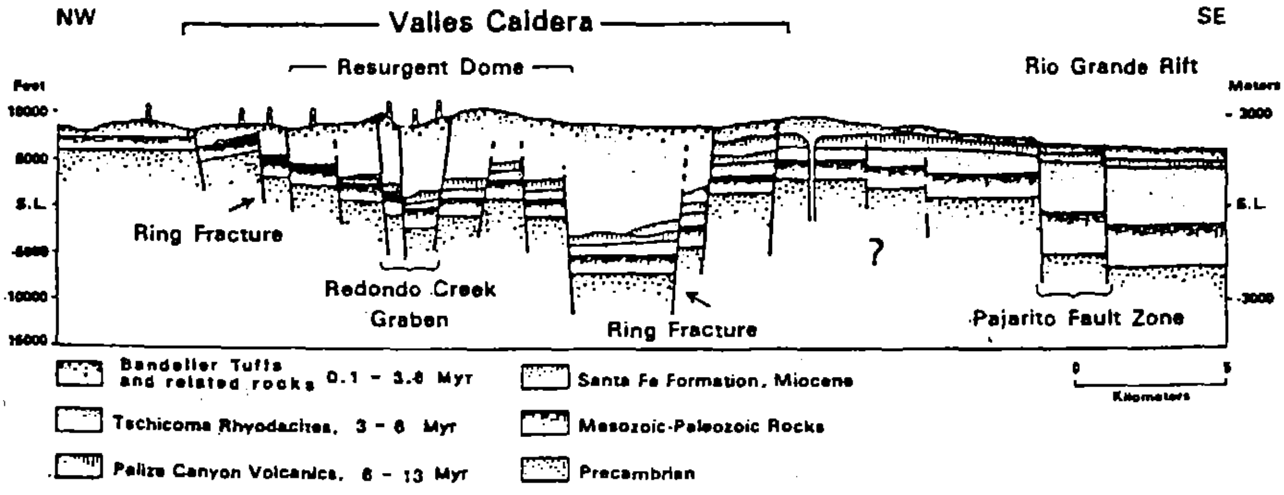


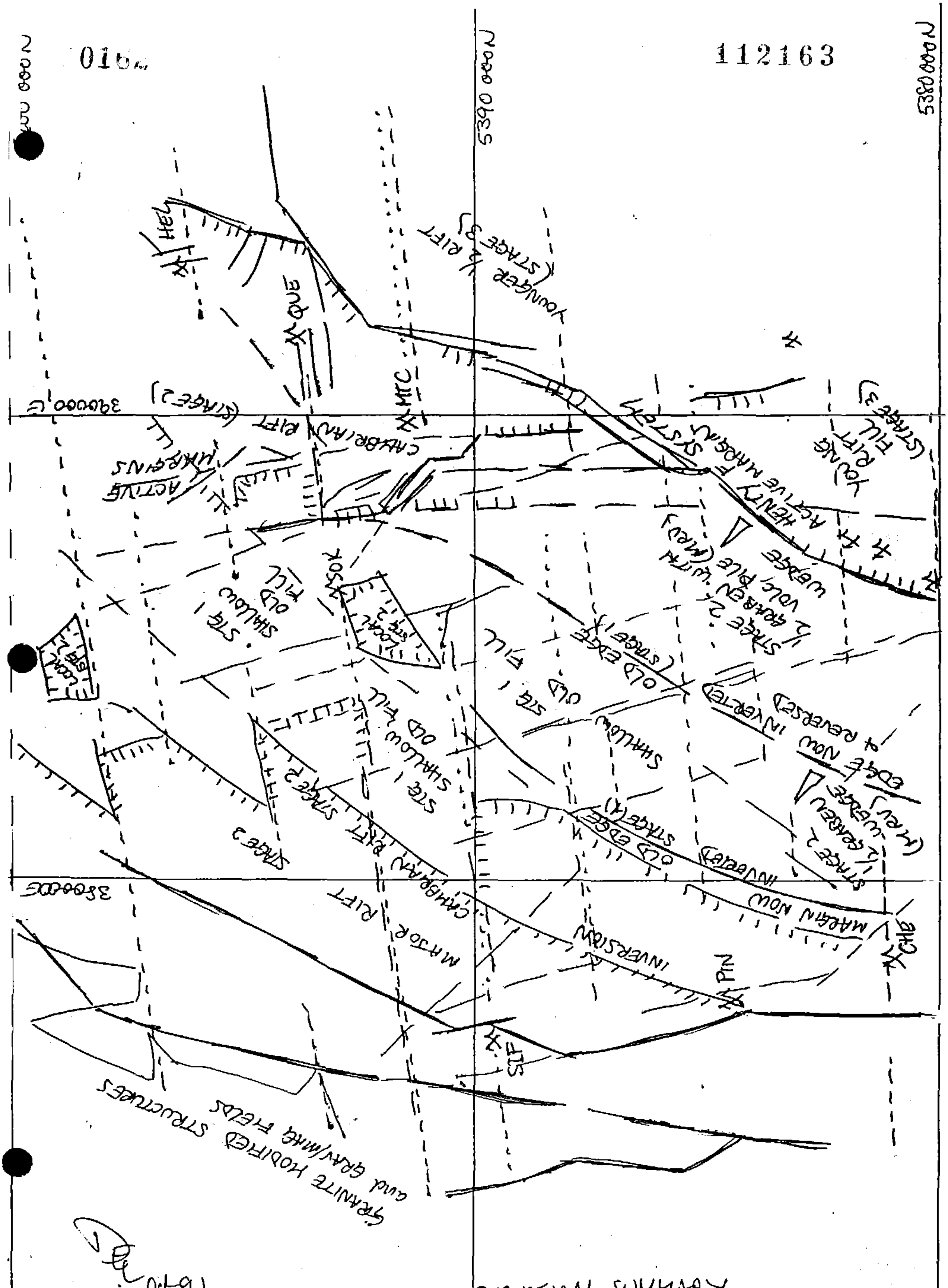
Fig. 222 Schematic NE-SW cross section of Valles caldera based on deep drill holes of Union Oil Company, Geothermal Resources International, and Los Alamos National Laboratory and the gravity interpretation of *Segar* [1984]. Drill hole control to Precambrian basement is excellent from the west caldera flank to the apical graben and agrees well with the gravity interpretation

(Self et al 1986)

5 cm

0162

112163



STRUCTURAL SUMMARY

FIGURE 17.

REFERENCES

Komyshan, P., 1986. Geology of the Mt Charter - Hellyer area. Map 1, Mount Read Volcanics Project, Dept. Mines Tasm.

Leaman, D.E., 1988. Late Precambrian and early Palaeozoic basin Evolution in western Tasmania. Extended abstract, Geol. Soc. Aus. Symposium, Hobart April, 1988

Leaman, D.E., 1990. Aeromagnetic survey, EL 37/89 Bulgobac Hill. Acquisition report (including preliminary interpretation). Report for Pasminco Exploration by Leaman Geophysics, . August.

Leaman, D.E., 1991. High Point magnetics. Memo to Pasminco Exploration by Leaman Geophysics, Jan., 31, 1991.

Report submitted on behalf of Leaman Geophysics

by

D. Leaman

Dr. D. E. Leaman, B.Sc., Ph.D.,
F. Aus. I.M.M., M.M.I.C.A.

Date: 07/10/91

APPENDIX 9

MAGNETIC PROFILE
- BULGOBAC HILL LINE 4000N,

by D Leaman, January 1992

LEAMAN GEOPHYSICS
Survey Review, Specification, Reduction, Interpretation
Gravity, Magnetic and Seismic Methods
Structure and Prospect Evaluation

Registered office:
3 MALUKA STREET, BELLERIVE, TAS. 7018
All correspondence to:
CPO BOX 320 D, HOBART, TAS. 7001
Telephone: (002) 44 1233
Fax: (002) 44 6674

112167

SHORT NOTE:

FROM: D.E.LEAMAN, LEAMAN GEOPHYSICS

TO: PASMINCO EXPLORATION. Attention: F.Fitzgerald
J.G.Purvis

RE: MAGNETIC PROFILE - BULGOBAC HILL (LINE 4000N, 3440-4400E)

Due to considerable discussion about the nature of the northern boundary of the Mt Read Volcanics near Bulgobac Hill and Mt Charter a detailed surface magnetic profile was observed across the northern slopes of Bulgobac Hill (Figure 1).
Diurnally corrected data have been tabulated below. Spacing 5 m.
A subsampled version (25 m spacing) of this profile has been modelled. Preliminary review of this profile showed that it was not long enough for reliable interpretation and that the volcanics, or equivalent, were more extensive (magnetically) and that the true boundary may be within so-called Dundas Group rocks.

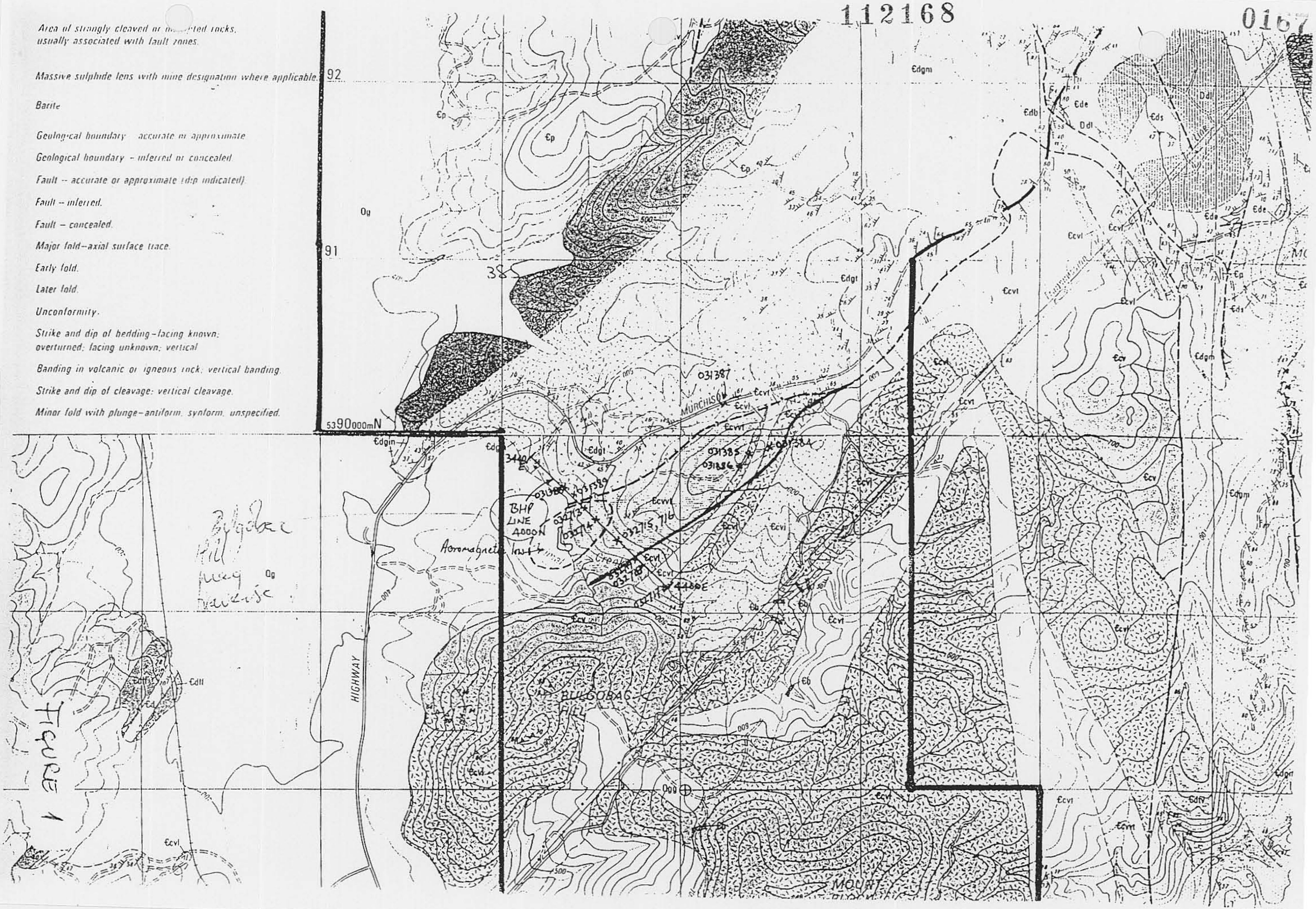
Prior to a detailed interpretation a more regional view was obtained using aerial data along the same alignment. The complementary airmagnetic and ground magnetic profile interpretations are given in Figure 2.
The two interpretations are consistent in terms of source style and contrasts but there is an offset of about 150 m in position for some parts. This is thought to be a function of airmagnetic line orientation and density and the actual shape of the field at 120 m clearance.
Both profiles are dominated by a gross regional effect and this has been explained using a thin high contrast source at about 2.5 km depth. This is an equivalent source form and is not presented as a true geometry; simply one which accounts for the primary regional response.

The detailed responses and sources are of low to moderate contrast and narrow and depth limited. Some parts, as near A-B, are concealed at depths of 500+ m. The detachment is probably exposed near the contact with porphyry. The slab of porphyry may itself by included in a detached slice. All dips are steep and to the west.

Using the regional indications as a guide the more detailed surface data may be readily explained - with some minor positional offsets. All properties and depth ranges are consistent, with respect to surface.

This review suggests that the actual position of the structural limit of the volcanics may lie near the porphyry contact 500 m NW of peg 3440E - or at least beyond the line end or contact between tuffs and mudstone.

DLeaman

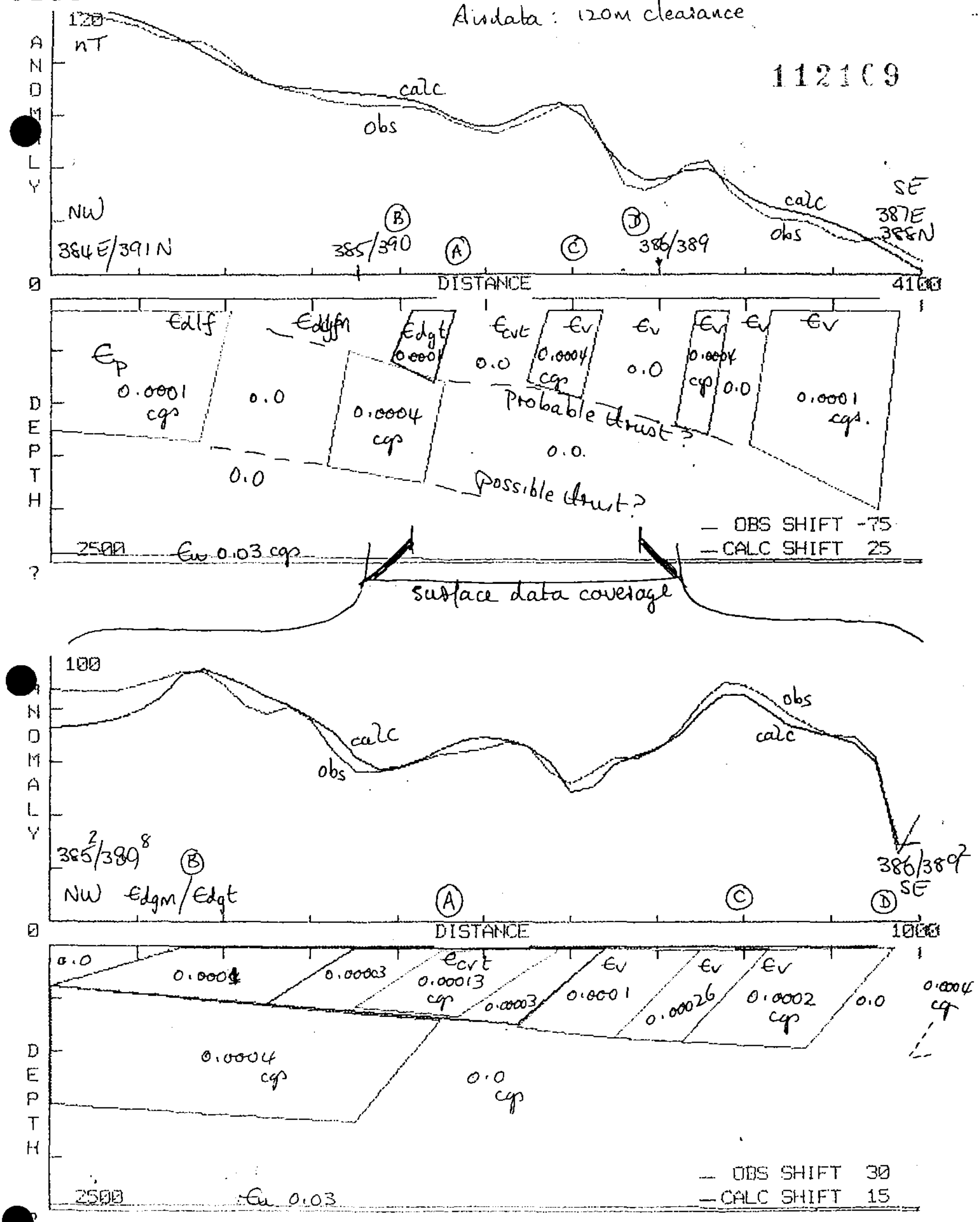


Area of strongly cleaved or [illegible] rocks, usually associated with fault zones.
Massive sulphide lens with mine designation where applicable.
Barite
Geological boundary - accurate or approximate
Geological boundary - inferred or concealed
Fault -- accurate or approximate (dip indicated)
Fault -- inferred.
Fault - concealed.
Major fold-axial surface trace.
Early fold.
Later fold.
Unconformity.
Strike and dip of bedding-facing known; overturned; facing unknown; vertical
Banding in volcanic or igneous rock; vertical banding.
Strike and dip of cleavage: vertical cleavage.
Minor fold with plunge-antiform, synform, unspecified.
92
91
5390000mN
Og
€p
€dl
385
031387
MURCHISON
€cvl
€cvvl
€dgl
€dgin
€dg
3440E
031388
031389
031385
031386
031384
BHP LINE 4000N
032713
032714
032715, 716
032717
032718
4480E
Aeromagnetic low
Creek
€cvi
€b
Bulgobac Hill mag traverse
HIGHWAY
BULGOBAC HILL
Ogg
MOUNT
€dgm
€db
€de
€ds
Ddl
€dgt
€cv
€dll
500
600
700

FIGURE 1

0160

112109



Jan 92

BULGOBAC HILL – LINE 4000
AIRMAG/GROUND MAG INTERPRETATION

FIGURE 2

0169

112170

Bulgobri Line 4000N

29/11/91

Di-urnal corrected

```
        Dare   Time     No   Mag (nT x10)
120 333   83333   449 623514
120 333   83418   450 623521
120 333   83450   451 623509
120 333   83517   452 623479
120 333   83538   453 623503
120 333   836 3   454 623552
120 333   83632   455 623482
120 333   837 2   456 623470
120 333   83727   457 623573
120 333   838 1   458 623513
120 333   83833   459 623518
120 333   83933   460 623682
120 333   840 1   461 623645
120 333   84052   462 623478
120 333   84118   463 623629
120 333   84133   464 623467
120 333   842 9   465 623482
120 333   84237   466 623359
120 333   843 0   467 623564
120 333   84619   468 623573
120 333   84659   469 623672
120 333   84722   470 623754
120 333   84748   471 623497
120 333   84833   472 623597
120 333   849 9   473 623649
120 333   84927   474 623481
120 333   85014   475 623528
120 333   85047   476 623754
120 333   851 8   477 623618
120 333   85141   478 623470
120 333   852 1   479 623322
120 333   85236   480 623644
120 333   853 0   481 623368
120 333   85322   482 623464
120 333   85356   483 623253
120 333   854 9   484 623360
120 333   85447   485 623471
120 333   855 8   486 623405
120 333   85527   487 623404
120 333   85551   488 623438
120 333   856 8   489 623548
120 333   85637   490 623422
120 333   85654   491 623416
120 333   85710   492 623453
120 333   85724   493 623500
120 333   85736   494 623469
120 333   859 9   495 623426
120 333   85925   496 623501
120 333   85938   497 623457
120 333   9 022   498 623412
120 333   9 045   499 623430
120 333   9 136   500 623405
120 333   9 150   501 623388
120 333   9 2 6   502 623348
120 333   9 229   503 623406
```

Profile for model.

BH4000 NX=41 Sp=2

3400	350	50
	350	50
	350	50
	350	50
3500	352	52
	354	54
	357	57
	357	57
3600	352	52
	345	45.
	342	42
	345	45
3700	340	40
	329	29
	322	22
	322	22
3800	323	23
	326	26
	328	28
	329	29
3900	330	30
	332	32
	331	31
	322	22
4000	318	18

```
120 333   9 319   504 623301
120 333   9 511   505 623538
120 333   9 530   506 623136
120 333   9 6 0   507 623301
120 333   9 615   508 623235
120 333   9 7 5   509 623242
120 333   9 9 6   510 623247
120 333   9 927   511 623229
120 333   9 942   512 623230
120 333   91019   513 623237
120 333   91314   514 623296
120 333   914 7   515 623272
120 333   91426   516 623242
120 333   91452   517 623195
120 333   915 8   518 623256
120 333   91524   519 623281
120 333   91555   520 623212
120 333   91628   521 623437
120 333   91658   522 623266
120 333   91719   523 623247
120 333   91838   524 623269
120 333   919 6   525 623309
120 333   91922   526 623328
120 333   91939   527 623285
120 333   91951   528 623305
120 333   92027   529 623301
120 333   92049   530 623295
120 333   92117   531 623370
120 333   92134   532 623299
120 333   922 3   533 623285
120 333   92212   534 623295
120 333   92250   535 623294
120 333   923 7   536 623305
120 333   92326   537 623301
120 333   92339   538 623286
120 333   92352   539 623311
120 333   92424   540 623322
120 333   92443   541 623540
120 333   92454   542 623363
120 333   925 4   543 623480
120 333   92513   544 623491
120 333   92536   545 623367
120 333   92552   546 623335
120 333   926 8   547 623294
120 333   92621   548 623280
120 333   92643   549 623314
120 333   92710   550 623242
120 333   92739   551 623231
120 333   92759   552 623221
120 333   92814   553 623227
120 333   92829   554 623173
120 333   92855   555 623200
120 333   92911   556 623204
120 333   92924   557 623186
120 333   92939   558 623234
```

```
120 333   92954   559 623222
120 333   93112   560 623279
120 333   93140   561 623364
120 333   932 1   562 623242
120 333   93227   563 623180
120 333   93249   564 623245
120 333   93319   565 623325
120 333   93333   566 623366
120 333   93346   567 623303
120 333   93359   568 623285
120 333   93410   569 623286
120 333   93441   570 623227
120 333   93458   571 623260
120 333   93510   572 623201
120 333   93530   573 623253
120 333   93551   574 623269
120 333   93614   575 623287
120 333   93628   576 623355
120 333   93651   577 623431
120 333   93711   578 623397
120 333   93723   579 623366
120 333   94139   580 623352
120 333   94155   581 623389
120 333   942 8   582 623407
120 333   94226   583 623470
120 333   94258   584 623526
120 333   94310   585 623518
120 333   94335   586 623461
120 333   94351   587 623488
120 333   944 8   588 623495
120 333   94429   589 623502
120 333   945 1   590 623531
120 333   94514   591 623546
120 333   94527   592 623560
120 333   94544   593 623533
120 333   94557   594 623600
120 333   94618   595 623545
120 333   94630   596 623551
120 333   94649   597 623528
120 333   947 4   598 623513
120 333   94730   599 623524
120 333   94752   600 623523
120 333   948 9   601 623470
120 333   94831   602 623488
120 333   94845   603 623491
120 333   94856   604 623464
120 333   94919   605 623465
120 333   94934   606 623399
120 333   94950   607 623422
120 333   95010   608 623370
120 333   95025   609 623409
120 333   95053   610 623407
120 333   951 9   611 623370
120 333   95129   612 623372
120 333   95146   613 623365
```

	322	22
	327	27
	327	27
4100	330	30
	337	37
	346	46
	353	53
4200	352	52
	348	48
	342	42
	338	38
4300	335	35
	334	34
	327	27
	293	-7
4400	307	7

```
120 333  95226  614 623386
120 333  95252  615 623399
120 333  953 7  616 623333
120 333  95324  617 623349
120 333  95346  618 623344
120 333  95414  619 623330
120 333  95436  620 623463
120 333  95456  621 623365
120 333  95510  622 623377
120 333  95527  623 623347
120 333  95537  624 623320
120 333  956 5  625 623232
120 333  95621  626 623184
120 333  95635  627 623087
120 333  95650  628 623057
120 333  95659  629 623017
120 333  95722  630 622967
120 333  95741  631 622880
120 333  95758  632 623088
120 333  95826  633 623095
```

APPENDIX 10

GRAVITY COVERAGE - TULLABARDINE GORGE AREA

by D Leaman, January 1992

RECEIVED
13 JAN 1992

MEMORANDUM:

FROM: D.E. LEAMAN, LEAMAN GEOPHYSICS

TO: PASMINCO EXPLORATION. Attention: F. Fitzgerald
G. Purvis

RE: CURRENT STATUS
GRAVITY COVERAGE TULLABARDINE GORGE AREA

Until recently the only gravity stations in the area between Mt Block and Tullah were those acquired by the Department of Mines and Mineral Resources as part of its regional Mt Read Volcanics Project survey. These stations have a nominal station spacing of 1 km and were observed to regional specifications. They may be identified in Figure 1 as those stations with a diagonal cross. Compilations based on them appeared anomalous and inconsistent in the Mt Block area but no evaluation was possible until some infill had been completed.

Recent work on behalf of Pasminco Exploration has improved the coverage in the region although still very patchy and generally inadequate. The current coverage is shown in Figure 1. Some old stations (3 or 4 sites) thought to be suspect are now definitely considered suspect and are marked with (?). These were ignored to produce the contoured version shown in Figure 2. The nature of the problem is unknown but barometric elevations may be implicated pending checking of control points. All suspect values are too positive which is not consistent with insufficient terrain correction or gravity links.

The values plotted in Figures 1 and 2 are residual Bouguer anomalies derived from the raw Bouguer anomalies using the crustal separation process known as MANTLE91. This has been done to improve ease of direct geological correlation and ease evaluation or recognition of suspect stations. All stations have been fully linked to state datum, terrain corrected to a radius of 22 km and reduced with a Bouguer density of 2.67 gm/cc. The contour presentation should be regarded only as indicative of the gravity field with the present coverage.

The compilation of residual anomalies has been overlain on a geological base map in Figure 3.
The higher negative values in the south of the area, near Tullahd, are related to shallowing of the Pine Hill - Granite Tor Granite and there may be some relationship between the location of the Henty Fault Zone and the change in roof depth. Most other features are very poorly defined with present coverage but the significant negative values east of Mt Block are based on a number of stations.
The general negative values across the entire region in which Cambrian rocks of various types are exposed is odd.

All the Cambrian rocks have bulk densities in excess of the Bouguer assumption and the average elevation of the terrain is about 400 to 500 m. This means that residual values should be positive. Part of the negative effect can be assigned to diffusion of the effect of the batholith to the south and south west of the area but this cannot explain the deeper low values.

Several previous analyses undertaken for Pasminco Exploration have implied siliceous basement at shallow to moderate depth in order to balance the denser Cambrian suites. The new work would certainly indicate that this relationship persists at least as far west as Boco. Local, more negative effects, may be associated with siliceous lavas or intrusives, perhaps quartz porphyry masses. Any relationship between lithology and anomaly must await a more even coverage and better definition of the gravity field.

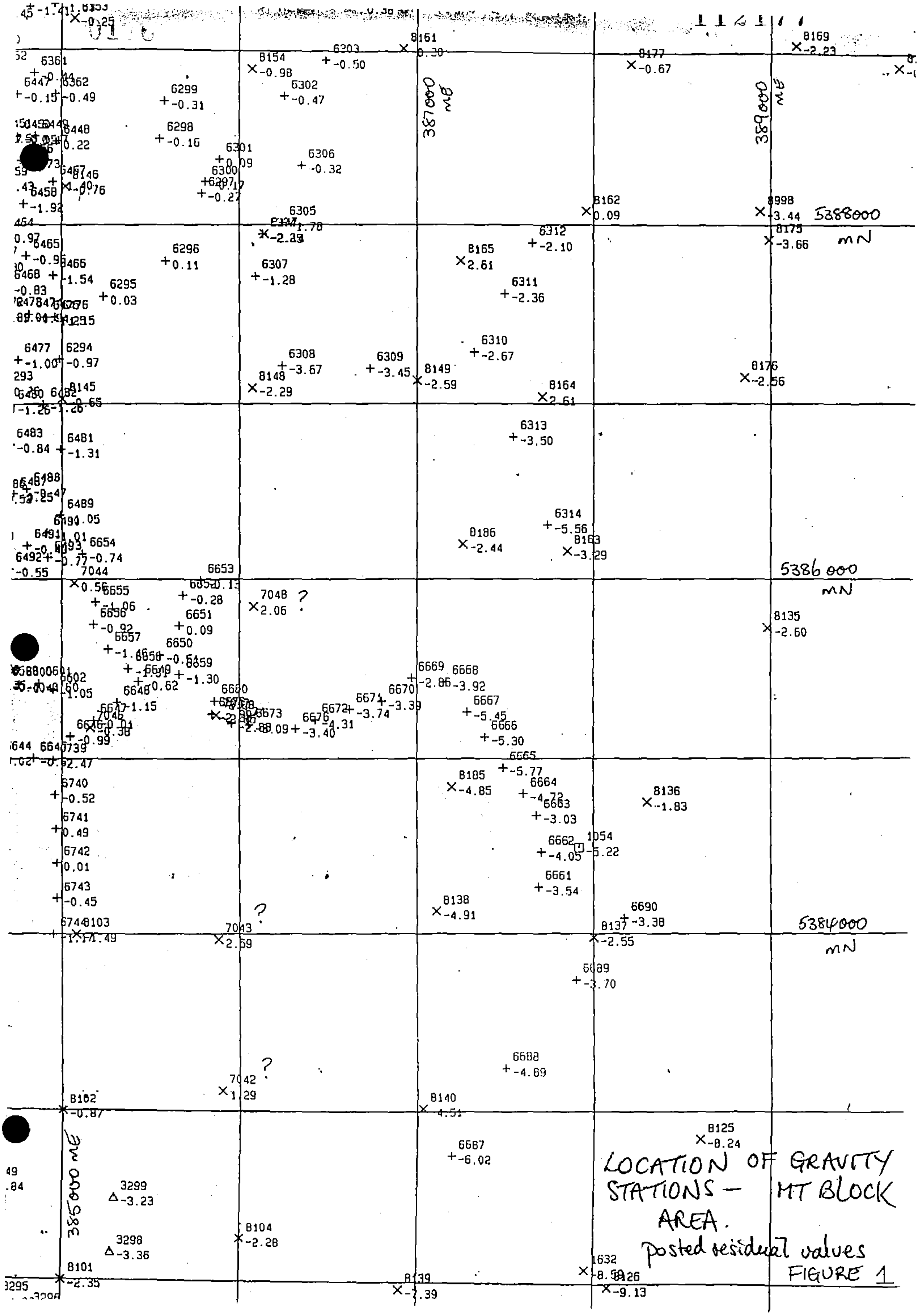
If this data set is considered as an inset within a more regional distribution then a number of trends, consistent with it, can be recognised. They are not well defined in the Mt Block area with present coverage but they are approximately located. These are shown in Figure 4.

Three ENE trends can be continued into and across the area. One of these is defined by an undoubted step in the field near 5387 000 mN and this has been called the "Boco corridor".
Another significant feature, which is associated with the deep internal lows, trends NNE. This seems an unusual trend in an anomalous location until the geological map is placed in regional context. This is the trend of, and extension of, the eastern side of the Henty Fault Zone south of Tullah. The origin of lows along such a feature are not easily explained unless there is extensive alteration or acidic intrusion. Some inspection is warranted.

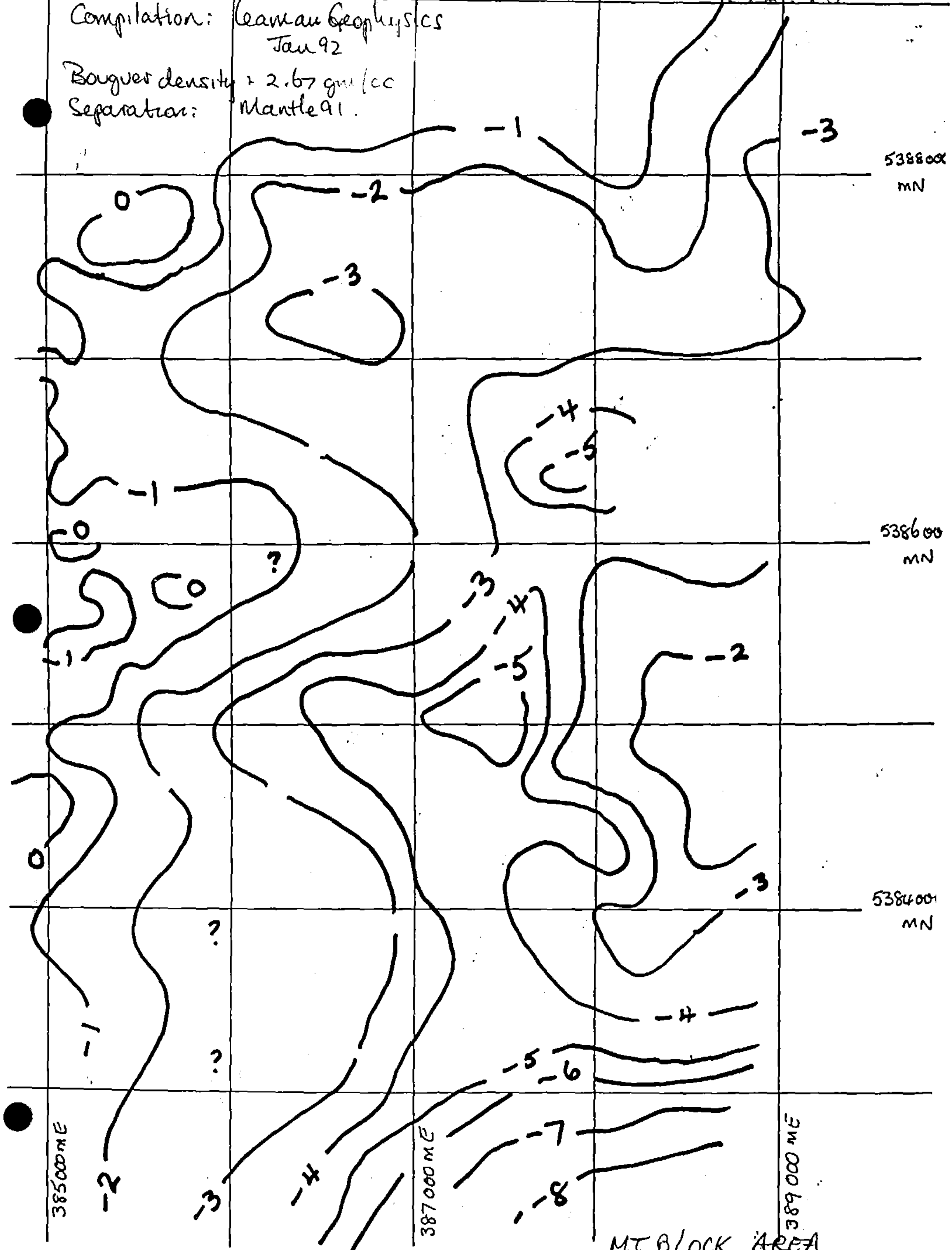
The extant data do not justify more detailed reviewm, or modelling, for specific targetting at this stage but are certainly suggestive in regional terms. Proper definition of the field, and any gross structural trends, in this area requires a general coverage in which four or five stations have been observed in each grid square. It will be noted that some kilometre squares contain no stations as at January 1992.

D. Leaman

D.E. Leaman
Jan 10, 1992



LOCATION OF GRAVITY STATIONS – MT BLOCK AREA.
posted residual values
FIGURE 1

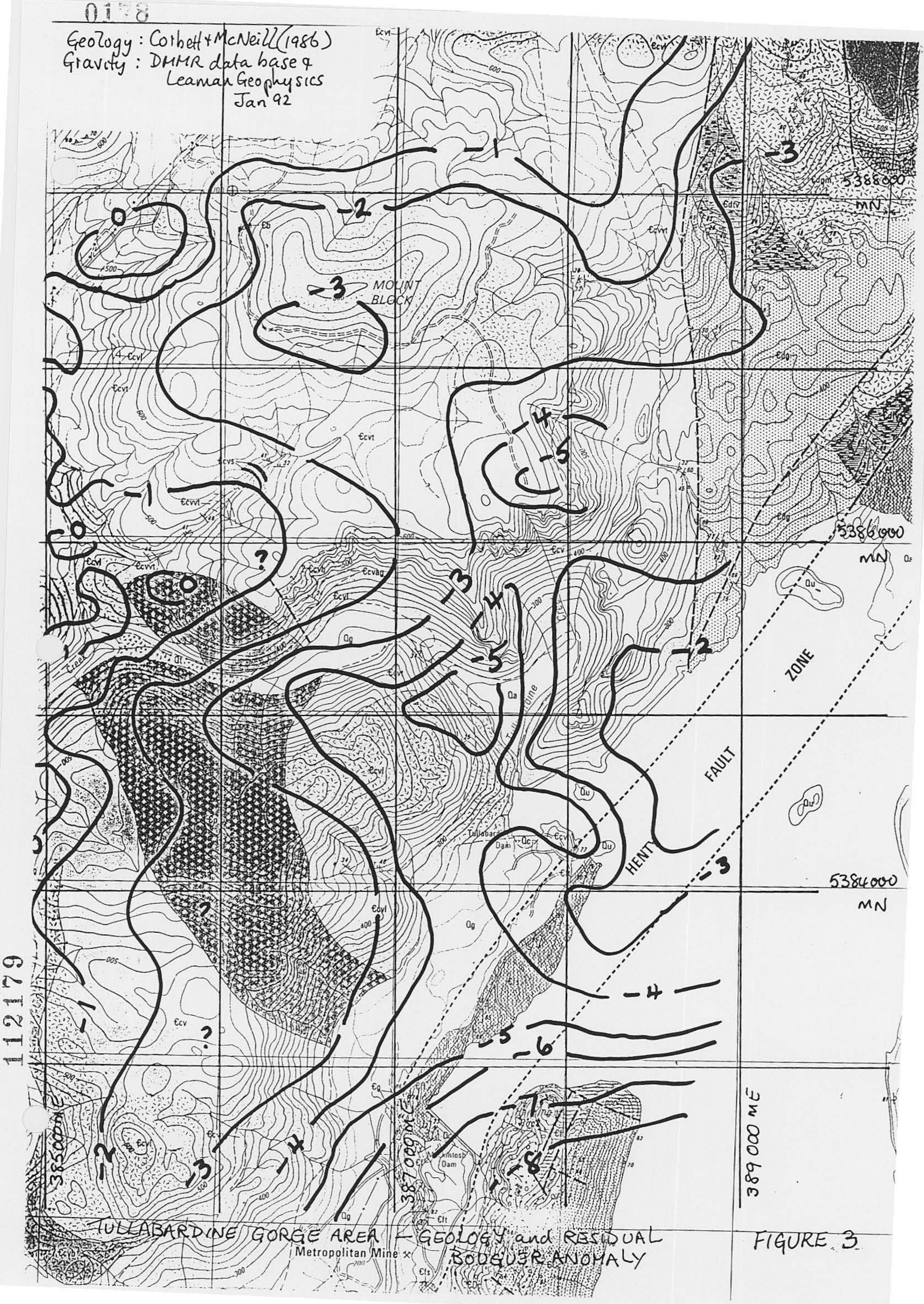


MT BLOCK AREA

CONTOURS — RESIDUAL BOUGUER ANOMALY

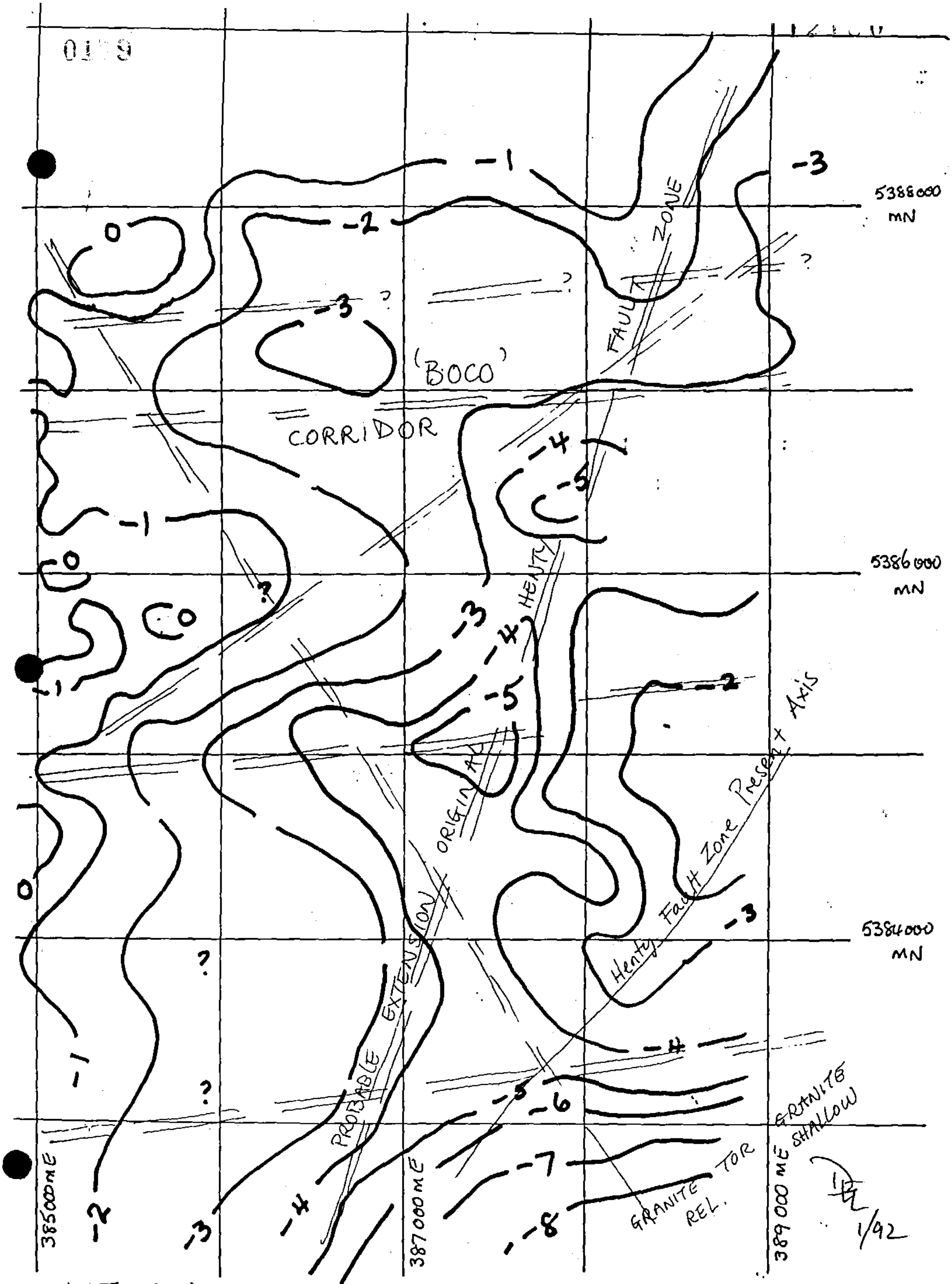
FIGURE 2

Geology : Corbett & McNeill (1986)
Gravity : DMMR data base & Leaman Geophysics
Jan 92



TULLABARDINE GORGE AREA – GEOLOGY and RESIDUAL BOUGUER ANOMALY

FIGURE 3



INFERRED TRENDS— MT BLOCK AREA

FIGURE 4

APPENDIX 11

REASSESSMENT OF BHP DRILLHOLE EM
– HIGH POINT

BY R. Smith, November 1991

MEMO TO: A N Lorrigan
FROM: R Smith
DATE: 27TH November 1991

REASSESSMENT OF BHP DRILL-HOLE EM
HIGH POINT PROSPECT

HP1

The area around HP1 appears conductive, with signal lasting as late as 10 *milliseconds*. The response is very broad. The conductive source would either be a broad zone of more conductive material intersected at about 400m down hole (not entirely consistent with the data) or an off-hole conductor more than 600m away. The relative sizes of the responses from loop 17 and 18 would imply this conductor is to the north or poorly coupled to the field of loop 18. It is mysterious why the hole was not logged using loops 14, 15 or 16, as these provide in section information. Loops 17 and 18 would couple best to bodies parallel to section.

HP2

This hole is 200m north of HP1 and does not have a strong late-time response from loop 18. Once again, the response is significantly greater when the hole is logged with the northern transmitter (17). However, it is hard to reconcile the disparity between the time constants observed in HP1 with that in HP2 when loop 18 is used for both holes.

When HP2 is logged using transmitter loops 16 and 15 there is an indication of an off-hole conductor at about 460m down hole and about 200m off-hole. Whether it is above or below the hole (or even in section) is difficult to determine, but the latter seems likely. The Ground EM data may resolve this question.

HP3

This hole was surveyed with EM 37 equipment using an unspecified high frequency. It is therefore difficult to determine whether or not the ground is as conductive as for the other holes. There is, however, a relatively conductive feature at about 490m down-hole which exhibits "drive-delay" in early channels and a lingering positive response in the late channels. It appears likely this response is associated with a more conductive zone within the black shales. The zone is probably of the order of 100m wide and (?) appears to have been intersected.

BHD1

BHP loops 15 and 16 should be adequate to log this hole with downhole EM, particularly if the CRONE 3 component probe is used. Loop 17 or 18 could be useful if there is a conductor parallel to section.

OTHER RECOMMENDED GEOPHYSICS

While the CRONE system is available it would be a good idea to try and use it to determine the position of the possible off-hole conductors in HP1 and HP2. This should be possible without using all five BHP loops for each hole. HP1 has apparently not been logged with loops 14, 15 or 16, so at least 15 and 16 should be done. One of 17 or 18 should also be repeated, probably the former, as it appears to have the larger response. The same loops could be used for HP2 and possibly even HP3.

All newly acquired data should be plotted using linear rather than logarithmic scales.

APPENDIX 12

USE OF OBSERVED MAGNETICS BASE LINE 3500E – HIGH POINT

By D. Leaman, January 1992

LEAMAN GEOPHYSICS
Survey Review, Specification, Reduction, Interpretation
Gravity, Magnetic and Seismic Methods
Structure and Prospect Evaluation

Registered office:
3 MALUKA STREET, BELLERIVE, TAS. 7018
All correspondence to:
GPO BOX 320 D, HOBART, TAS. 7001
Telephone: (002) 44 1233
Fax: (002) 44 6674

MEMORANDUM:

FROM: D.E. LEAMAN, LEAMAN GEOPHYSICS

TO: PASMINCO EXPLORATION Attention: F. Fitzgerald
J.G. Purvis

RE: USE OF OBSERVED MAGNETICS BASE LINE 3500 E AT HIGH POINT

Corrected data for this base line tie has now been received and inspected.
My report describing an evaluation of surface magnetic data along lines 8200, 8600, 9000 and 9400 N found that assignment of anomaly base levels was critical if a coherent and feasible interpretation was to be achieved. This was a reflection of the subtle magnetic properties and anomalies of the area and their domination by a large regional effect sourced to the WSW of the Mt Charter-Que area.

Airborne data were used to estimate the regional gradient along the grid in the absence of surface data along the base line. The gradient was deduced to be about 5 to 7 nT per 400 or 500 m, decreasing to the east. The models prepared allowed for a differential of this scale.
Final models for

lines	8200	8600	9000	9400	allowed
	45	40	30(35)	30	nT shift on base, or
	0	-5	-15(-10)	-15	relative shift across grid

This was equivalent to a general reduction of 5 nT per 400 m. Line 9000 may be modified by the need for additional sources at its western end and could thus have been raised by 5 nT (bracketed).

Examination of new observations along the base line suggests the following base levels and shifts.

Line	8200	8600	9000	9400	
	234	230	228	223	nT as base, or
	0	-4	-6	-11	relative shift

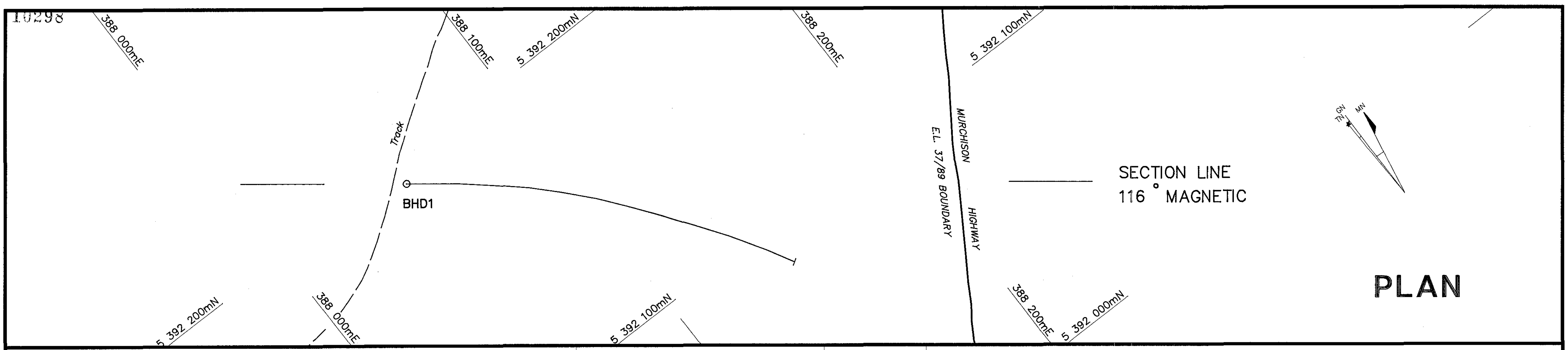
across grid.

These tables show that reasonable relationships have been maintained for a satisfactory primary or preliminary uncontrolled interpretation.

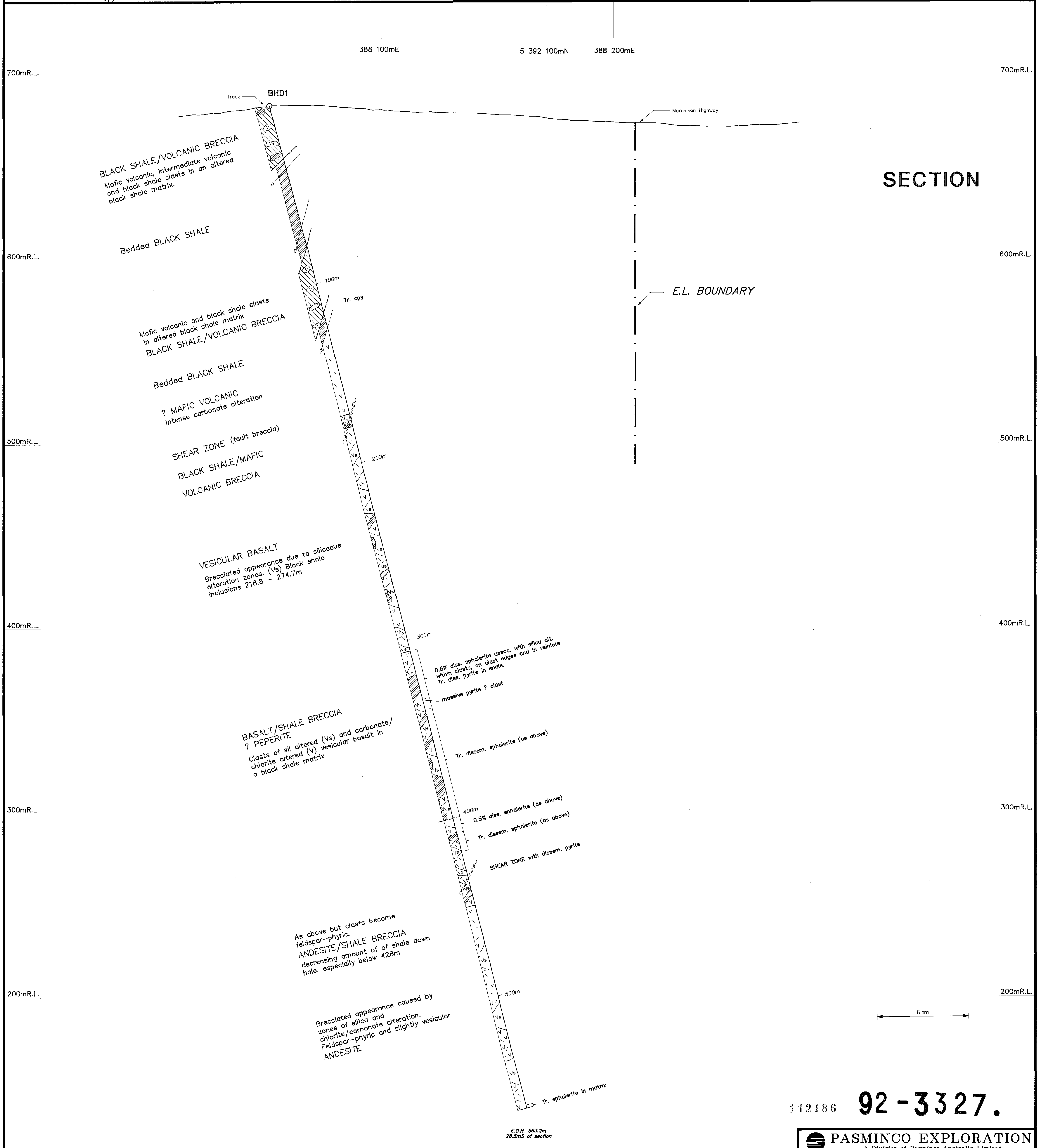
The differences between the original assumptions (reported and used in interpretation) are greatest for lines 9000 and 9400 and any future revision of these lines should make due allowance for appropriate shifts. The differences are small but comparable with the very subtle responses observed and therefore crucial to reliable interpretation.
The current interpretation, while surely imperfect, is better for a near approximation of regional shift than would be any attempt undertaken wholly in active or innocent ignorance of the effect.

D.E. Leaman, Jan 3, 1992

10298



PLAN



SECTION

112186 92-3327.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : A.N.L.	E.L. 37/89 - BULGOBAC HILL HIGH POINT DRILL HOLE SECTION **BHD1** FACING N.E.
DATE : Dec., 1991	
DRAWN : G.M.B.	
REFERENCE :	
REVISIONS :	
DRAWING No.	SCALE 1:1000 0 100 200 METRES

FIG. No. 15

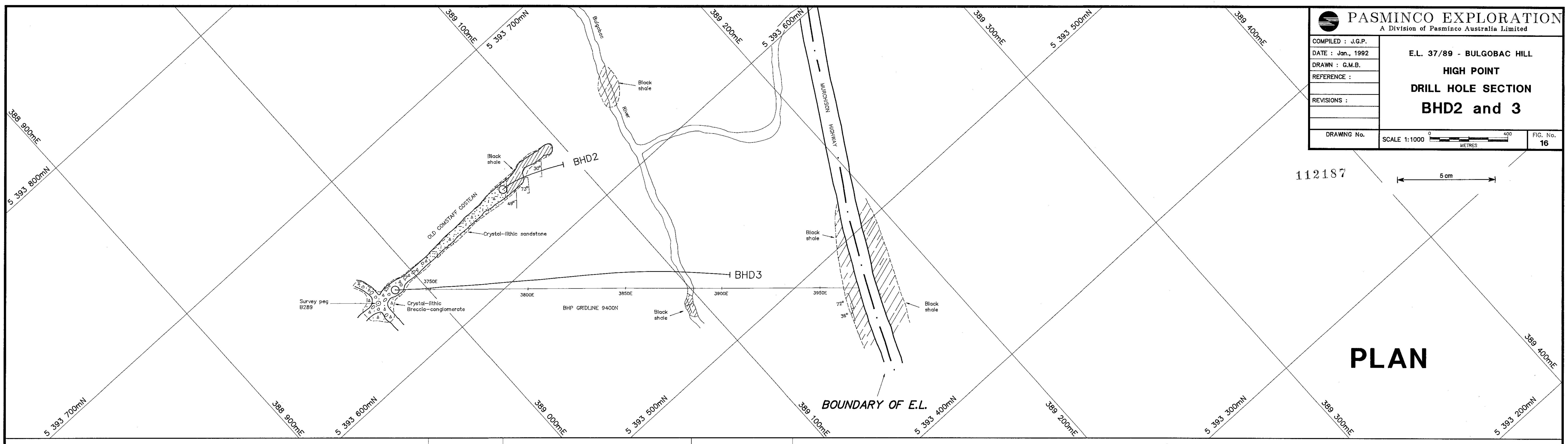
PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : J.G.P.
DATE : Jan., 1992
DRAWN : G.M.B.
REFERENCE :
REVISIONS :

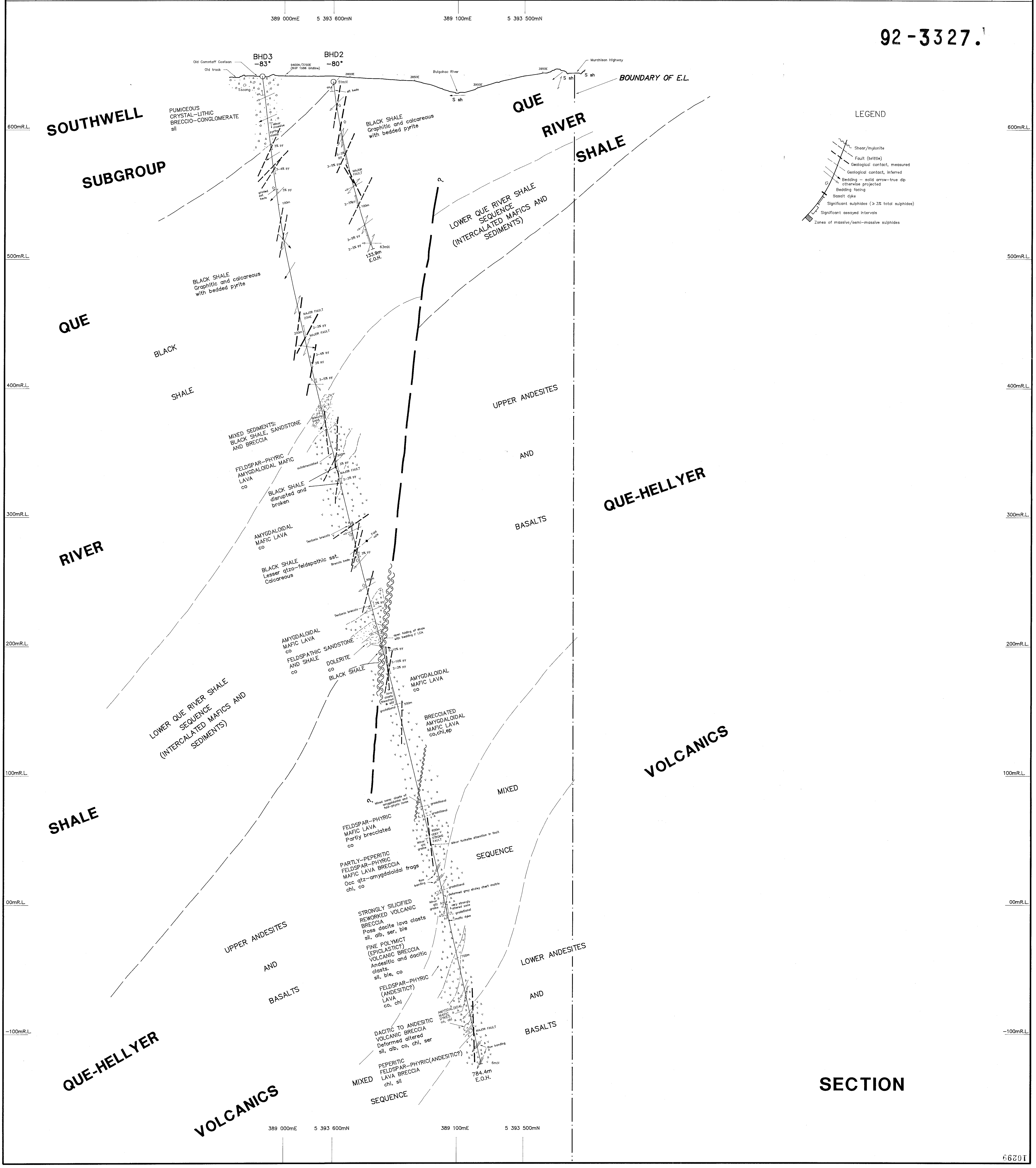
E.L. 37/89 - BULGOBAC HILL
HIGH POINT
DRILL HOLE SECTION
BHD2 and 3

DRAWING No.
SCALE 1:1000
FIG. No. 16

112187

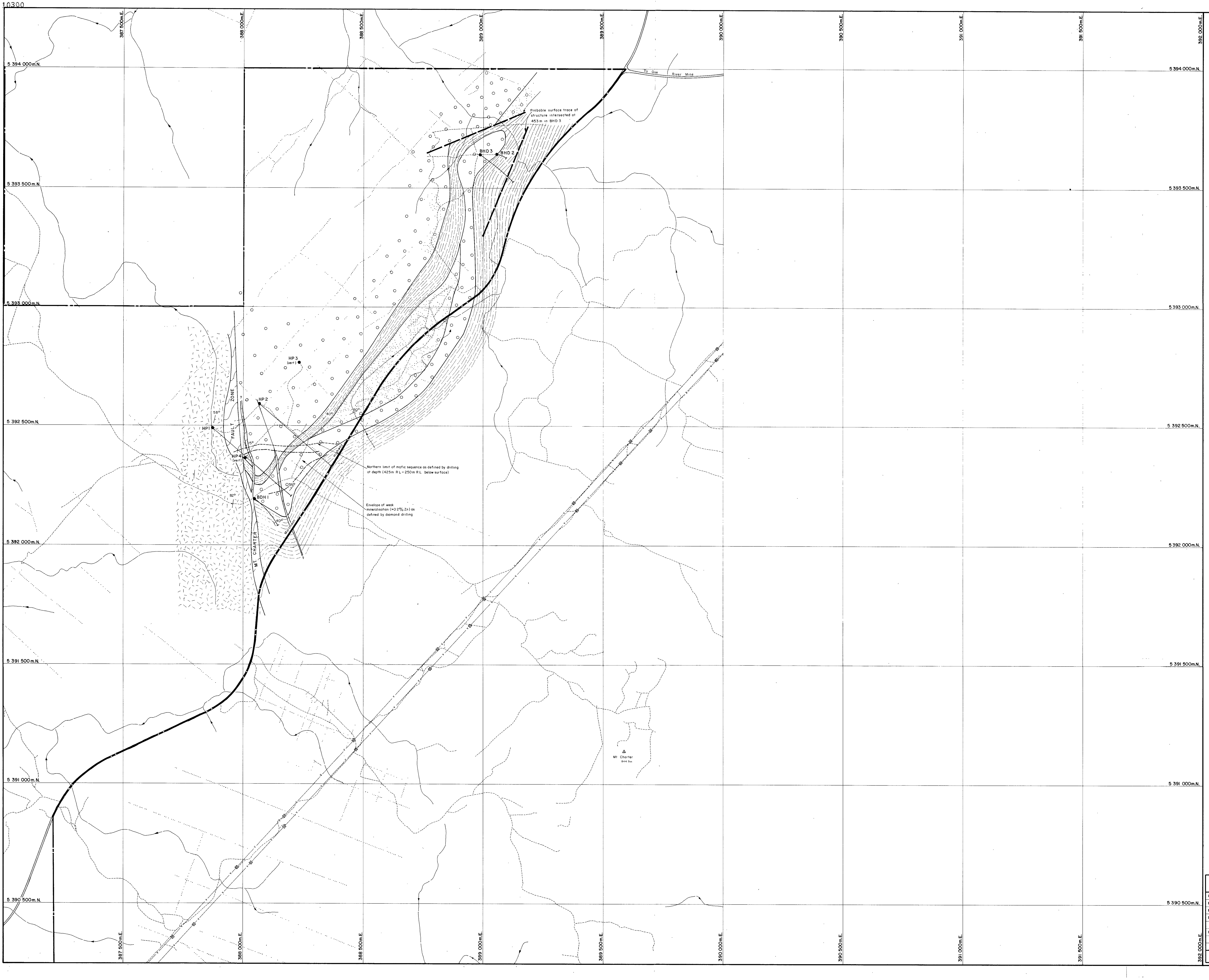


92-3327.1



10299

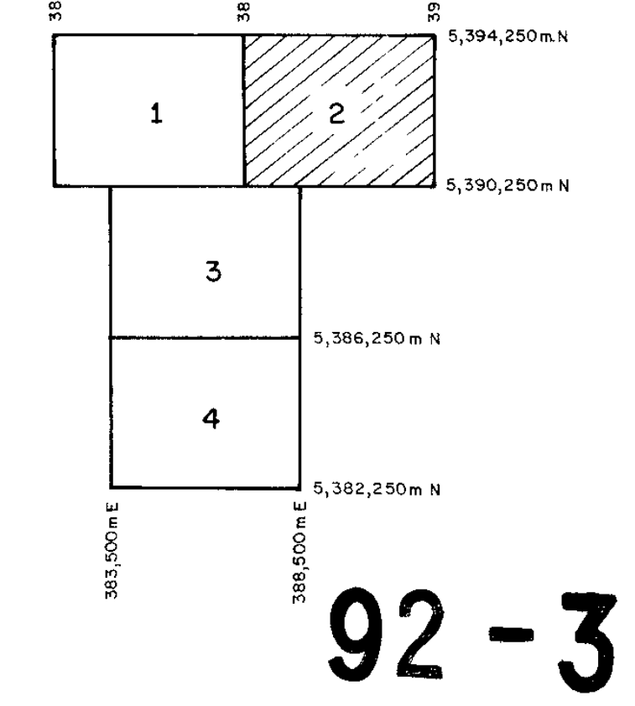
10300



LEGEND

○ ○ ○	Quartz-feldspar sandstone Varying quantities of rhyodacite & shale lithics Dark shaley matrix Resembles a porphyry in places.
○ ○ ○	Feldspar (quartz) sandstone-siltstone, commonly with dacite rhyolite & sericite lithics
▤	Black Shale
v v v	Mafic-intermediate hyaloclastite lavas & intrusives with minor epiclastics
▨	Quartz-mica sandstone, siltstone & minor shale
▨	Shear Zone
	HEC Powerline
	Highways
	EBR Railway
	Vehicle Tracks
	Foot Tracks
	Rivers/Creeks
	Swamps
	Lakes
	EL Boundary.

5 cm



92-3327.

E.L. 37/89 BULGOBAC HILL

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED . A N L
DATE : 25-1-'91
DRAWN : N.W D.S
REF:
REVISIONS : J G P
Jan , 1992
DRAWING No

HIGH POINT PROSPECT

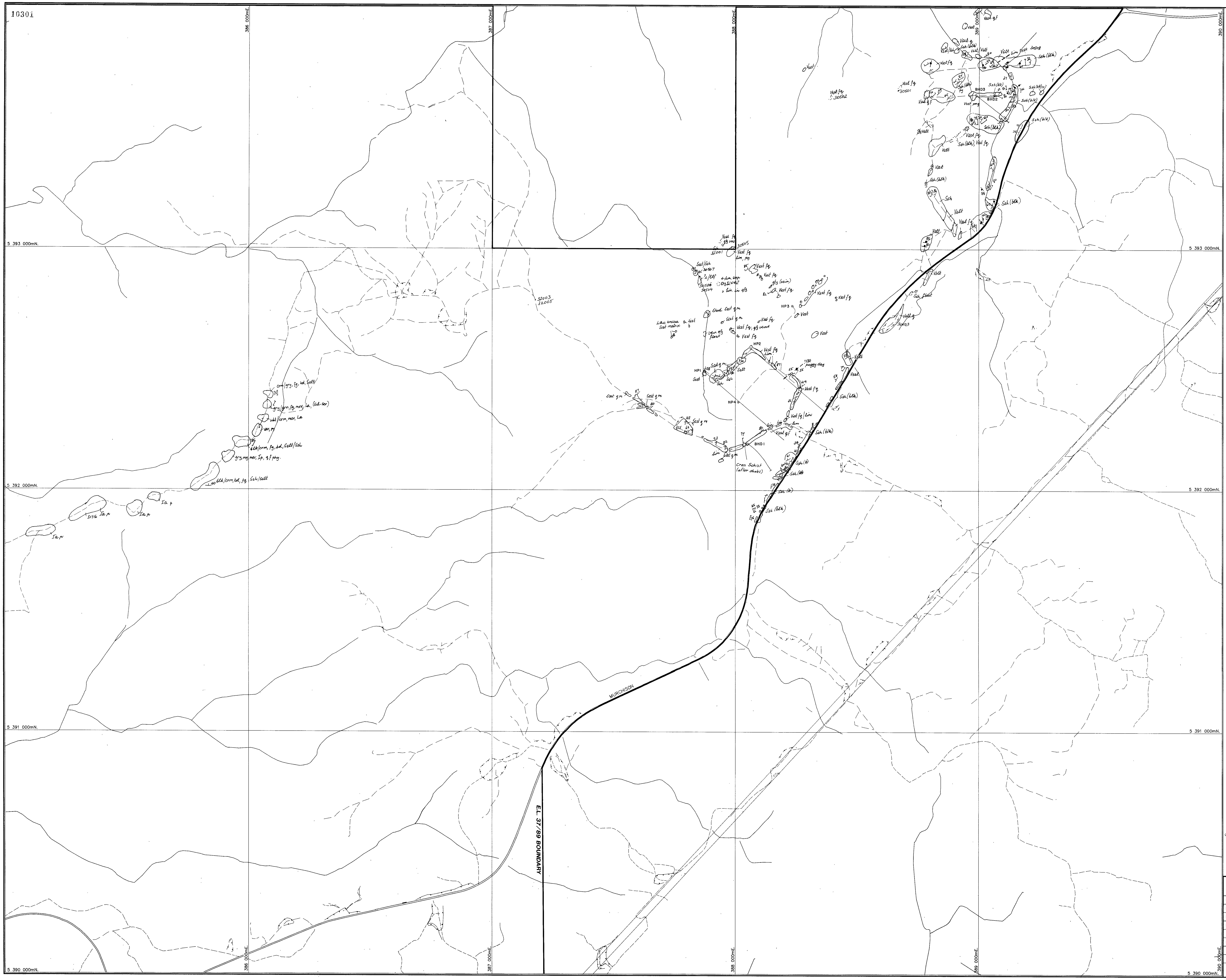
INTERPRETED GEOLOGY

112188

SCALE = 1 5000 0 100 200 METRES

FIG. No. 17

1030i



L E G E N D

1. General Form

Colour, grain size, overall texture, Rock Type, constituents & textutres, alteration, mineralisation.

Descriptors and Rock Types to be separated by comma or slash. Derwent series 19 colours (in brackets) are intended for the Cambrian sequences.

2. Rock Types

Lavas L

a	(9)	acid
i	(46)	intermediate
b	(49)	basaltic
r	(9)	rhyolitic
d	(11)	dacitic
n	(46)	andesitic

Intrusives I

a	(12)	acid
i	(46)	intermediate
b	(49)	basic
fel		felsic
p		porphyritic
g	(12)	granitic
peg		pegmatitic

Volcaniclastics V

pm	(7)	pumiceous mass flow
q	(32)	quartz phyric mass flow
sst	(32)	sandstone

Sediments S

sh	(35)	shale
t	(36)	slate incl. black slate
slt	(35)	siltstone
sst	(39)	sandstone
tb		turbidite
w	(39)	wacke
cong	(39)	conglomerate
Δ		breccia
cht	(34)	chert
lst	(65)	limestone
dol	(65)	dolomite
q	(39)	quartzite
Fe		iron formation
gl	(4)	glacial deposits
fgl	(4)	fluvioglacial deposits
alv	(4)	alluvial deposits
mst	(35)	mudstone

Metamorphic Rocks M

Colours should be hatched

sht	(38)	schist
sp	(35)	semi-pelite
ps	(39)	psammite
amph	(49)	amphibolite
gran		granulite
sk		skarn
mb	(65)	marble
m		mylonite

Unassigned

?	Use alone or as a qualifier to other rock types where uncertain.

3. Descriptors

Colour:

ple	pale	[illegible]	[illegible]
dk	dark	wht	white
clr	clear	yel	yellow
or	orange	ol	olive
blk	black	grn	green
pk	pink	ppl	purple
rd	red	crm	cream
brn	brown		

Grainsize:

fg	fine grained
mg	medium grained
cg	coarse grained
vcg	very coarse grained

Overall Texture:

aug	augen
p	porphyritic
fol	foliated
clvd	cleaved
msv	massive
blk	blocky
bd	bedded
lam	laminated
xbd	cross bedded
xlam	cross laminated
br	brecciated
fb	flow banded
fΔ	flow brecciated

Constituents & Internal Textures:

f	feldspar
q	quartz
l	lithic
pm	pumice
styl	stylolites
wsp	wisps
ves	vesicles
sph	spherulites
lph	lithophysae

Alteration:

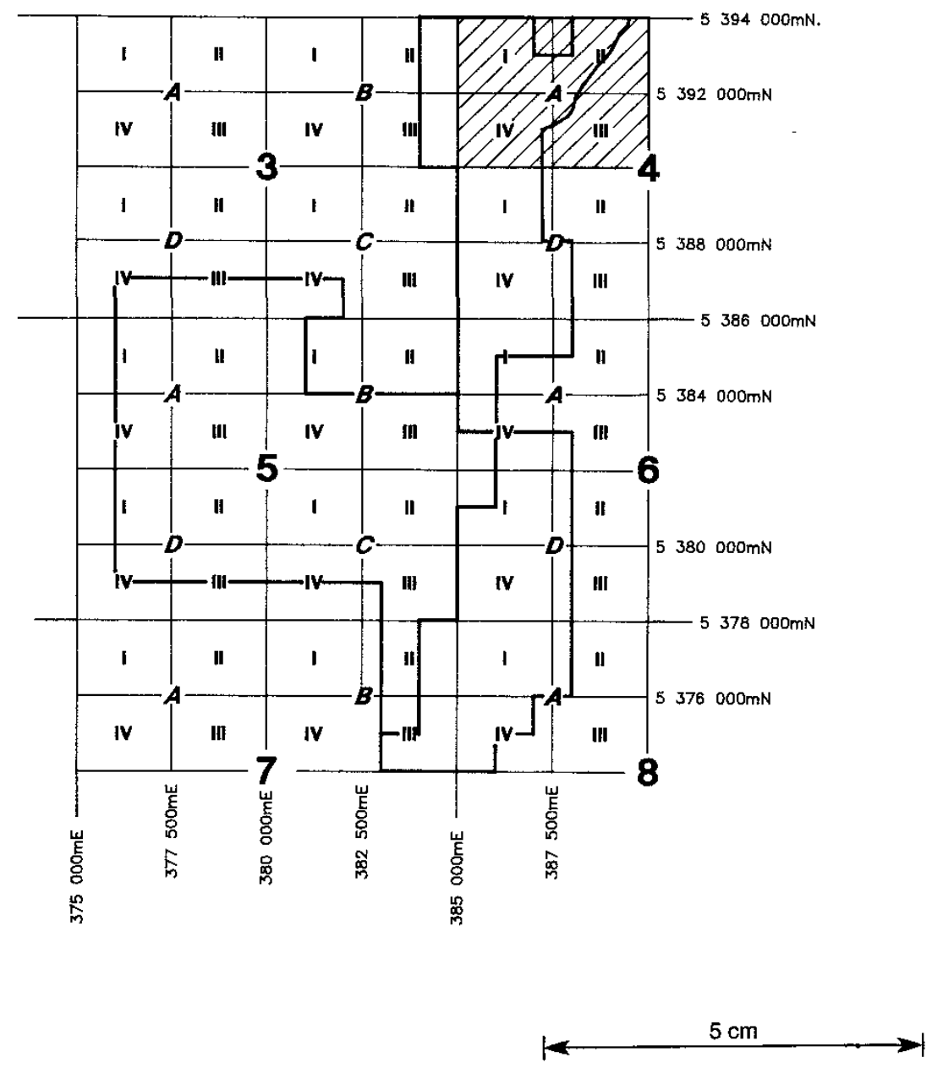
alb	albitised
co	carbonate alteration
chl	chloritised
ser	sericited
kao	kaolinised
ep	epidotised
sil	silicified

Mineralisation:

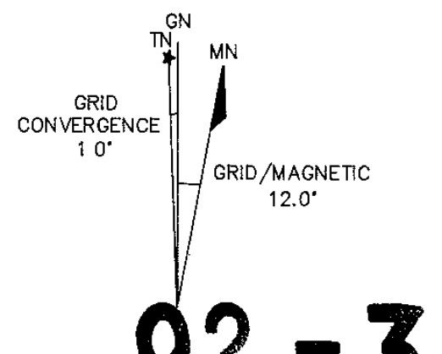
diss	disseminated
str	stringer
msv	massive
gos	gossan
bx	boxwork
py	pyrite
po	pyrrhotite
asp	arsenopyrite
gn	galena
sp	sphalerite
mag	magnetite
hm	haematite

4. Mapping Symbols

25°	Strike and Dip of Strata		Unconformity
	Strike and dip of inverted strata		Fault
60°	Strike and dip of cleavage or foliation		Thrust Fault
50°	Plunge of lineation		Plunging antiform
	Geological boundary position accurate		Plunging synform
	Geological boundary position approximate		
	Mine		
	Abandoned prospect or mine		
	Costean or trench		
	Diamond drill hole, including projection		



5 cm



Geology –
J.G.P (BHP) 1989
A.N.L. (Pas) 1990-91
L.W.K " 1991

112189

92-3327.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : A.N.L./J.G.P.
DATE : Dec., 1991
DRAWN :
REFERENCE :
REVISIONS :
DRAWING No.

E.L. 37/89 - BULGOBAC HILL

HIGH POINT

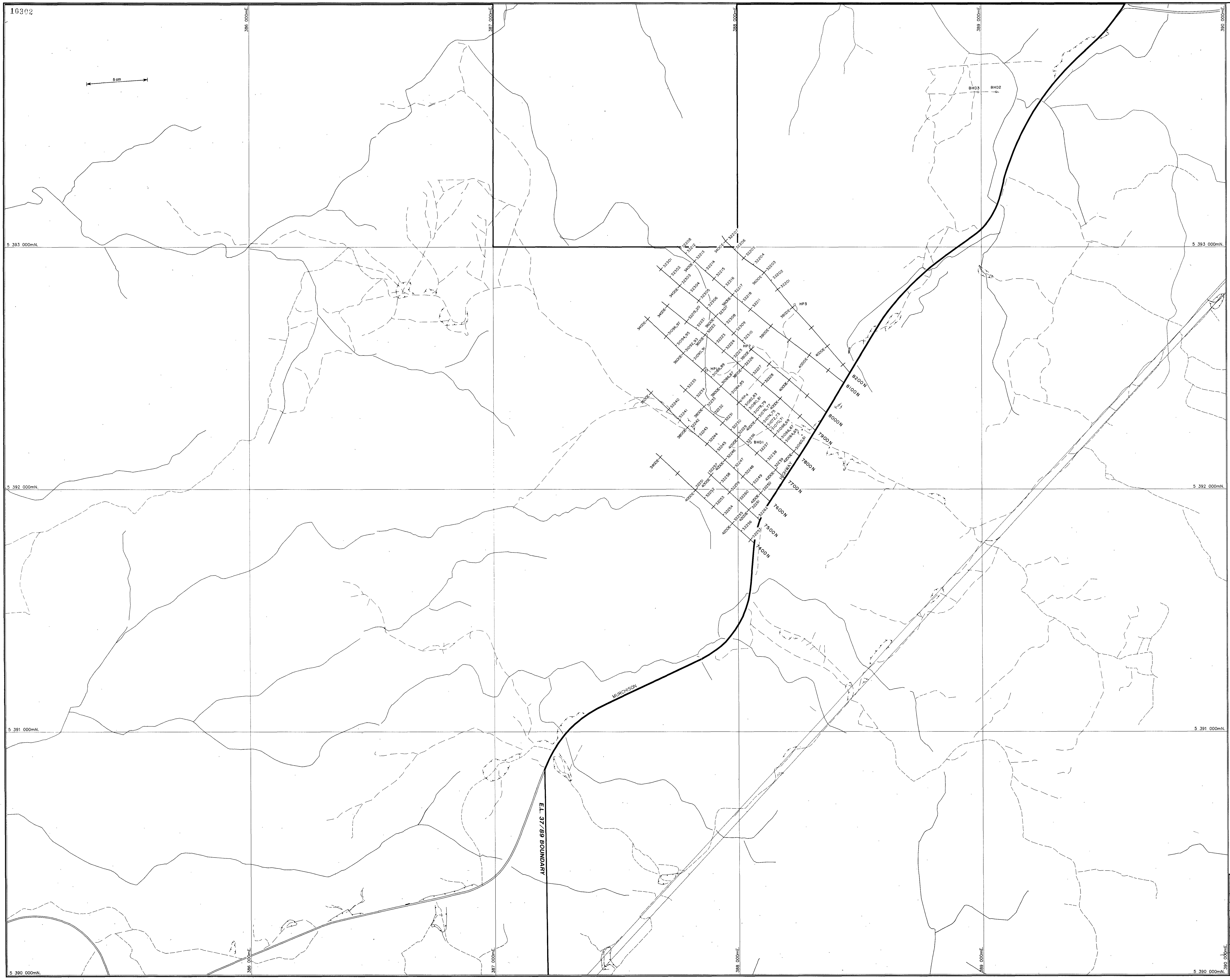
OUTCROP GEOLOGY

SCALE 1:5000 0 100 200 METRES

FIG. No. 18

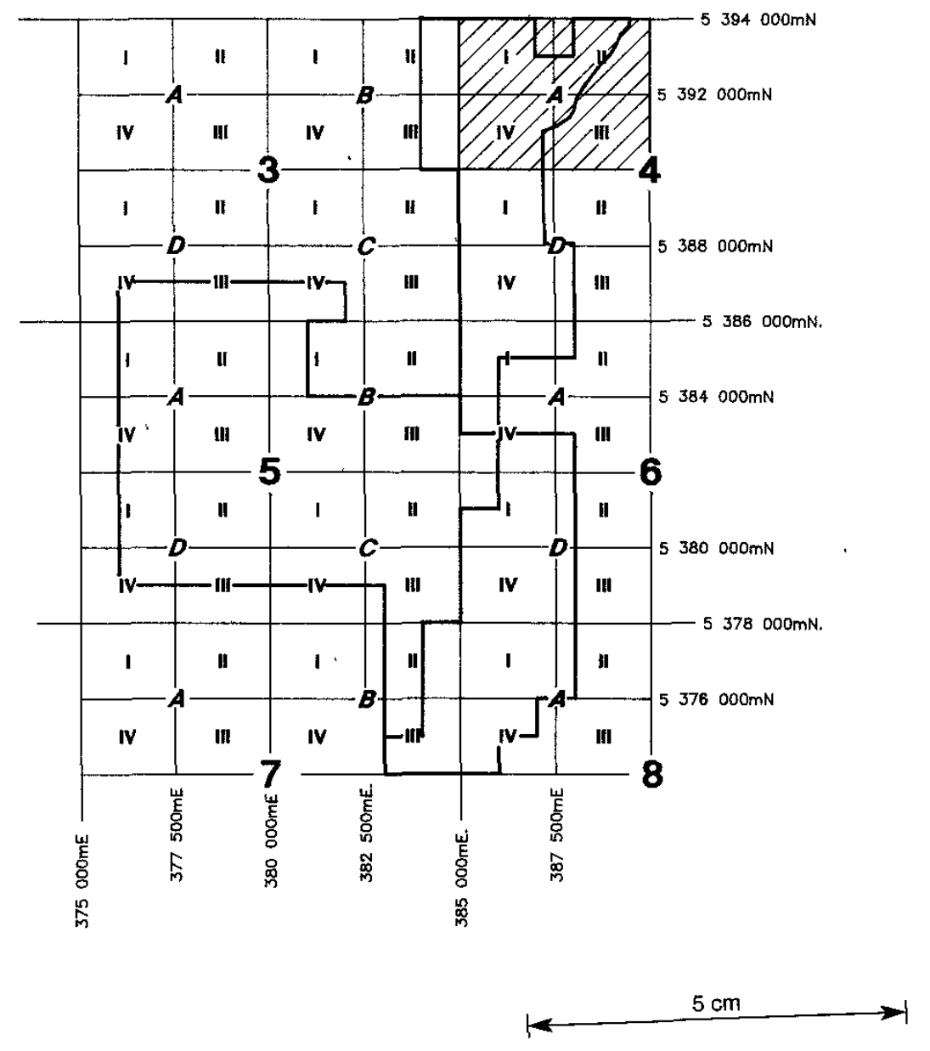
N.W Coast Computer Aided Drafting Centre. Phone (004 354315)
Fax. (004 354495)

10302



LEGEND

31064	Soil sample



112190

92-3327.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : JGP
DATE : 7-2-'92
DRAWN : NWDS
REFERENCE :
REVISIONS :

DRAWING No.

E.L. 37/89 - BULGOBAC HILL

HIGH POINT

SAMPLE

LOCATIONS

SCALE 1:5000 0 100 200 METRES

FIG. No. 19

N.W Coast Computer Aided Drafting Centre Phone (004 354315)
Fax (004 354495)