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EXPLORATION LICENCE

NO. 10/88 - GOWRIE PARK

PROGRESS REPORT ON EXPLORATION ACTIVITY

AUGUST 1989 TO JULY 1990

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P.A. JONES July, 1990
Phil Jones and Associates
FOR NORANDA PTY. LTD.

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D I S T R I B U T I O N

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FIGURE

1 Location Diagram

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Drew Eage - Aeromagnetic Survey

SUMMARY AND CONCLUSIONS

The primary exploration target for EL 10/88 is a polymetallic volcanogenic massive sulphide deposit of the Rosebery or Hellyer style. The secondary target is for a volcanic hosted gold show for which the Henty Gold deposit is only one of the type occurrences defined to date in the Mount Read Volcanics.

The licence, totalling approximately 53 square kilometres, was granted to Noranda Pty Ltd for a period of 12 months from 22 August 1989. The tenement has currently been renewed for an additional 12 months. The tenement comprises two separate areas: Part 1 - Lake Barrington and Part 2 - Gog Range Fig. 1. Both portions of the licence are well situated to power, water, transport and labour facilities. Access is good within the prospective area with numerous gravel and 4 x 4 wheel drive tracks being utilised.



Project Location


ULVERSTONE
DEVONPORT
LATROBE
Railton
Sheffield
Wilmot
Barrington
Lower Barrington
Lake Barrington
Lake Paloona
Lake Cethana
Mole Creek
Gowrie Park
Claude Road
Paradise
Beulah
Lower Beulah
Weegena
Merseylea
Sunnyside
Kimberley
Stoodley
Nook
Forth
Leith
Devonport Airport
Wesley Vale
Northdown
Egg I
Wright I
Mersey Bluff
Picnic Pt
Turners Beach
Gawler
Riana
North Motton
Spalford
Kindred
Sprent
Melrose
Aberdeen
Paloona
Sprayton
Eugenana
Tailleton
Moriarty
Sassafras
Gunns Plains
Preston
Warrinea
Central Castra
Upper Castra
Lower Wilmot
Nietta
Narrawa
South Nietta
West Kentish
Roland
Promised Land
Staverton
Erriba
Lorinna
Liena
Mayberry
Chudleigh
Caveside
Dogs Head Hill
Kenzies Hill
Minnow
Dasher
Panorama SL
Mt Claude
Mt Vandyke
Mt Roland
Mt Montgomery
Mt Duncan
Mt Riana
Mt Corymer
Mt Kate
Middlesex Plains
Daisy Dell
Emu Plains
Borradaile Plains
Lake Parangana
Pencil Pine Creek
Standard Hill
Western Bluff
Great Western Tiers
Overland Track
Cradle Mountain-Lake St Clair National Park
Devils Gate
Kimberleys
Bonneys Tier
Badgers Range
Oonagana Range
Dogs Range
Mersey River
Forth River
Don River
Leven River
Gawler River
Castra River
Wilmot River
Claytons Rd
Clerke Plains
Eldandula
Eardley Tor
Loyetea Pk
Three Brothers
Tullie Tree
Falls Creek
Patricks Brook
Jean Brook
Whyte River
Iris River
Lea River
Stormont River
Bull Creek
Down River
Rowallan
Hampshire Hills
Hellyer
Black Bluff Range
Quoiba
Braddons Lo
Lillico
Adams
Penguin Creek
The Dial Range
Myrtle Cr
Buttons Cr
Claytons Cr
Bonneys Cr
Pardoe Cr
Rowallan
Maggs
Halkyard
5 cm
340000E
5460000N
1231 MT ROLAND
1420 WESTERN BLUFF
1545
1432 MT
803
1339
PART 1
PART 2
GOG RANGE
noranda
E.L.10/88 - PARTS 1 & 2
LOCATION PLAN
DRAWN BY : T.G.D.S.
DRAFTSMAN : T.G.D.S.
DATE : July '89
REVISIONS :
TITLE No.
SCALE 1 250 000
FIG. 1

Minor prospecting was undertaken late last century to early this century with no serious exploration being completed until Asarco was granted a licence in March 1973. Their original 743 square kilometre application was reduced to 199 square kilometres in 1976 when CRAE entered into a joint venture with Asaro. By 1983 CRAE held sole title to the EL and continued to explore the licence until early in 1988 when it was finally relinquished. During this period extensive ground surveys were completed assessing many of Asarco's original stream sediment anomalies. Many areas were gridded, mapped, soil and rock chip sampled, surveyed with geophysics (gradient array IP, dipole dipole IP, Magnetics, SP, VLF-EM) and later more detailed surveys completed prior to drilling (both diamond and percussion). Significant but low grade basemetal mineralisation was encountered both at Cethana and Staverton. Significant copper silver +/- gold mineralisation was also intersected at the Lake Barrington prospect.

Best results from the CRAE drilling were as follows:

Cethana:	77CC1	78.6 - 79.0 =	0.4m @ 8.3% Zn, 0.2% Pb
	77CC5	37.8 - 38.8 =	1.0m @ 3.9% Zn, 0.8% Pb, 1.2% Cu, 185 g/t Ag
Staverton:	PD 83 SP1	20 - 44 =	24.0m @ 0.5% Zn, 0.9% Pb, 10 g/t Ag
Lake Barrington:	DD 82 LB3	156.5 - 172.45 =	15.85m @ 1.2% Cu, 12 g/t Ag
	DD 82 LB4	225.8 - 226.3 =	0.50m @ 4.8% Cu, 36 g/t Ag, 3.2 g/t Au

The geology of the area is poorly understood, however, the basement sequence includes the Fossey Mountain Trough portion of the MRVs. The volcanics include rhyolitic to dacitic extrusive, intrusive and pyroclastic sequences with minor intercalated units of felsic vitric tuffs and volcaniclastic/tuffaceous siltstones. An anomalous belt of mixed andesite/rhyolite and epiclastics lying in the vicinity of the Lake Barrington Road may be an equivalent to the Que-Hellyer volcanic sequence. Overlying these volcanics unconformably and also thrust faulted is the Cambro-Ordovician Roland Conglomerate and Moina Sandstone sequences. Overlying the majority of the more gently undulating areas is a Tertiary Basalt of variable thickness.

Significant quartz - sericite - K spar - albite +/- pyrite - chlorite alteration is mapped at Cethana and Staverton associated with minor basemental mineralisation. A different type of alteration is evident in the Lake Barrington Road Area where a strong calcite - chlorite - sericite assemblage has been defined. A somewhat unique zone of quartz / hematite / carbonate stockworking associated with siliceous - sericitic carbonated volcanics occurs at the Fire Tower prospect, on the western portion of the Gog Range Grid. This alteration style is accompanied by highly anomalous gold, arsenic tungsten and basemetal values.

To date Noranda has concentrated its efforts on the evaluation of the Cethana Alteration Zone and the Fire Tower Prospect on the Gog Range grid.

D. Leaman supervised the acquisition of detailed aeromagnetics for the Lake Barrington portion of the licence and reviewed all existing aeromagnetic and gravity data for this and the Gog Range portion of the licence in an attempt to outline the geologcial history and mineralization potential of the licence.

Detailed surveys completed over the Cethana Alteration Zone by D. Hicks have further highlighted the potential of this Cambrian hydrothermal system. Targetting still remains a problem for this significant system and IP results may help to clarify the potential allowing drill surveys to commence.

Intensive work was also conducted over the Fire Tower prospect with surveying, detailed rock chip and channel sampling, mapping, IP surveying and diamond drilling surveys being completed. Highly significant gold values were returned (up to 14 g/t as composite sample and 11 metres @ 4.9 g/t Au from a channel sample) associated with significant basemetal, arsenic, tungsten and cobalt values. The mineralization is associated with highly altered quartz / sericite / carbonate / pyrite valcanics, epiclastics and possible intrusives. Major zones of stockworking (quartz / carbonate / pyrite / hematite) are also associated with the zone of alteration. Three diamond holes were targetted to assess the coincident zones beneath the limit of oxidation in an attempt to assess the geology, structure and style of mineralization. Hole GP-90-1 returned 25m @ 1.95 g/t Au and hole GP-90-3 25 metres @ 1.85 g/t Au with the best interval being 6 metres @ 3.56 g/t Au from 12-18 metres.

From previous surveys and surveys completed by Noranda it is evident that EL 10/88 shows great potential for the discovery of volcanogenic massive sulphide mineralization as well as volcanic hosted precious metal deposits.

In order to locate these possible deposits, additional lithogeochemical isotopic, geological, geophysical and geochemical surveys will need to be undertaken prior to the commencement of diamond drilling. This balanced exploration programme should locate the type of mineralization sought if it is at all present.

RECOMMENDATIONS

It is recommended that the proposed programme be initiated as soon as possible in order to make the most use of the coming summer field season.

The proposed programme is designed to assess the Lake Barrington portion of the tenement for polymetallic volcanogenic massive sulphide (VMS) deposits and the Gog Range Portion for volcanic and/or structurally hosted precious metal deposits.

IP data for both Cethana and the Fire Tower Prospect will be evaluated and drill targets defined. Additional shallow drill fences will be completed over the Fire Tower alteration zone, in an attempt to constrain mineralization and target deeper diamond holes.

The Lake Barrington prospect will be diamond drilled, testing the major IP and Misse a la Masse anomaly at depth beneath previous drilling.

TARGET CONCEPT AND OBJECTIVES

The primary exploration target on EL 10/88 is a polymetallic volcanogenic massive sulphide (VMS) body, similar to those found at the Rosebery, Que and Hellyer Mines. Large hydrothermal alteration zones at Cethana and Staverton may represent haloes around similar sulphide bodies. A secondary although equally important target is for a volcanic-hosted gold deposit. Although there are no type deposits in production within the Mount Read Volcanics, two major gold occurrences within the MRV are being pursued at depth to ascertain their viability. The Henty Prospect appears to be a volcanic hosted deposit which has been partly controlled and/or overprinted by major basement structural features (Henty Fault) and the South Hercules deposit is more akin to a gold rich low grade basemetal occurrence adjacent to a mined out massive sulphide.

Detailed lithogeochemical (major and trace element) isotopic (lead, carbon, oxygen and sulphur) and petrographic surveys have been completed over the Cethana Alteration Zone and some over the Staverton Alteration Zone. These surveys further highlighted the prospectivity of the zones yet failed to delineate a distinct target within the large alteration areas. A more stratigraphic type of exploration approach may be necessary to adequately test the zones at depth. A reassessment of the available geophysics may necessitate some shallow drill testing of prospective horizons.

Exploration on the Gog Range portion of the tenement has provided significant encouragement in the location of a gold anomaly hosted within altered and stockworked volcanics and epiclastics. This area was reported by CRA as having a strongly anomalous (320 g/t Au) drainage response. No follow-up, other than a cursory examination, was made by CRAE. Noranda has conducted a detailed exploration programme including mapping, soil and rock chip sampling, channel sampling and shallow diamond drilling surveys which has indicated significant gold values associated with boldly outercropping stockworked, basemetal / arsenic / pyrite / gold mineralized and altered volcanics and epiclastics. More detailed man portable diamond drilling surveys will be completed prior to implementing a major drilling programme. Additional significant gold values obtained from the regional bulk cyanide leach programme of CRAE will need to be investigated in detail as well.

DESCRIPTION OF THE PROPERTY AND OWNERSHIP

Exploration Licence 10/88 Gowrie Park, of approximately 46 square kilometres in area was granted to Noranda Pty Ltd for a period of 12 months from August 22, 1989. Subsequent to this application, Noranda was successful in obtaining an adjacent licence, EL 35/88 Cethana, totalling 7 square kilometres through the Mines Department tender system. Once granted, this small tenement was amalgamated into EL 10/88 which during November 1989 was further amended (adding 0.9 square kilometres to the total area of 10/88), by the Mines Department to allow for the squaring up of the northern most boundary of the licence (Enclosure 1).

The tenement which consists of two parts is bound by the following co-ordinates:

Part 1 - Lake Barrington, totalling 36 square kilometres.

Commencing at a north west corner of the area whose grid co-ordinates are 431 000 m E 5 417 000 m N thence grid east to 434 000 m E grid south to 5 415 000 m N grid west to 433 000 m E again grid south to 5 409 000 m N again grid west to 432 000 m E again grid south to 5 406 500 m N again grid west to 430 500 m E grid north to 5 407 000 m N again grid west to 429 500 m E again grid north to 5 407 500 m N again grid west to 428 500 m E again grid north to 5 408 000 m N again grid west to 426 000 m E again grid north to 5 409 000 m N thence grid east to 428 000 m E again grid north to 5 412 000 m N again grid east to 429 000 m E again grid north to 5 413 000 m N again grid east to 430 000 m E again grid north to 5 415 000 m N aforesaid again grid east to 431 000 m E aforesaid thence again grid north to the point of commencement.

Part 2 - Gog Range, totalling 17 square kilometres

Commencing at the northwest corner of the area whose grid co-ordinates are 442 000 m E 5 407 000 m N thence gride east to 449 000 m E grid south to 5 404 000 m N grid west to 445 000 m E grid north to 5 405 000 m N again grid west to 443 000 m E again grid north to 5 406 000 m N again grid west to 442 000 m E aforesaid thence again grid north to the point of commencement.

All exploration and reporting is conducted as if one licence (EL 10/88).

Government expenditure requirements for the licence totalled $122,000 for the initial 12 month period with a further $185,000 to be expended during the second year, as per tender obligations.

The pre-existing Mining Lease, 93 M/84 totalling 12 hectares, is located in the western portion of the Gog Range and covers a stone and gravel deposit held by A.E. and K.H. Walters.

A portion of the licence is covered by the proposed Mount Roland Protected Area which may at some stage in the future be gazetted. Should this occur, then some additional environment constraints may be imposed upon the explorer. The tenement is otherwise made up of Crown Land, State Forest, Freehold Land and some land vested in the Hydro-Electric Commission (Lake Barrington high water mark and Cethana Dam Area).

LOCATION AND ACCESS

Exploration Licence 10/88 comprises two separate areas, these being Part 1 - Lake Barrington and Part 2 - Gog Range.

The Lake Barrington area is located 15 kilometres south west of Sheffield and 35 kilometres south south west of Devonport, a major city and port on the north coast. The Gog Range portion of the tenement lies 15 kilometres east south east of Lake Barrington and approximately 12 kilometres south south east of Sheffield.

Sheffield is a service town for the large agricultural community and is connected via a network of major bitumen roads to all major towns and ports in Tasmania.

Access within the prospective area is good with numerous gravel and bitumen roads developed by the HEC during dam construction. Subsidiary four wheel drive tracks including old Forestry logging tracks, HEC transmission line and previous explorer tracks also add to the overall accessibility.

An excellent power and water source is available in the area through the extensive hydro-electric schemes. The area has an annual rainfall of from 120 to 200 cm dependent on location. In general the farming (grazing and cropping) land is flat to hilly with the prospective sequences being more hilly to rugged.

HISTORY AND EXPLORATION TO DATE

Asarco Australia Pty Ltd was granted EL 7/73 totalling 743 square kilometres on 15 March 1973. The licence covered the majority of the Cambrian Mount Read Volcanics within the Fossey Mountain Trough and its initial programme was one of regional stream sediment sampling and reconnaissance mapping. In March 1974 the tenement was reduced to 440 square kilometres - after targets were outlined from the previous surveys.

CRAE entered into a joint venture with Asarco on 12 July 1976 and at the same time pegged EL 10/76 which was a relinquished parcel of land within 7/73 held previously by the Tasmanian Mines Department. Title for EL 7/73 transferred to CRAE on 29 December 1977 and in 1979 the licence was reduced to 199 square kilometres. In June 1980 Asarco transferred its interest in the joint venture to Carpentaria Exploration Co. Ltd and finally in 1983 CRAE assumed sole title to the EL. The tenement was relinquished early in 1988 and was immediately put up for tender through the Mines Department ETA system.

Extensive ground surveys were initiated by CRAE to assess the targets generated through Asarco's stream sampling programme. These surveys included gridding, geological mapping, soil and rock chip sampling and geophysical surveying (gradient array IP, dipole dipole IP, Magnetics, Self Potential, and VLF-EM) on the Lake Barrington, Promised Land, Staverton, Cethana (East and West), Gog Range and Cethana Picnic Ground prospects. Encouraging results necessitated follow-up, more detailed work conducted on the Lake Barrington, Cethana, Staverton and Gog Range grids. These surveys included detailed dipole dipole IP, Genie EM, PEM, UTEM and helicopter borne EM (Dighem), results of which led to the drilling of 18 holes; 16 diamond and two percussion. Thirteen of the holes were drilled on the Cethana Prospect with seven situated at Cethana West and the remainder at Cethana East. The majority of holes intersected low grade lead-zinc mineralization (1.2%) within pyritic altered volcanics and tuffaceous sediments. Best results are as follows:-

Cethana West - Hole DD 77CC1 78.6 - 79.0 = 0.4 m
@ 8.3% Zn + 0.2% Pb

Cethana East - Hole DD 77CC5 37.8 - 38.8 = 1.0 m
@ 3.9% Zn + 0.8% Pb + 1.2% Cu + 185 ppm Ag

All four diamond holes drilled on the Lake Barrington prospect encountered encouraging pyritic copper mineralization with some gold and silver credits also present, within siliceous and chlorite/sericite altered volcanics and volcaniclastics. Best results are as follows:-

DD82 LB3	140.8	- 140.98	=	0.18 m @ 9.1% Cu, 52 g/t Ag.
	156.5	- 172.45	=	15.85 m @ 1.2% Cu, 12 g/t Ag
	207.85	- 209.00	=	1.15 m @ 1.6% Cu, 18 g/t Ag
DD83 LB4	48.0	- 49.0	=	1.00 m @ 1.9% Cu, 5 g/t Ag
	225.8	- 226.3	=	0.50 m @ 4.8% Cu, 36 g/t Ag, 3.2 g/t Au

A percussion hole designed to test coincident geochemical / geophysical responses on the Staverton grid intersected highly altered pyritic quartz sericite schists with minor but significant basemetal mineralization. Results for this hole are as follows:-

PB 83 SP1 20 - 44 = 24 m @ 0.9% Pb, 0.5% Zn, 10 g/t Ag
includ. 20 - 34 = 6 m @ 1.3% Pb, 1.0% Zn, 14 g/t Ag

Importantly it should be noted that little gold assaying was attempted until extremely late in the period of tenure when an attempt was made to broadly assess the licence for fine grained volcanogenic gold deposits. Bulk Cyanide Leach sampling techniques in conjunction with standard stream sediment sampling surveys were implemented sparesly across the tenement.

Significant results were returned, however, no detailed investigations were instigated to confirm and quantify the occurrences. In particular no detailed follow up of the Gog Range gold/tungsten panned concentrate sample - now the Fire Tower Prospect.

Some minor core reassaying for gold was conducted very late in the period, returning values to 1 g/t Au over 1 metre. However, in general, only samples which contained visible lead-zinc were assayed for the noble metal. Extensive pyritic zones failed to be assayed. An exception to the lack of gold assaying occurred on the Lake Barrington Prospect where drillhole assaying for gold was completed on mineralized zones from all four holes.

REGIONAL GEOLOGY

The geology in the general area of the licence is poorly understood and the most up to date published mapping is of 1958 vintage (Sheffield and Middlesex sheets). Mapping by the Department of Mines during the Mount Read Volcanic Project stopped immediately to the west of the licence and it is hoped that this mapping will shortly continue through and beyond the licence to the east so as to constrain the geological setting.

The basement sequence in the region includes the Fossey Mountain Trough portion of the Cambrian Mount Read Volcanics (MRV). These volcanics importantly host five polymetallic ore deposits; Mt Lyell, Rosebery, Hercules, Que River and Hellyer and one volcanic related gold deposit - Henty. These calc-alkaline volcanics which form the Mount Read Arc, extend in a belt over 150 kilometres long from Elliott Bay in the south-west, up through Queenstown and Hellyer and then continue easterly around the northern flank of Mount Roland toward Deloraine. The 10 - 15 kilometre wide belt which flanks the western margin of the Precambrian Tyennan Geanticline is divided into three main lithofacies.

The central belt sequence (CV) comprises rhyolitic to andesitic subaerial and subaqueous intrusive and extrusive volcanics and lacks notable sedimentary horizons. Previous interpretations by Mines Department geologists (Corbett et al) had placed virtually all of the known volcanogenic mineralization within this central belt of massive volcanics. More recent studies by Corbett, Large and others have shown that the majority of deposits now occur within the time equivalent Tyndall Group / Southwell Subgroup / Western sequence rocks. These units flank the central volcanic sequence on the western side by volcano - sedimentary marine sequences (western sequence) and to the north and east by a mixed sequence of volcaniclastic sediments, rhyolitic quartz crystal tuffs and lavas with minor intermediate volcanics (Southwell Subgroup and Tyndall Group rocks). The western sequence rocks grade westward into fossiliferous middle late Cambrian turbiditic successions of the Dundas Group.

An anomalous pile of andesites (Beulah Formation) near Sheffield which also crop out within EL 10/88 may be Que-Hellyer time equivalents, hence the surrounding areas rate highly for volcanic massive sulphide (VMS) potential.

Late Cambrian shallow marine and terrestrial siliciclastic Roland Conglomerates unconformably overlie or are thrust over the older volcanic sequences. Siluro-Ordovician siliciclastic sediments and carbonates conformably overlie the Roland Conglomerate.

This period was followed by widespread folding and faulting which culminated in the intrusion of the Devonian Dolcoath Granite. The steep margins to the granite and rocks adjacent to it are now dotted with numerous tin, tungsten, molybdenum and gold prospects.

Large flood basalt sheets were erupted on to an eroded surface during the Tertiary, infilling many valley areas. Continuing erosion via streams and glaciation has left the present day rugged and incised relief.

GEOLOGY OF THE PROPERTY

The geology of the property varies greatly from Lake Barrington to Gog Range, therefore the two areas will be discussed separately.

LAKE BARRINGTON (Enclosure 2)

Rocks encountered in outcrop in the Lake Barrington Area, centred on the Cethana Alteration Zone, comprise a sequence dominated by quartz feldspar phyric rhyolitic minor dacitic volcanics including probable intrusive, extrusive and pyroclastic units with minor intercalated sequences of fine grained (aphyric) felsic - vitric tuffs and volcaniclastic/tuffaceous siltstones and shales - Tyndall Group equivalents. The interpreted basal portion of the sequence lying adjacent to the thrusted Roland Conglomerate - Moina Sandstone contact is comprised of well bedded north dipping sandstones, siltstones and shales which grade northwards into volcaniclastic and tuffaceous sediments thence conformably into volcanics.

Bedding orientations where observable in the volcanics also show a steep northerly dip which in places is subparallel to the regional cleavage. Graded bedding and scour and fill structures within the basal sediments indicate the sequence youngs to the north and that the sediments are overlain by the volcanics.

Alteration within the Cethana area is demonstably variable, however, a significant quartz - sericite - K spar - albite +/- pyrite - chlorite mineralogy is mapped, where outcrop permits from Lake Barrington east to the Mount Claude Road where the host volcanics are hidden by extensive talus and/or fluvioglacial material. The zone of alteration is up to 500 metres in width and has minor associated basemetal mineralization occurring as disseminations, aggregates and transgressive veinlets and stringers. Results of a lead isotope survey conducted on galena rich core (CRAE Drillholes) samples: predominantly late stage, cross cutting mineralization, showed a Cambrian signature falling within the Rosebery 95% confidence ellipse. It is possible that this style of mineralization may be remobilized or stringer mineralization peripheral to a major deposit at depth.

A possible Devonian overprint has been observed complicating the picture with the addition of a biotite-tourmaline-quartz assemblage generally as veinlets and to a lesser extent as pervasive disseminations. Although this is not encountered at Hellyer, it is at Rosebery where a granite association is well demonstrated.

The schistosity observed in the alteration zones at Cethana and further north at Staverton is considered to be the product of a Devonian regional deformation event where stresses appear to have been concentrated in the easily deformed mica rich sequences in preference to the less deformed and less altered more competent rocks.

The approximately east-west trending volcanics continue northward from Cethana through younger less altered dacitic and rhyolitic lavas and tuffs until a second major zone of quartz - sericite altered volcanics and sediments is encountered at Staverton. The sequence at Staverton is shown on the Mines Department 1:50,000 Cethana compilation map to be predominantly felsic agglomeratic, however, cursory mapping with later petrographic work has shown the rocks to be schistose quartz phyric pumiceous and vitric tuffs, massive chloritic felsic vitric tuffs and quartz phyric crystal tuffs. More detailed mapping of this area is required.

Overlying this unit to the north is the lithologically anomalous andesitic Beulah Formation. Detailed mapping by W. Herrmann along the Lake Barrington Rowing Course road has indicated that this formation, described previously as intermediate to mafic lavas, tuffs and breccias, in fact comprises a mixed volcanic-epiclastic assemblage. Calcite-chlorite altered feldspar phyric dacitic lavas, quartz feldspar phyric glassy rhyolite lavas (plus pyroclastic component) and porphyritic andesites are associated with mass flow type medium grained lithic wackes of mixed felsic-intermediate volcanic composition and minor intercalations of mixed micaceous volcaniclastic greywacke and silstone.

Several sedimentary facing determinations indicate a younging generally northwards, confirming facing directions observed further south. This mixed volcanic/sediment sequence may be an equivalent to the Que-Hellyer sequence and more detailed mapping is necessary in order to ascertain its true stratigraphic position. Noranda is constrained here as the sequence is protected by a Government Reserve (Lake Barrington Recreation Area), which is managed by the Department of National Parks and Wildlife thus exempting it from exploration.

Strong calcite-chlorite-sericite alteration was highlighted through petrographic studies and reference made to the alteration system responsible for this being quite unlike that which produced the sericitic style observed at Cethana. (Previous annual report.)

The Beulah Formation is in turn overlain to the north by a mixed assemblage of volcaniclastic sediments, tuffaceous sediments of felsic derivation and more extensive conglomerates, grits, sandstones and shales. These units have previously been named the Gog Range Greywacke, however, they are analogous to the Southwell Subgroup / Tyndall Group / Dundas Group mixed sequence described by Corbett north and north-east of Hellyer.

Unconformably overlying in the north and thrust faulted in the south lies the Cambro-Ordovician siliciclastic sequences including the Roland Conglomerate and Moina Formation sandstones and siltstones. The contact observed on the Cethana dam road (old Lorinna Road) is interpreted as a shallow angle thrust with tuffaceous sediments immediately north of this feature being heavily ironstained (pyritic) and siliceous. In other exposures the conglomerate abuts volcanics with no evidence of pyritic or siliceous alteration or movement along the contact.

Blanketing much of the prospective geology is the Tertiary Basalt. This unit is of variable thickness due to being extruded on to an incised surface. The present day topography is a product of Pleistocene glaciation and more recent stream erosion.

GOG RANGE (Enclosure 3)

Rocks encountered in the Gog Range area have previously been mapped by Jennings 1958 as Minnow Keratophyre (volcanics) and Gog Range Greywacke (volcanics and sediments) which Noranda has tentatively ascribed to the Southwell Subgroup / Tyndall Group / Dundas Group sequence - see Regional Geology, as at Lake Barrington.

This conclusion was further strengthened after petrographic studies were completed on samples submitted after detail mapping of the gridded area. Rocks are derived from rhyolitic to rhyodacitic magmas and include dominant quartz feldspar phyric

lavas, crystal lithic and vitric tuffs, minor rhyolitic intrusives and subordinate epiclastic sediment horizons. The abundance of quartz-phenocrysts and the relative abundance of large zircons within these volcanics is a diagnostic feature of the Dundas Group - Tyndall Group - Southwell Subgroup felsic lavas and tuffs.

The mapped volcanic/sediment sequence is very proximal and coarse grained in the western portion of the grid grading into finer sequences to the east. Significant Cambrian and possibly overprinted Devonian silica / sericite / pyrite / carbonate alteration containing variable arsenopyrite, scheelite - wolframite, basemetals and gold mineralization is observed at the western, coarser, fragmental portion of the gridded volcanic / sediment pile - Fire Tower Prospect Enclosure 4. The 300m x 100m altered zone which is also variably quartz / carbonate / hematite / pyrite +/- mineralized stock work veined, lies directly over a major north south trending intrusive spline itself cut by a major E - W trending basement structure. (Appendix 1 .. D. Leaman). Genetically at least, part of the mineralization would appear to be related to the intrusive body, the structure possibly acting as a conduit for fluid flow.

Bedding orientations are scarce, however, when observed they show a generally very steep northerly dip in accordance with those at Lake Barrington. The majority of the prospective sequence is covered by talus material and the resistant silica / carbonate / sericite altered bluffs which boldly outcrop are generally quite massive and textureless. The only good mappable contact is the shale / siltstone epiclastic horizon which directly overlies the alteration / mineralization zone to the north.

Composite rock chip samples from the prospect assayed up to 14 g/t Au and channel sampling returned values up to 5 g/t over 11 metres giving hope that the mineralization zone may be the surface expression of a major volcanic hosted gold deposit.

Widespread silica-sericite-biotite +/- chlorite alteration is observed regionally over the remainder of the volcanic sequence with local variations in intensity, possibly due to proximity to additional major structures.

The east-west trending sequence of volcanics and epiclastics is in fault contact to the west with Roland Conglomerate although much of this contact is also covered by scree and talus. Roland siliceous, hematitic conglomerate, conformably overlain by Moina siliceous sandstone, is mapped in faulted and possibly unconformable contact south of the volcanic sequence.

Further rhyolitic volcanics and epiclastics are mapped (CRAE, Jennings) to the west and north west of the gridded area. These have been reconnaissance mapped and sampled returning weak veining densities and weak to minor gold values to 0.02 g/t Au - from spot rock chips. Further, more detailed mapping surveys will be implemented in order to screen these prospective rocks for additional mineralized zones.

Blanketing much of the prospective sequence are widespread slope induced talus and scree deposits. These Quaternary deposits are themselves being eroded by present weathering processes.

MINERALIZATION

Highly anomalous basemetal and minor to significant noble metal mineralization has been delineated through Noranda and CRAE diamond and percussion drilling surveys over various sections of the MRV within EL 10/88.

The style of mineralization varies from volcanic exhalitive(?) pyrite at Cethana East and basemetal mineralization within tuffaceous shale (77CC1 98.0 - 100.6 = 2.6 m @ 0.9% Zn + 0.9% Pb) at Cethana West to stringer, veinlet and disseminated mineralization varying from one to two percent (lead + zinc) in the majority of holes drilled at Cethana (best results being from: 77CC1 78.6 - 79.0 = 0.4 m @ 8.3% Zn + 0.2% Pb and 77CC5 37.8 - 38.8 = 1 m @ 8% Pb + 3.9% Zn + 1.2% Cu + 185 g/t Ag).

Noranda through its detailed ground surveys on the Gog Range Grid (Fire Tower Prospect) has outlined a major and distinctive volcanic style of gold mineralization. At this prospect a major quartz / carbonate / hematite stockworked silica - sericite - pyrite - carbonate - gold - arsenopyrite mineralized zone has been delineated hosted by altered epiclastics and possible fragmental rhyolitic volcanics. To date only three shallow (T.D. per hole - 25 metres) diamond holes have penetrated this zone all of which encountered significant gold mineralization. Best results are as follows:-

GP-90-1 0 - 24 = 24 m @ 2.01 g/t Au
GP-90-3 0 - 25 = 25 m @ 1.85 g/t Au
inc 12 - 18 = 6 m @ 3.55 g/t Au

Significant basemetal mineralization is associated with the gold zone along with minor cobalt (up to 0.2% Co in rock chips) and tungsten values (up to 0.6% W in drill core).

Highly significant copper-silver-gold stringer style mineralization has been drilled at Lake Barrington (DD82 LB3 156.5 - 172.45 = 15.85 m @ 1.2% Cu, 12 g/t Ag and DD83 LB4 225.8 - 226.3 = 0.5 m @ 4.8% Cu, 36 g/t Ag, 3.2 g/t Au), indicating a markedly different mineralizing environment.

Percussion drilling by CRAE at Staverton encountered significant lead-zinc mineralization within a quartz-sericite altered volcanic sequence (PD83 SP1 20-44 = 24 m @ 0.9% Pb, 0.5% Zn, 10 g/t Ag). No indication of mineralization style was reported.

WORK CONDUCTED BY NORANDA

Work conducted during the August 1989 to July 1990 period entailed the production of 1:25,000, 1:5,000 and 1:500 base maps, regional and detailed geological mapping, line cutting and gridding, geochemical sampling (including rock chip, channel and minor soil sampling), geophysical surveying (including aeromagnetics, gravity and IP surveying) and isotopic and major and trace element geochemical studies.

The programme to date has concentrated on both the Cethana Alteration Zone and the Fire Tower Prospect on the Gog Range grid.

1. REGIONAL WORK

Base maps of the two portions of the Licence were prepared by Tasmanian Geological Draughting Services of Sulphur Creek. A regional plan at 1:25,000 scale was produced as well as 1:5000 and 1:500 plans for the Gog Range - Fire Tower areas.

GEOPHYSICS

Dr. D. Leaman of Leaman Geophysics was contacted to review the available aeromagnetic and gravity data for the licence in an attempt to understand the geologically and structurally complex area and perhaps define additional prospective areas requiring detailed follow-up - Appendix 1. The initial basic review clarified a number of structural issues however, for more detail Leaman suggested that the Lake Barrington portion of the licence should be reflown with detailed aeromagnetics and that the Department of Mines should be requested to complete infill gravity surveys over the same area - Appendices 2 and 3.

Geo Instruments were contracted to complete the aeromagnetic programme which entailed the flying of approximately 300 line kilometres of N-S lines at 150 metre intervals and E-W lines at 400 metre intervals, with a nominal bird height of 80 metres. An aerospatiale AS 350 B squirrel helicopter was used to carry the G - 813 proton precession magnetometer enabling the 80 metre bird clearance limit to be achieved.

An additional 114 gravity stations were surveyed during the same period by Department of Mines personnel, the raw data for which was delivered to Dr. Leaman for reduction and terrain correction analysis.

The gravity and magnetic data sets are clearly coherent and complementary and Leaman was able to suggest concealed structural and lithological patterns, which were previously unrecognizable. The most complex and anomalous zone was WSW of Staverton where many structures are terminated, stepped and offset. The target area covers both sides of the Lake north of Jarmans Creek and WSW of Staverton. This area lies close to Leamans prospective 'Erriba Gradient' and stradles Leamans major 'Lake Barrington suture'.

Closer to Cethana, Leaman has defined probable Cambrian granitoids which appear to have been partially intruded along the Lake Barrington suture and which to date have been only found in small outcrops as well as some minor CRAE drill intersections. Leaman puts the Devonian Dolcoath granite at approximately 800m vertically below the Cethana Alteration zone and at the very limit of its influence. This has been later verified by petrographic and geochemical work - Hicks. Hons Thesis. Possible mafic rocks were also outlined at depth beneath younger cover rock in the vicinity of the Lake Barrington Copper Prospect, east of Staverton and coincide with the mapped Beulah Andesite unit which is anomalously non magnetic.

In the Gog Range Area local gold mineralization (Fire Tower Prospect and Star of the West Prospect) appears to be related to the upper surfaces of small Cambrian granitoids. Their unusual properties and varied composition is consistent with small Cambrian plugs perhaps later intruded by small Devonian systems. The instrusive pods are generally oriented N-S and subtle magnetic anomalies near the Fire Tower prospect appear to relate to a major E-W trending dislocation, which may have tapped the instrusive source and acted as a pathway for fluid movement. The magnetics also appear to have defined the significant alteration zone at the prospect.

2. CETHANA ALTERATION ZONE

SUMMARY

As stated in the previous progress report 1988-1989 D. Hicks was supported by Noranda in his studies over the Cethana Alteration Zone (Cethana Pyrite Zone) which he later submitted as his Honours Thesis. During the period he completed detailed mapping and isotopic (Pb, S and O) surveys and conducted some statistical analysis (Zinc

ratios) on drillhole geochemical results over the Cethana Pyrite Zone (CPZ). These studies have shown the alteration zone to be of Cambrian hydrothermal origin with minor modification due to the Devonian orogeny. No definite drill target was delineated utilizing these surveys however, it is hoped that dipole - dipole IP surveying to be completed mid August, will outline further CRAE's chargeable and resistive anomalies occurring in the altered zone, but masked in part by extensive scree deposits.

A more detailed summary of his data presentation is as follows:

GEOLOGY (Enclosure 5)

The Cethana Pyrite Zone with associated large hydrothermal alteration system, extends across a lower (older) sequence of altered dacitic to rhyolitic lavas, volcaniclastics and associated sediments. Stratigraphically above is a younger sequence of fresh rhyolitic lavas and pyroclastics. The two are separated by an outcropping zone of WNW trending weakly mineralized, quartz - sericite schists which have been strongly influenced by Cambrian hydrothermal alteration and Devonian deformation. The volcanic sequence hosting the CPZ has been intruded by a post-volcanic, pre alteration granodiorite (also defined by Leaman). Late Cambrian to Early Ordovician clastics of the Denison Group unconformably overlie the volcanics - thrust faulted in places.

Structurally the CPZ is very complex and cleavage values suggest a strong WNW regional trend with bedding often sub parallel to cleavage. Bedding is, however, often effected by drag faulting and little of the Cambrian structure is seen through the masking effect of the WNW trending, Mid Devonian deformation.

Hydrothermal alteration is intensely to strongly developed over a large area (3 kilometres along strike) of the lower volcanic sequence of the Cethana Pyrite Zone. The assemblage is sericite / chlorite / carbonate / silica / pyrite with minor phases such as hematite, biotite and tourmaline - the later appearing to be derived from the nearby Dolcoath Granite. Other late stage cross cutting carbonate / chlorite veins are also prominent. Original volcanic textures and mineralogies are generally not retained.

The altered volcanics are depleted in the relatively mobile elements Na, Ca and Sr and enriched in Mg, K and Rb compared to fresh equivalents. Comparisons of hydrothermal alteration at Cethana with other systems within the MRV indicates that the alteration around the CPZ is very similar to those containing volcanic massive sulphide deposits. A direction to mineralization based upon a zonation of alteration at Cethana is not obvious. However, it does appear that alteration is open in both directions along strike for some distance and the stratigraphic base of the alteration system has not previously been drilled.

Another large zone of sericite alteration at Staverton, some 3 kilometres north of the CPZ is in all respects the same as the major zone of sericite alteration mapped at Cethana. This would seem to indicate that hydrothermal activity in the region of Lake Barrington was active for a considerable time.

The extent of fluid/rock reaction during alteration at the CPZ is highlighted by relatively depleted oxygen isotope values (mean $\delta^{18}O$ = 11.6‰) around the zone. The fluids which formed the alteration and mineralization were dominated by seawater as the water/rock ratio was high. Sulphur isotope evidence suggests however, the bulk of the sulphur precipitated in sulphides were derived from leaching

of magmatic sulphur from the source volcanics rather than the inorganic reduction of seawater sulphate, although the mean $\delta^{34}S$ value of 6.5‰ is comparable to those from Tasmanias VMS deposits. In particular they fall outside the range of barren sulphide systems (Boco, Chester), and these results suggest that there is potential for the CPZ to host a massive sulphide deposit. On limited data it would appear that the eastern section of the CPZ has generally lower ^{34}S values and may therefore be more proximal to the centre of deposition of the hydrothermal system.

Fluid temperature estimates (oxygen isotope work) cluster around 200°C however, some re-equilibration may have occurred during the Devonian deformation period, masking higher values.

Lead isotopes were discussed in the previous progress report and results obtained reinforced the more recent oxygen and Sulphur isotope data giving a good Cambrian signature.

Cambrian VMS type deposits can also be distinguished from other styles of mineralization solely on their characteristic zinc ratio histograms and accompanying statistics. Cethana mineralization within 12 CRAE drillholes were analysed by Hicks using cut-off grades within drillcore of 200 ppm combined lead-zinc. Composite plots reveal a marginally better statistical distribution in the western portion of the lease where a mean of 70.2 and a standard deviation of 15.3 is very similar to such deposits as Rosebery and Hercules. The eastern grouping of drillholes has a lower mean (68) and a larger standard deviation (19.4) than the western grouping, which may suggest a lower potential for the eastern part of the licence. However, comparisions of numbers from Que River and Hellyer indicate that lower means may represent slightly different chemical conditions during metal deposition, and hence may still be prospective. Barren systems with available zinc ratio plots such as at Lake Selina differ strongly from Cethana results again reinforcing the prospectivity of the overall sytem.

GEOPHYSICS (Enclosure 6)

Repeat dipole-dipole IP surveys were completed over selected lines from east to west over the Cethana Alteration zone in response to recommendations made by P. Zarzavatjian (consultant geophysicist to Noranda) in the previous annual progress report. In this report he stated that CRAE's IP anomalies should be checked and validated prior to undertaking major drilling surveys.

Surtec Geosurveys was contracted to carry out the programme both at Cethana and Gog Range during the July - August period. At Cethana 11 wide spaced lines were surveyed with IP using a 50m dipole spacing and a dipole - dipole array down to n=6 using a Scintrex IPR-8 transmitter/receiver system. Power lines over the gridded area appear to have little effect on the data quality.

Data is currently being assessed by Dr. John Bishop of Mitre Geophysics who also monitored the overall programme. Data will be presented in the next progress report.

3. GOG RANGE PROSPECT

The promising Fire Tower Gold Prospect located on the western portion of the Gog Range Grid was subjected to detailed surveys including: tape and compass surveying, channel and composite rock chip sampling, soil sampling, IP surveying, UV lamping (both outcrop and drillcore) and man portable diamond drilling.

SURVEYING

A detailed tape, compass and clinometer survey was undertaken to accurately locate outcrop, grid lines and significant features in this very rugged portion of the Gog Range Grid. Stations were marked by galvanized nail / perma

tag / flagging and marker paint and daily reductions of traverse loops were completed prior to starting new loops, thus eliminating large errors (Appendix 4). This detailed survey allowed a contoured base plan to be prepared onto which all Fire Tower data was draughted - Enclosure 7.

GEOLOGY

A revised interpretive geological map for Gog Range at 1:5000 scale, is enclosed - Enclosure 3, on which the Fire Tower prospect is located. A more detailed geological plan was produced for the Fire Tower Prospect at 1:500 scale utilizing the tape and compass survey data - Enclosure 4.

D Hicks was contracted to grid map the Fire Tower area in detail in an attempt to define the mineralized sequence and possibly define structural controls.

The grid mapping has outlined a distinctive mixed suite of shales, siltstones and lithic arkoses which overlie the highly altered and mineralized host sequence of epiclastics, crystal tuffs, vitric tuffs and possible medium to coarse grained quartz / feldspar porphyries. The overlying and generally poorly mineralized sediments dip approximately 70° to the north and facings indicate the sequence is right way up. Hicks found the 'Host' sequence to be extremely difficult to differentiate primarily due to the overpowering nature of the quartz / sericite / carbonate / pyrite alteration with associated quartz / pyrite / hematite / carbonate stockwork veining. The less altered sequences generally fail to outcrop in this rugged portion of the grid, these mainly being scree covered, thus the southern boundary of the host tends to be covered as the extent of alteration 'peters-out'.

Significant dislocations to the lithologic sequence are indicated at approximately 2450E and again at 2370E yet surface mapping fails to adequately explain the 50 metre and 20 metre breaks in the overlying sediments. Drillhole GP-90-3 encountered a major gassanous zone at 15 metres downhole (assaying 1 metre @ 2.97 g/t Au) which may represent the 2450E feature. Surface sampling from station 15 to 16 also returned 11 metres @ 4.94 g/t Au which may also represent the same structure - sampled along strike. the host sequence appears to terminate or dives beneath cover rock in the vicinity of line 27E and disappears beneath scree cover west of line 23E.

GEOCHEMISTRY

Soil Sampling:

Noranda's initial soil sampling programmes outlined a significant 350 x 150 metre zone open to the east and west, which assayed strongly for the base and noble metals. Additional sampling at 25 metre intervals along lines 27, 28, 29 and 30E was completed in an attempt to close off the response (Enclosures 8, 9, 10, 11, 12 and 13). Assay values however, show a significant arsenic (up to 190 g/t) and spotty gold (up to 0.29 g/t) response associated with elevated zinc and lead values. Importantly however, no distinctively stockworked volcanics and epiclastics were observed within the anomalour zone other than for small pieces of float.

Rock Chip Sampling - Channel Sampling:

Rock chip and channel sampling surveys were completed over the boldly outcropping altered and mineralized sequence with approximately 423 metres of channel sampling being completed along with 25 composite rock chips with spheres of influence of up to 4 metres in radius - Enclosure 14. Channel sampling

intervals varied from 1 to 15 metres, averaging just on 4 metres with sample weights varying from 7 - 9 kilograms per interval. Composite rock chips also varied from 5 - 9 kilograms dependent on the sphere of influence taken. All samples were dispatched to Analabs for analysis for basemetals, gold and arsenic (Appendix 5).

Significant pyrite / Arsenopyrite / Galena / Sphalerite / gold and minor malachite and erythrite mineralization were observed during sampling with individual samples to 14.2 g/t Au being returned. Channel sampling results proved highly encouraging with the best intervals as follows:

11 metres @ 4.94 g/t Au, 5 m @ 4.0 g/t Au, and 8 m @ 2.0 g/t Au.

The better values lie between co-ordinates 2450E and 2550E consistent with strong quartz / sericite / pyrite / carbonate stockworking. Approximately 25% of the channel sample assays returned values > 1 g/t Au. A similar proportion of assays returned values > 0.5 g/t Au.

All samples > 1 g/t Au were later assayed for Sb with poor results, however, similar assaying for W returned spotty but highly interesting values up to 0.22%. Assaying for tungsten was carried out because of a significant tungsten value obtained from CRAE's original panned concentrate sample draining the zone.

ICP analyses were conducted on random samples in an attempt to rapidly assess the zone for the following suite of elements: Mn, Ni, Co, Mo, Ba, Cr, Fe, Ta, V and Li. Cobalt has been shown to be quite anomalous with values to 0.21% being returned, however no other outstanding patterns emerged from the random sampling.

GEOPHYSICS

Dipole-Dipole IP surveys were completed over lines 22E to 27E centred on the main zone of alteration at the Fire Tower Prospect. Surtec Geosurveys conducted the programme under the watchful gaze of Mitre Geophysics during July 1990 at which time the weather proved horrendous. Six lines were surveyed using a 25 metre dipole spacing and an identical array to that used at Cethana. Significant responses were observed in the raw data however, data is currently being assessed by Dr. Bishop and will be presented in the next progress report.

DRILLING

Encouraged by the results of all ground surveys Noranda decided to test the subsurface nature of the altered and mineralized zone in an attempt to better understand the geology, structure and mineralization. As the area is very rugged and steep it was thought advisable to use the man portable diamond drilling technique rather than the more destructive skid mounted L-38 standard type of drilling, which by necessity needs dozer support.

To this end, N. Poltock was contracted to complete 3 diamond holes totalling 75 metres drilling T/T 46 sized core - Enclosures 15 and 16. A small PVC lined dam or sump was hand dug into a nearby creek to act as a water supply for the programme. A sump was not necessary at the drillsite as water was lost down the fractured hole.

All holes encountered extensive silica / sericite / pyrite altered epiclastics and fine granied volcanics with minor to strong pyritic / hematitic minor galena / sphalerite / chalcopyrite veining and stringers as well as moderate to strong quartz / carbonate veining. All core was 1/2 split over 1 metre intervals, with the 1/2 core dispatched to Analabs in Burnie for analysis for basemetals, gold, arsenic

and some intervals for tungsten and cobalt. Detailed drill logs for the three holes are appended (Appendix 6).

Results from the drilling are as follows:

Hole	Location	Depth	Results		
GP-90-1	Near Station 52	24.7m		0-25 = 25 m @ 1.95 g/t Au	
			inc	0- 8 = 8 m @ 2.69 g/t Au	
				11-12 = 1 m @ 3.26 g/t Au	
				16-17 = 1 m @ 5.61 g/t Au	
				21-22 = 1 m @ 3.84 g/t Au	
GP-90-2	Near Station 53	25.8m		0-26 = 26 m @ 0.64 g/t Au	
			inc	10-11 = 1 m @ 4.53 g/t Au	
GP-90-3	Near Station 15	24.6m		0-25 = 25 m @ 1.85 g/t Au	
			inc	5- 8 = 3 m @ 4.04 g/t Au	
				12-18 = 6 m @ 3.56 g/t Au	
				19-21 = 2 m @ 3.04 g/t Au	

All drillcore was UV lamped, however no observable pattern between fluorsecence and gold values was ascertained. Drillcore assaying for W returned values up to 0.65%. The majority of fluorescing material was associated with late stage cross cutting carbonate +/- quartz veinlets. UV lamping of the outcropping mineralized zone also defined patchy but significant scheelite mineralization associated with later stage carbonate veining.

The man portable drilling programme proved most successful, achieving more often than not 100% recovery in very difficult terrain, and also highly fractured veined and altered ground. Drill fences will be designed to adequately test the mineralized zone over its entire length during the forthcoming period.

EXPLORATION POTENTIAL

Exploration Licence 10/88 shows great potential for the discovery of volcanogenic massive sulphide mineralization within the altered zone at Cethana and possibly at the less explored Staverton prospect.

Noranda also believes the licence holds great promise for the location of volcanic hosted and/or structurally hosted precious metal deposits in particular at the Fire Tower Prospect on the Gog Range Grid.

Additional potential exists in yet to be explored areas, such as the mixed andesitic - rhyolitic - epiclastic altered sequence (Que-Hellyer equivalent ?) north/east of Staverton, and the Lake Barrington Cu/Ag/Au prospect north of Staverton.

EXPLORATION PROGRAMME PROPOSED

1. Cethana Alteration Zone

Data generated by D. Hicks from surveys over the Cethana Alteration Zone has confirmed the prospectivity of the cambrian hydrothermal system. The data did not however target individual areas for drilling and wide spaced dipole - dipole IP surveying was carried out to highlight previous CRAE responses requiring further evaluation.

The majority of the CRAE responses remaining undrilled lie in distinctly different horizons within the overall altered sequence. Noranda will drill test the best of the scree covered dipole - dipole IP anomalies and all holes will be cased and surveyed with downhole EM looking for "near miss" situations.

2. Fire Tower Prospect - Gog Range

Data from the IP survey will need to be evaluated and targets generated. It is anticipated that chargeable zones will relate to high sulphidic vein densities and that high resistivities may relate to silica flooding within the altered zone. VLF - EM will also be used to map out possible major structures.

A major man portable diamond drilling programme totalling 500 metres will be completed early this summer as a series of drilled fence (A-B, C-D and E-F sections) lines across strike and possibly including a longitudinal section. Holes will vary from 25 to 50 metres in length and all core will be 1/2 split and assayed for basemetals, gold, arsenic, tungsten and cobalt.

3. Staverton Prospect

The altered area at Staverton is to be regridded and mapped with some additional soil and rock chip sampling to be completed. Some infill IP and possibly EM surveying will be conducted as well as some additional major and trace element geochemistry and isotopic surveys. The best coincident geology / geochemistry / geophysical signature will be diamond drilled. Holes will be surveyed with down hole EM.

4. Lake Barrington Prospect

A geophysical re-evaluation of CRAE's data has shown the four holes drilled on the copper, silver, gold show failed to test the major IP and Misse and la Masse target, due to being pulled up short. A deeper hole is planned to test this hypothesis. Down hole EM will be completed to test for a near miss situation.

APPENDIX 1

Regional Interpretation Gravity and Magnetic Data EL 18/88 - Dr. D. Leaman Sept. 1989

0047 LEAMAN GEOPHYSICS

Survey Review, Specification, Reduction, Interpretation
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REGIONAL INTERPRETATION GRAVITY AND MAGNETIC DATA

EL 10/88 GOWRIE PARK

for
NORANDA PTY LTD

by
Dr. D.E. Leaman

September 1989

GOWRIEPK

SUMMARY

Although the quality and coverage of available gravity and magnetic data in the vicinity of EL 10/88 (Lake Barrington and Gog Range) is variable this review leaves little doubt that the data sets and methods can resolve many issues related to the prospectivity or structure of the area.

Both data sets imply, but cannot fully resolve, high contrast mafic units north of the Staverton Prospect. Thusts involving ultramafics are indicated and some complex repetition of the sequence should be anticipated.
It can be shown that the large Devonian Dolcoath Granite is terminated near Cethana and that the effects of its emplacement control or fracture system barely extend into the EL but would account for at least some of the schistose alteration extending NW from Cethana. The granite is enclosed by a thermal alteration halo about 800 m wide and it is likely that most Devonian mineralisation or overprinting occurs in or near this range from the granite contact.
It is suggested, therefore, that mineralisation north of the Cethana shear zone, including Staverton, is Cambrian in origin.
Extant data do not permit evaluation of rock formation/property alteration, possible mineralisation responses or detailed structure and boundary mapping.

Both data sets suggest the presence of at least two small granitoids of variable composition in the Beulah, Gog Range region. Implied properties and scale are consistent with Cambrian intrusives. Both methods can be used to map them although it is possible that part of the magnetic responses are compound and may involve some alteration effects. The intrusives appear to be aligned N-S. Known gold mineralisation in the area, at Star of the West and near the Gog Range Fire towrer, correlates closely with the crudely interpreted granitoid forms. The large faults on the south side of the range have a displacement of at least 1000-1700 m.

It is recommended that the data coverage be improved and that refined analysis be attempted in light of encouraging results with current information.
The Lake Barrington area should be reflown magnetically with new specifications and the gravity coverage should be infilled. Such surveys would allow full analysis of signatures, rock properties and structure including rock volumes capped by Tertiary rocks. Detailed survey of prospects such as Staverton may also yield useful results within the regional framework and may directly assess the extent of any mineralisation present.
Magnetic data in the Gog Range area is satisfactory but further work must use it in fully corrected form. Some assessment of rock property characteristics is advised prior to further interpretation. The gravity data base should be infilled. This data acquisition and processing should allow a fuller appraisal of structure or anomalous rock volumes.

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INTRODUCTION

EL 10/88, Gowrie Park, consists of two parts - Lake Barrington north of Cethana, and part of the Gog Range near Beulah in North west Tasmania (see Figure 1).

Both areas include Cambrian volcanic and sedimentary rock suites and Lower Ordovician conglomerates and sandstones. Some Tertiary basalts and sediments obscure parts of these sequences which generally are very poorly exposed. Mapping is old and lacking in detail (e.g., Jennings & Burns, 1958; Jennings et al, 1959 and Bamford & Green, 1988 based on the above). Available geological mapping does indicate that both areas are structurally complex and mineralised although the nature of most known mineralisation or its controls remains hypothetical.

Mineralisation near Cethana (area 1) indicates a Cambrian lead isotope signature with a superimposed Devonian alteration assemblage. This is consistent with primary base metal mineralisation associated with the various volcanics intruded by the Devonian Dolcoath Granite. The Dolcoath Granite is exposed on the shores of Lake Cethana but the work of Leaman & Richardson (1989) has shown that the granite exposed represents only a small fraction of the total cross section of this body. A large intrusive may well have played a major role in remobilisation or emplacement of mineralisation.
South of Beulah (area 2), where a further granitoid is exposed, some gold and barytes mineralisation has long been known. This intrusion has also been presumed to be Devonian in age. There has been long debate about the source and age of much mineralisation in north west Tasmania - issues critical to exploration and further discovery.

Knowlege of the form and distribution of Devonian, or Cambrian, granitoids in the area is an important factor in appraisal of mineralisation and assessment of these materials forms the basis of this report. Similarly, any regional overview of gross structures, including thrusting, which might have repeated segments of target volcanics and, indeed, the nature and distribution of the volcanics forms a secondary element in the assessment reported.
Available magnetic data has also been reviewed for indications of alteration or mineralisation signatures.

DATA USED FOR ANALYSIS

Magnetic data was extracted from the 1986 Mines Department aeromagnetic survey of north Tasmania (Bishop, 1987). This is the most recent public domain data available and provides coverage of both parts of EL 10/88. Contour presentation of this data is shown in Figures 2 and 11.
The survey was flown with north-south flight lines 500 m apart. The sampling was about 40 m. The specified terrain clearance was 150 m but this was rarely achieved in EL 10/88.
In the Lake Barrington portion clearances were extreme (> 400 m) due to drainage patterns, the Round Mountain ridge and HEC transmission lines. This results in an uncertain presentation in Figure 2. Basalt caps on interfluves and extreme clearances over valleys have distorted the data base and much detail and resolution related to pre Tertiary materials has been irrecoverably lost.
Similar problems apply across the Gog Range but the nominal specifications were more closely approximated except south of the Gog Range ridge top.
These issues have prohibited useful correction and compensation of the data for flight path variation. Sample profiles, based on the contour compilation, have been generated but these can only indicate gross structural features.

Other magnetic surveys have been examined with a view to recovering lost detail. A survey by Shell during the last decade terminated at 528 000 mE and 5408 000 mN in the region of Lake Barrington and excluded the Cethana region. Older surveys have more uncertain specification and acquisition parameters and provide no improvement.

Gravity data, from the TASGRAV and MTREAD data bases of the Mines Department, is limited in coverage in this region. Stations are indicated in Figures 3 and 12. The Bouguer anomaly values have been converted into residual values using the geological crustal concept known as MANTLE-88 (Leaman, 1988). This process removes the deep crustal contribution to the Bouguer anomalies and simplifies analysis in terms of shallow sources (up to 5 km deep). This improvement in resolution and application is largely neutralised by the gappiness in extant data.

BACKGROUND INFORMATION

Geological information has been drawn from Jennings & Burns (1958), Jennings et al (1959) and Bamford & Green (1988). This mapping is old and limited by relatively poor exposure of many units. Large areas are also covered by Tertiary materials. Cambrian and Ordovician rocks dominate the licence and the Cambrian suites include an array of volcanic units (lava and pyroclastics) with a range of compositions.

Previous geophysical work has either been superficial, using magnetics, prospect oriented using electrical methods, or regional. Examples of regional analysis applicable to EL exploration include the review of granite forms by Leaman & Richardson (1989). Prospect surveys have been described by Jones (1989).

The regional granite study has indicated that the Dolcoath Granite is a more significant body than mapping or exposure would suggest and that it is distinct from the three Dove Granite bodies exposed further south. This study also showed that the granite exposures centred on Beulah are unusual and idiosyncratic and part of a compound intrusion. The Beulah intrusions have been presumed to be Devonian in age by previous workers. Various granite and granodiorite or monzonite compositions have been recorded in the Dove Granite bodies and at Beulah while the Dolcoath Granite is an adamellite. Each granite type possesses distinctive magnetic and density contrasts. The igneous plutons, of different volumes and crustal penetration, contrast with the intruded sedimentary and volcanic sequences.

Known properties may be summarised as follows but there is a need for more extensive sampling in order to confirm appropriate value ranges.

Unit	Density (t/cu m)	Susceptibility (cgs)
Tertiary sediment	2.0	0.0
basalt	2.7- 3.0 fresh	0.0-0.006
Jurassic dolerite	2.75-3.0 fresh	0.0-0.005
Permian units	2.35-2.65	0.0
Devonian granite	2.62-2.64	0.0
Silurian units	2.55-2.65	0.0
Ordovician units	2.55-2.65	0.0-0.0005
Cambrian sedimentary	2.65-2.77	0.0-0.0002
volcanics	2.65-2.85	0.0005-0.005
ultramafics	2.55-3.1	0.0-0.02
granitoids	2.59-2.72	0.0-0.003
Precambrian	2.65-2.67	0.0-0.0005

INTERPRETATION

LAKE BARRINGTON PART OF LICENCE

Introduction

Interpretation of data in the Lake Barrington area has involved consideration of qualitative and quantitative implications of each data set and their integration into a structural synthesis. The available data and basemap control limit this integration. A profile-based assessment of anomaly or alteration characteristics is precluded by lack of resolution and detail along the magnetic profiles due to excessive ground clearance.

Gravity interpretation

A refined version of the granite forms inferred by Leaman & Richardson (1989) has been produced after three dimensional modelling. A coarse 3D model was tested by Leaman (1988) after extensive 2D modelling in NW Tasmania (e.g. Leaman & Richardson, 1989). This 3D model was used to test and confirm the crustal concept and has been used as basic stock for the refined version presented here as Figure 4. The detailed refinement of the 3D model has been based on 18 profiles at various orientations and, in particular, one profile along the Forth River at Staverton. The model of the entire pluton is close to the limit of resolution with the available data. The 3D profile calculation fit is shown in Figure 5. Note that 3D models generate a 9 mgal profile shift differential between observed and calculated profiles. The consistency of this fit differential is a test of the reliability of the model and the coherence of the geological and rock property assumptions used to generate it. The profiles also show how dominant the effect of this pluton is. All other sources are minor by comparison.

The 3D model shows that the granite has a relatively flat but undulating crest and roof whose pinnacles are associated with mineralisation between Cethana and Moina. The margins of the pluton are very steep. The intrusion is generally extended east-west but is terminated a little east of Lake Cethana.

Note that these comments apply to the entire granite even though only a small part of the model are shown in Figure 4. The information is deduced because no 3D model can be restricted to only part of an anomalous source; the entire body must be assessed, even if the detail extracted may vary around it. The Cethana termination of the pluton is super detailed but the shape varies smoothly, unlike its form near Moina. The observed profile, acquired at ground level, has been differentially continued to an absolute level of 800 m above sea level so that the model may include the irregular interactions between its upper surface and the irregular topography. The only limitations on this process, the method or the solution relate to the

quality and coverage of the basic survey.

Two dimensional appraisal of the Lake Barrington profile, undertaken to provide some evaluation of other minor sources, yields similar and consistent results. There is insufficient geological or gravimetric information to enable realistic 3D modelling of any other unit or structure. The shift differential is again about 9 mgal and any variation from this value would indicate a serious deficiency in the interpretation.
Other sources are suggested in Figure 6 which were initially inferred by magnetic interpretation. It is clear that density variations within the Cambrian sequence are either minor or that units are relatively thin with respect to the coarse station spacing. NW of Lake Barrington there is evidence of a major variation and the abnormally positive residual values (Figure 3) suggest a mafic complex or pile. There is little surface evidence of this although some minor mafic exposures were flooded by Lake Barrington (see Jennings et al, 1959). The profile avoids any complications which might be introduced by the Tertiary rocks which cap the interfluves.

Magnetic interpretation

Inspection of the magnetic contour map reveals a number of sizeable anomalies, most of which are associated with basalt-capped areas. Subtle character or smooth gradients are evident elsewhere. Numerous high frequency, but moderate amplitude effects may be observed where basalt is exposed. Many of these responses occur as couplets and most are limit-of-source effects. Their resolution has been enhanced by the reduced terrain clearances in these elevated areas. Responses related to Cambrian rocks are broad scale and relatively gentle and direct inspection does not enable certain resolution of geometric effects induced by the basalt.

Few direct response correlations may be made between "mapped" Cambrian units and the magnetic field due to lack of detail and Tertiary or Ordovician cover.

Felsic lavas west of Cethana provide a clear correlation but few other systematic correlations can be made. Near Gowrie Park only parts of the undifferentiated sequence are magnetic and there is no clear match with outcrop or mapping indications.
South of Roland the Beulah Formation (Ebf) is strongly magnetised but the anomaly extends far beyond mapped limits. Nearer Lake Barrington the same unit is not magnetic. There may be several explanations but the response pattern is not induced by deficiencies in the magnetic survey. Either the available mapping is faulty (possible), inconsistent (probable), important changes occur within the unit (also possible), or deeper structurally controlled sources are also present (also possible). Some of these factors could be assessed within the EL with a better survey. Note that this formation contains mafic

materials and should be moderately magnetic. Therefore any correct mapping of it coupled with a loss of contrast implies bulk alteration. This may have occurred near Lake Barrington. If this inference can be proven then the prospectivity of the region between the Staverton and Lake Barrington prospects will be considerably increased.
Other Cambrian units appear to be non magnetic.

The largest magnetic anomaly in the region occurs south of Wilmot to the northwest of Lake Barrington and may be correlated with the large positive residual Bouguer anomalies in the same area.
The Dolcoath Granite yields a neutral response. Modelling has shown (below) that the neutral field value is about 1850 nT. Many of the associated anomalies nearby are contact effects; that near the Cethana Dam is typical. The anomaly pattern around Cethana is modified and displays a NW-SE trend. This effect is not due to flight patterns, although it has probably been modified in amplitude by clearance variations, and appears to correlate with a schistose alteration zone and the limit of the shelving roof of the granite beneath (see Figures 4 and 6).

In order to test some of the possible explanations for character in the magnetic field a profile along the Forth valley was modelled. This is in the same location as the gravity profile and is free of direct Tertiary effects. Some secondary geometric character may be present, however.

Various approximate solutions are shown in Figures 7, 8, 9 and 10. These were selected to demonstrate issues involved in both geology and modelling procedure. Figures 7 and 8 contrast dipping sources at the north ende of Lake Barrington. Note that these are not exposed. Whatever solution is preferred high contrasts are implied - consistent only with massive basalts/ mafics, or in the case of the larger anomaly, ultramafics. In Figures 7 and 8 the observed to calculated shift differential is about 230 nT implying a neutral field at about 2000 nT. Note that the contractors have added such a value to the mean of their observations but this does not mean that the appropriate normal field values were either observed, used as a base reference or recovered. In my opinion the addition of such a scalar to residual values derived from the IGRF function is misleading when the assigned base reference value is not quoted. With this fit shift, however, it is quite impossible to match the zone between 5 and 9 km; especially if the sources dip south. Modelling of the simpler field patterns near Beulah (below) indicate a differential of about 100 nT and a neutral field value of 1850 nT. When the profile is recalculated with this shift scale and the sources adjusted appropriately much better correlations are achieved (Figures 9, 10). These observations show how it is possible to obtain different solutions and how they can be separated. Note that there is only one geology and any solution must be geologically believable. Reliability and resolution is enhanced if some part of the model can be tied to exposed fact but this is not easy to do in this

area due to data and mapping problems and lack of information on source properties.

The Figures suggest the nature of sources near Lake Cethana. The three dimensional shape of the granite and the contact zone makes appraisal difficult unless analysis is detailed but the style is clearly established. The granite shape, from gravity analysis, has been used and a thermal contact skin about 800 m thick applied. This may be demonstrated around the intrusion and above the roof but it is certainly more irregular than modelled here. The anomaly at 1.5 km near the Cethana Dam must be due to anomalous alteration about the contact and the source is not incompatible with Moina style mineralisation. Unfortunately it is just outside the EL. A suggestion of the shape of felsic volcanics is also included at this end of the profile.

The issues posed by the northern end of the profile can not yet be fully resolved. Various options have been displayed in Figures 7 to 10 but it is not easy to demonstrate a southerly dip for the high contrast sources which have to be material of Beulah Formation composition at least. If the lower shift differential is accepted it is almost impossible to justify this for the body at 9.5 km. It is possible that the sources represent limbs of a syncline since the larger anomaly is best fitted with a southerly dip although this may be an illusion due to geometric factors. All gross dip indicators suggest two sources dipping north. The mapping of Jennings et al (1959) showing slices of dolerite or gabbro at the projected position of the northern body is wholly consistent. The volumes implied for these sources are relatively small and each must posses a moderate to high contrast. It seems likely that the best solution is north dipping, high contrast slices. This would imply thrust sheets involving ultramafics and considerable repetition of sequence along Lake Barrington. The termination of sources at shallow depth is consistent with such structures.

GOG RANGE PART OF LICENCE

Introduction

The Gog Range portion of the EL is very small but critically located. It lies south of exposed granitic rocks and gold mineralisation near Beulah. Geological control is suspect here, as elsewhere in this region, but a major NW-SE - trending fault zone cuts off the south west part of the area.

Magnetic data for the region are shown in Figure 11 and residual gravity data in Figure 12.
Analysis for this report has been restricted to structural concept appraisal and the regional setting of the EL. No previous work of this type has been reported although an attempt was made by Leaman & Richardson (1989) to unravel the form of the Beulah granitoids. That work exposed a number of curious features and although it was suggested that these intrusions were part of a large body this could not be conclusively established.

Magnetic interpretation

Consideration of magnetic responses in this region also demonstrates some inconsistencies. The strong anomaly between Beulah and Lower Beulah can be correlated with the Beulah Formation in large part but equivalent anomalies are directly associated with granite exposures at Beulah.
Tertiary materials near Paradise yield comparable responses although the extent of those responses extends beyond the mapped basalt distribution - unless talus/scree from Mt Roland has buried it. What may be termed the Paradise anomaly extends onto the eastern flank of Mt Roland, however, near Minnow Falls. This is anomalous behaviour, unless the Ordovician conglomerate overlies Beulah Formation (if magnetic) or some other strongly magnetised unit. The Minnow Falls anomaly lies at the intersection of two anomaly trends; N-S through Paradise and NW-SE along the Gog Range.

These observations enable some perspective to be given to features within the EL. There is a group of isolated anomalies on the north face of the range which require either select parts of the Gog Greywacke to be magnetised or there are unmapped volcanic members high on the range. The bulk of the Minnow Keratophyre is non magnetic as shown by the non anomalous gradient between the ridge axis and Lower Beulah. Near Lower Beulah none of the greywacke is magnetic and thus the responses south east of Mt Roland, and on the Gog Range, must be due to some other source. That source may be local alteration or blocks of an unmapped unit. Note that the rocks forming Mackenzies Hill, and containing the Star of the West gold prospect, are similarly slightly magnetised. This effect is not immediately obvious due to the interference of the Paradise anomaly.

South of the range the magnetic field is stabler and displays reduced gradients. All sources are much deeper and the responses along the south face of the range appear consistent with topographic scarp and downthrown source effects coupled with some, probably, locally extreme terrain clearances.

Several of these factors have been tested by modelling a regional line which extends from the Beulah granite outcrops, across Mackenzies Hill (Star of the West) and the range col used by Union Bridge Road.
Two solutions are provided in Figures 13 and 14. Each provides for the large, deep anomaly south of the Mersey River west of Mole Creek. Only folded Silurian and Ordovician rocks are exposed and thus the source, certainly Cambrian, lies at some depth. Its shape must mimic the broad fold trends and forms unless detached. This aspect of the modelling is important since it provides an estimate of the scale of displacement at the south face of the Gog Range and magnetic field base level information for the entire profile. The fold pattern also provides some non Cambrian geological control.
Each solution also shows that the Beulah granite exposures are irregularly and often reversely magnetised. The bulk effect is reverse. This property alone demonstrates that these rocks of variable composition are not Devonian. See Leaman & Richardson (1989) for discussion of the distinctive magnetic properties of the Cambrian granitoids.

The Gog Range anomaly, one of several compound effects, consists of a superimposed axis and local effects. The compound character is clearly shown by the north facing shoulder on the anomaly at 10.5 km in Figure 13. It may be explained in two ways.
It could be due to either a wedge of volcanics exposed or concealed near ridge top (Figure 13) or a variably magnetised Beulah style granite at shallow depth (Figure 14). The first option does include the case of local alteration, perhaps due to a source of the second option type. This would yield a compound source and response pattern although it should be noted that the compound response may be purely geometric from a single source.
A shallow granite solution for these minor anomalies could account for the mineralisation at Mackenzies Hill and in the stockwork discovered by Noranda on the south face of the range below the fire tower. Each mineralised site would then lie adjacent to the south dipping face of the roof of a granite pod. This is a concept which must be investigated further.

Gravity interpretation

The gravity coverage is poor but the residual anomalies are consistent and suggestive (Figure 12). These indicate that the gravity field is generally negative south of the large structures along the south face of the Gog Range but positive north of them. Such a first order pattern is consistent with the presence of exposed Cambrian rocks to the north and more deeply buried Cambrian rocks overlain by siliceous rocks and weathered

limestones to the south.
Transverse to this grain, however, is a N-S trending depression in the field. This swells and then closes north of Beulah but the negative swell encloses all known granitic exposures in the area. The correlation is unambiguous. The scale of the response is compatible with small granite bodies or low contrasts; neither condition is noted in the case of Devonian granitoids.

Modelling of the N-S regional line chosen for magnetic interpretation verifies these conclusions. The more negative effects to the south are related to the folded siliceous Ordovician units. The underlying Cambrian units are not modelled, nor are they elsewhere in Figures 15 and 6, since their bulk Cambrian density of 2.74 t/cu m has been set as the reference density in each model. Only significant excursion from this value, as in mafic piles or formations, is modelled.
Although the total solution offered provides a good curve fit the data do not allow refinements of the type suggested from magnetics. Even so the general form of two granitic plugs can be extracted. It seems likely that a denser composition or variant outcrops north of Beulah.

The magnetic and gravity interpretations, are for all practical purposes, concordant with extant data (See Figures 14 and 15). The more localised solution implied in Figure 13 cannot be easily sustained gravimetrically.

The granite pod concept was further tested by an E-W line through the Star of the West mine where data coverage is the best available (though still poor). The result is shown in Figure 16. A small granitoid pod, or at least material of equivalent composition, lies at shallow depth (about 100 m). This is consistent with local exposure nearby. The anomaly form establishes the limited volume and low contrast of the source. The down-faulted Beulah Formation east of Lower Beulah could account for the asymmetry of the background levels (west to east).

The various models suggest the scale of the displacement for faulting south of the Gog Range. Although estimates vary depending on the method, the quality of the data, allowances for terrain form and clearance, the minimum throw is about 1000 m and the maximum is about 1700 m.

CONCLUSIONS

Basic review of gravity and magnetic data in the Lake Barrington and Gog Range areas has clarified a number of structural issues and shown that more information could be extracted using these methods provided some additional data was provided.

In the Lake Barrington area:
The Devonian Dolcoath Granite has been defined in some detail. It is a very large, high contrast intrusion with a thermal halo about 1 km wide. Beyond this distance changes in rock properties are minimal. It seems probable that most mineralisation of Devonian origin, or superimposition of Devonian signatures, will be restricted to this halo. A schistose alteration zone near Cethana occurs above the steeply plunging north wall of the pluton.
Data available preclude any assessment of mineralisation or alteration signatures within exposed Cambrian units.
Magnetic data do, however, reveal at least two concealed mafic-ultramafic units which have shallow dips and little thickness. Thust slices are implied and the corollary of repeated sections along the Forth River follows.

In the Gog Range area:
Local gold mineralisation appears to be related to the upper surfaces of small granitoids. Their unusual properties and varied composition is consistent with small Cambrian plugs. These intrusive pods are generally oriented N-S although some subtle magnetic anomalies occur on the periphery of the apparent axis of intrusion. It is not yet clear whether the magnetic anomalies represent alteration, mineralisation effects or an unmapped volcanic member high on the range.

Further data acquisition is recommended in each sub area; magnetics and gravity at Lake Barrington, and gravity at Gog Range. Some rock property determinations are also desirable. Detailed analysis of such data could be expected to resolve many persistent structural questions and assist geological mapping.

RECOMMENDATIONS

Given that gravity and magnetic techniques can provide useful information in this complex area and that the present interpretation is based on far from ideal data some acquisition is recommended. The potential uses for improved surveys are indicated.

Lake Barrington area:

1: Acquire new aeromagnetic data with high quality specifications. Terrain clearance approx 100 m; 250 m line spacing N-S and 500 m line spacing E-W. The E-W coverage to extend 1 km beyond the EL on all sides. Field sample spacing of 10 m with precision of 0.1 nT or better. In this area these specifications will require a helicopter. Cost estimated at $8000 for 300 line km for acquisition and basic presentation.
Vet drape data acquired for mapping purposes, formation characteristics and alteration and possible mineralisation signatures.
Differentially continue data to fixed level of 700 and 1000 m. This will allow appraisal of Tertiary-covered areas, terrain effects and structural relationships. If required this version of the data could also be used for detailed 3D modelling.

2: Infill gravity data base using available roads, tracks, access and lake shore. Some improvement in the area around the EL is also advised. The upgraded gravity coverage can be used to support structural assessments and cross-control magnetic interpretation.TASGRAV specification.

3: Undertake a trial gravity detailed survey of the Staverton Prospect or some other mineralised site for which geology, geochemistry or any other indicator indicates prospectivity. If undertaken at Staverton lines should be along contours and tied at 100 m intervals. Stations at 15 m interval in order to ensure redundancy and expose problems. A line separation of 50 m across an area of 500 by 500 m centred on the target site. Full terrain correction required.
Such a survey may well define targets or further exploration.

Gog Range area:

1: Infill gravity survey regionally to about 1 km spacing and about 500 m within the EL. Review structural implications.

2: Check magnetic properties of Cambrian suites and materials near gold prospects.

3: Differentially continue extant magnetic data to a true drape at the nominal specification of the survey for detailed profile examination and to a fixed level of about 1100 m for more accurate structural appraisal.

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Leaman Geophysics
by

D. Leaman

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M.Aus.I.M.M., M.M.I.C.A

22/9/89

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L. BARRINGTON PART.

GOG RANGE PART

EL 10/88 GOWRIE PARK LOCATION FIGURE 1

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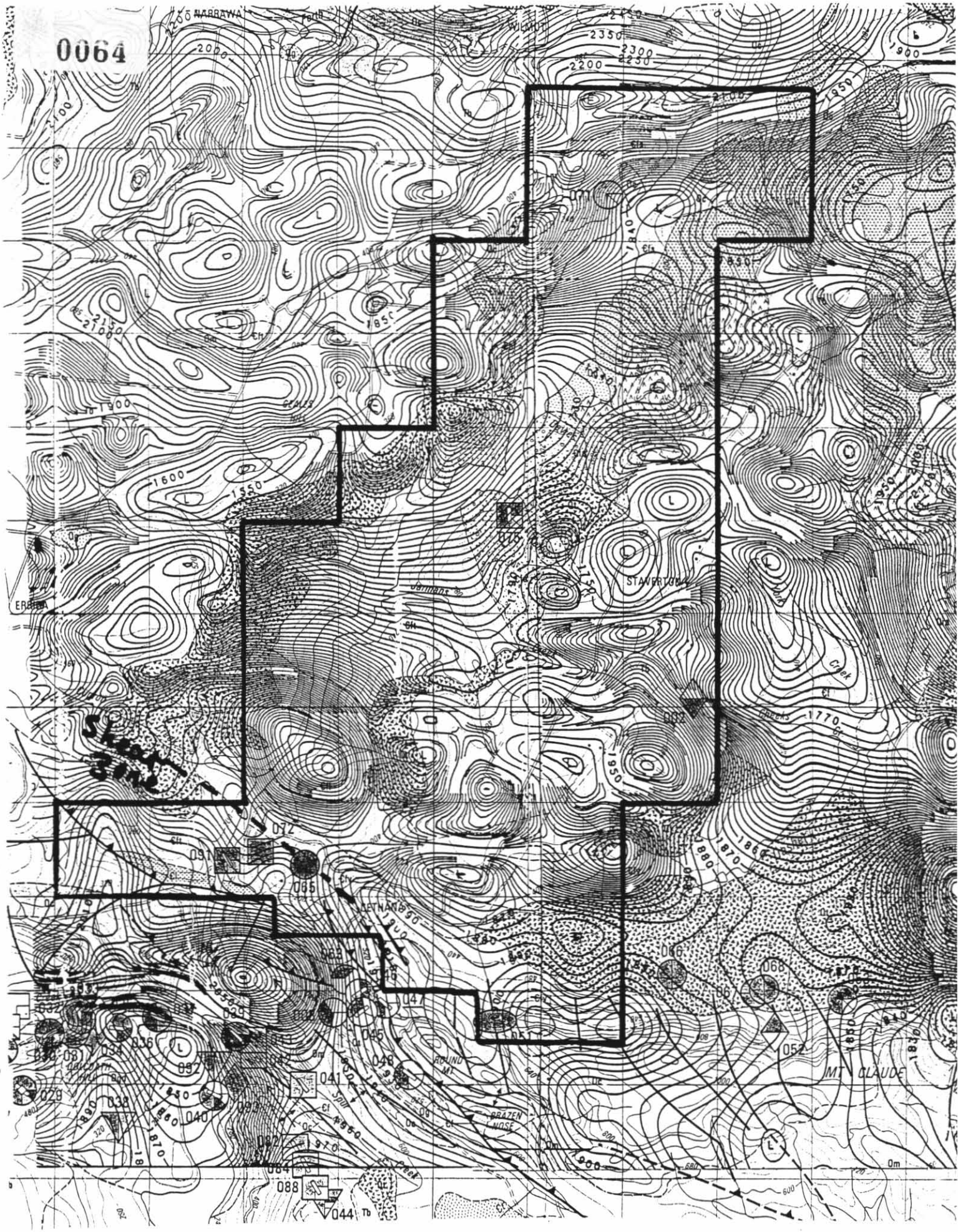
NARRAWA
WILMOT
STAVERTON
ERBIA
MT GLAUDE
BRAZEN NOSE
ROUND MT
SPOUT
Creek
Creeks
Gully
Gully
Gully

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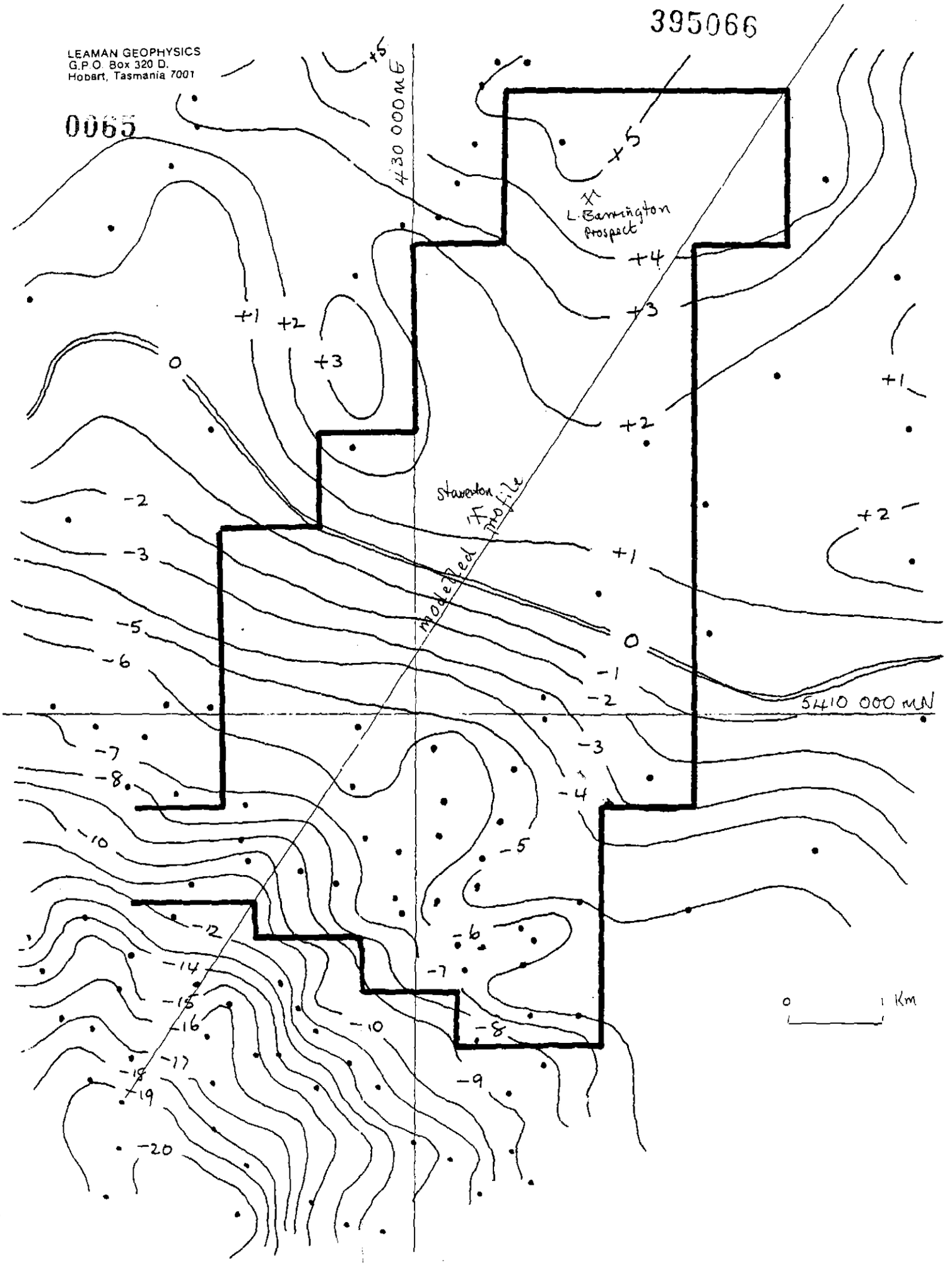

EL 10/88 GOWRIE PARK RESIDUAL BOUGUER ANOMALY
LAKE BARRINGTON AREA
Regional separation using MANTLE-88 (Leaman, 1988) FIGURE 3

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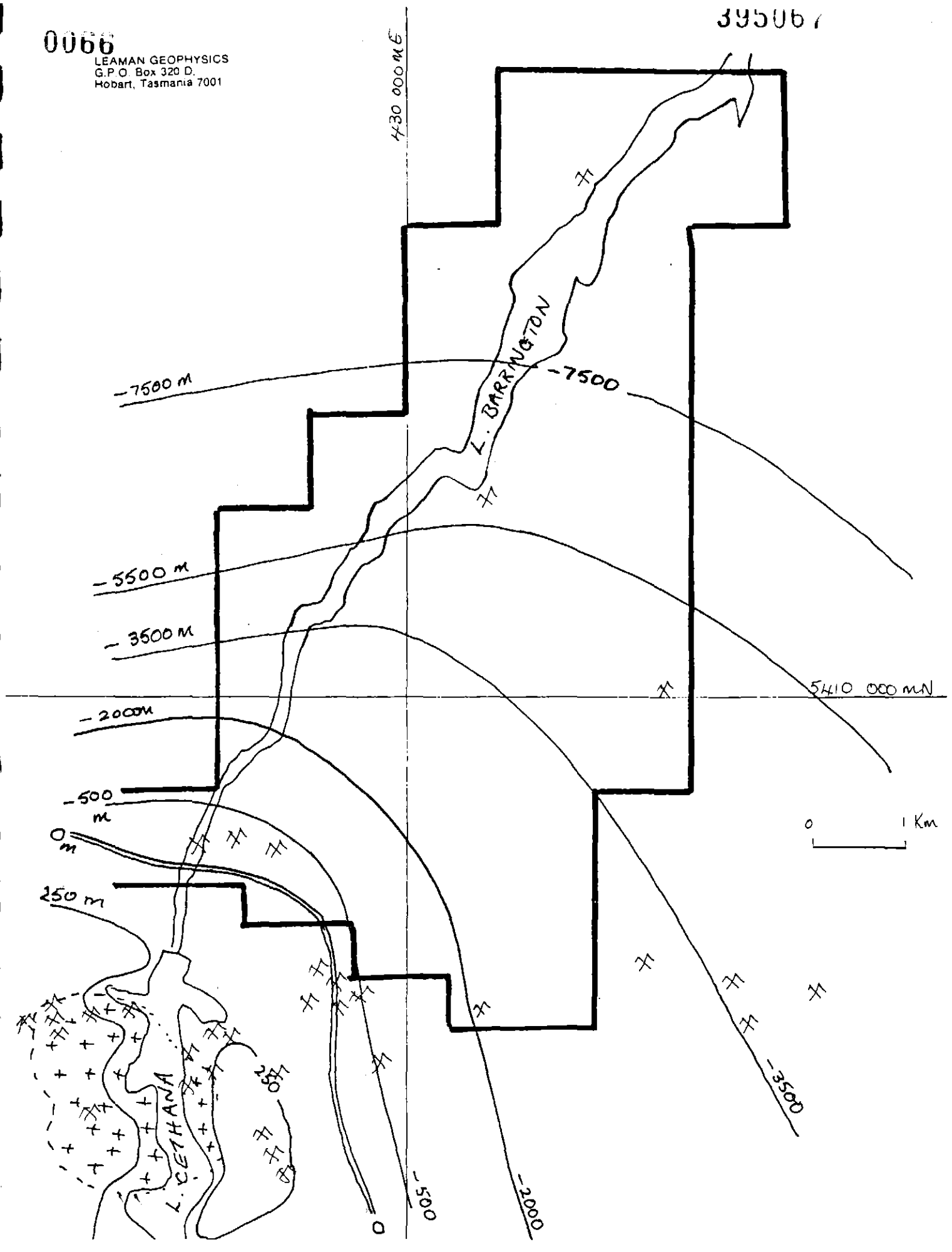

EL 10/88 GOWRIE PARK 3D MODEL OF DOLCOATH GRANITE
LAKE BARRINGTON AREA

Note that only a portion of a model of the entire granite is displayed. Contours relative to sea level of upper or outer granite surface.

FIGURE 4

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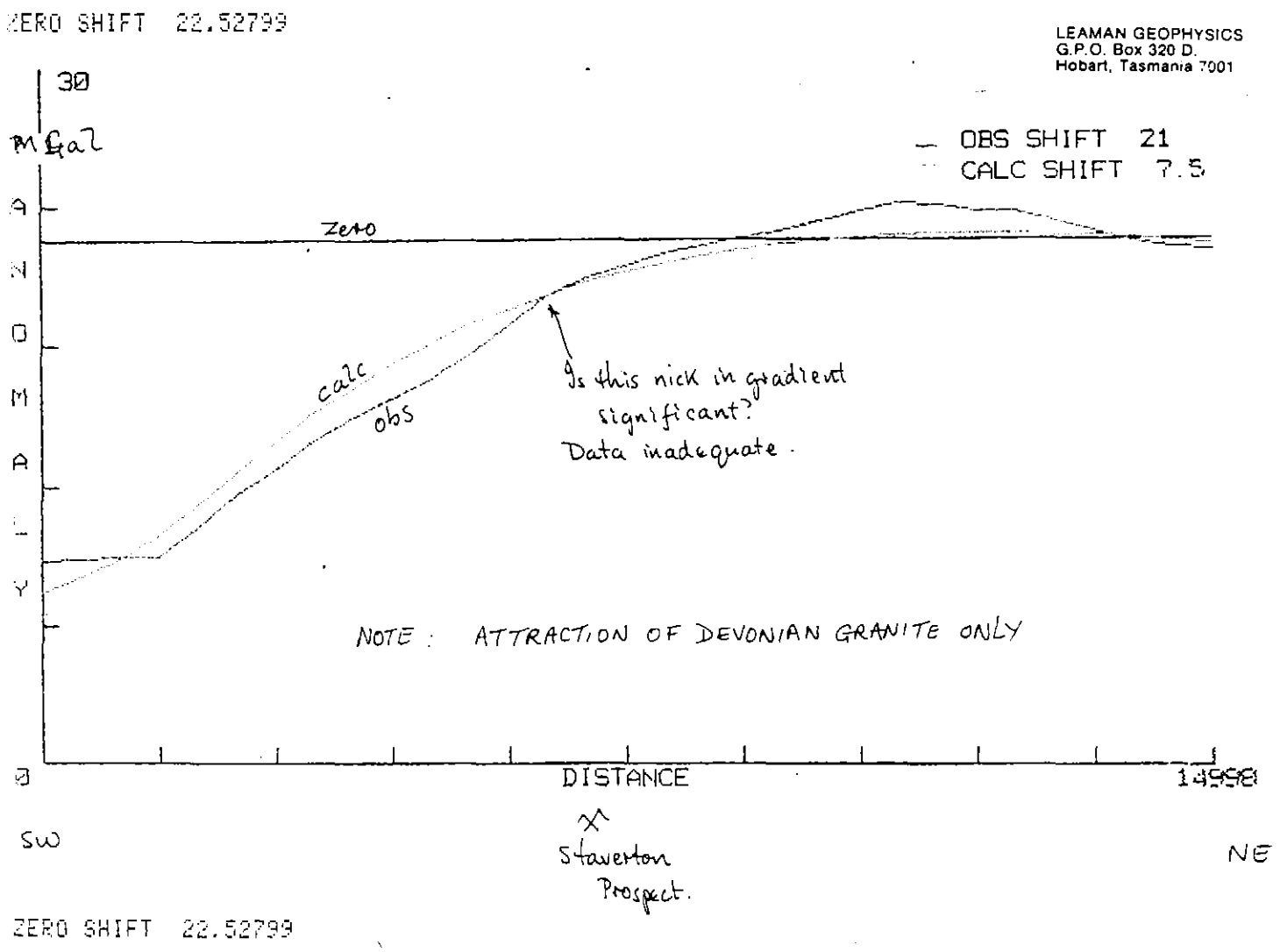

Differential : 22·53 − (21−7.5) = 9.03 mGal.

For granite profile : see Figures 4 and 6.

EL 10/88 (GRAVITY) GOWRIE PARK LAKE BARRINGTON AREA 3D PROFILE COMPARISON FORTH RIVER

FIGURE 5

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LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 15000 500

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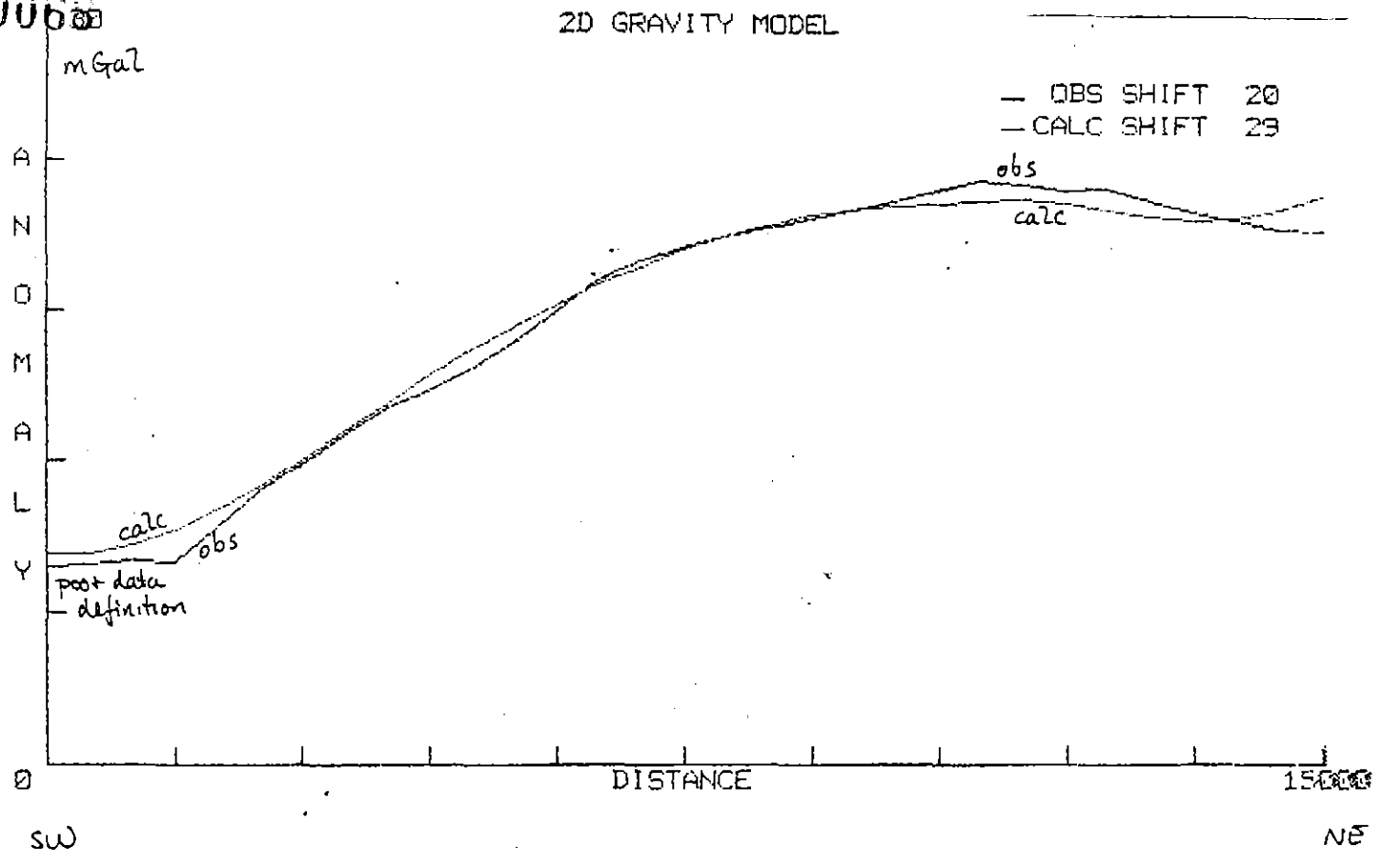
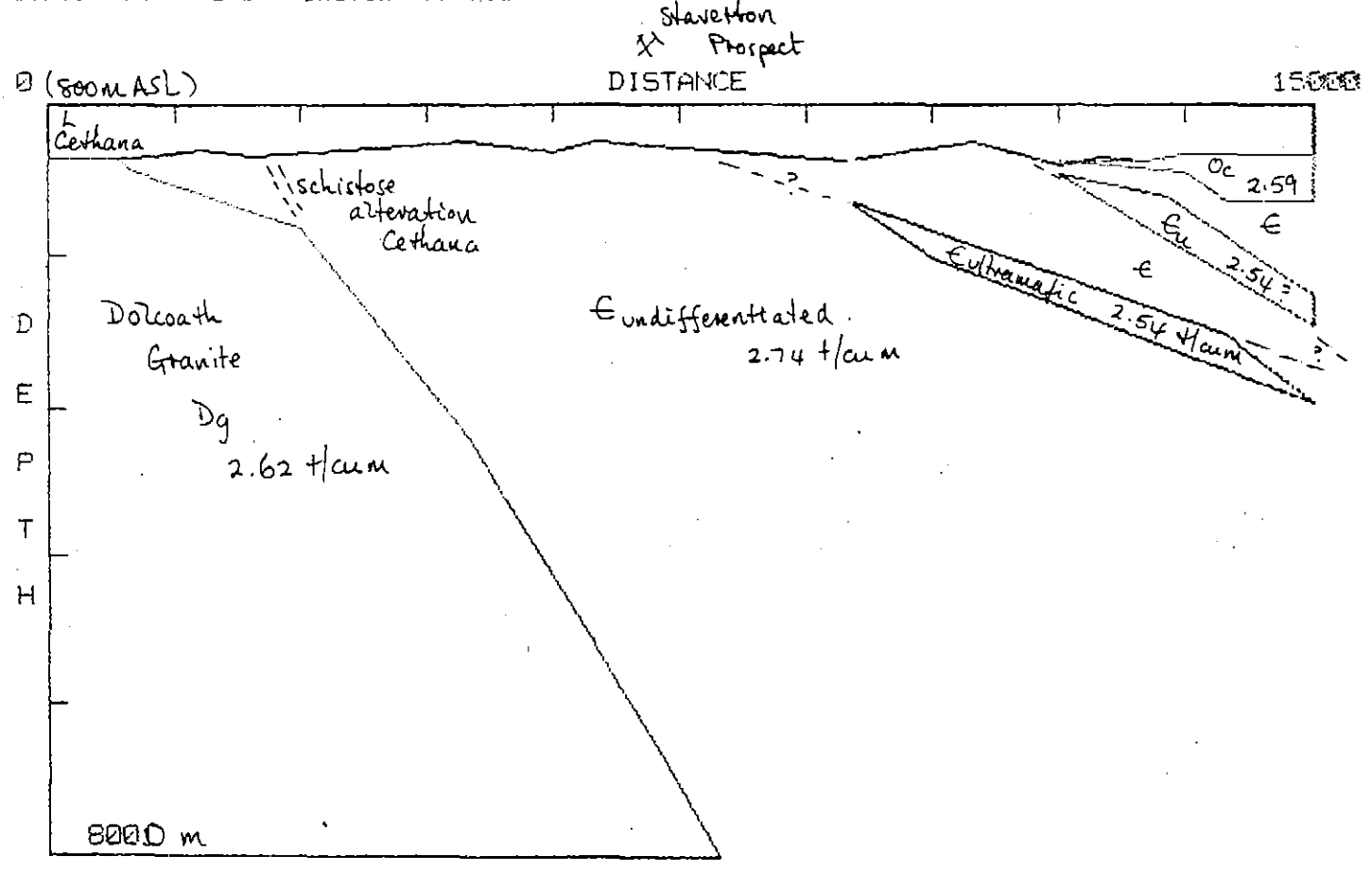


STAYERTON - L BARRINGTON PROFILE EL10/88



EL 10/88 GOWRIE PARK 2D GRAVITY MODEL - FORTH RIVER
LAKE BARRINGTON AREA

FIGURE 6

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STAVERTON - L BARRINGTON PROFILE EL10/88

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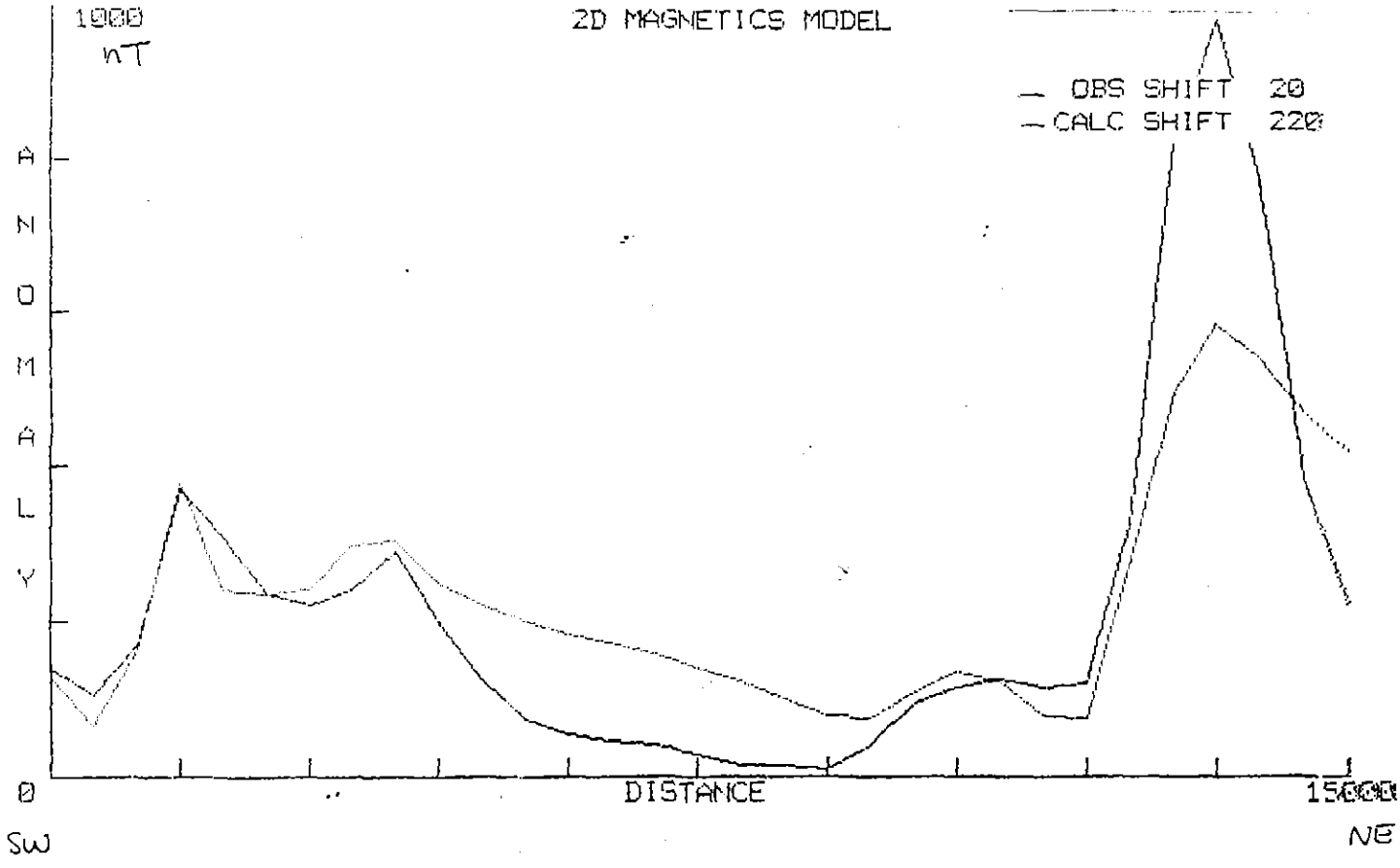

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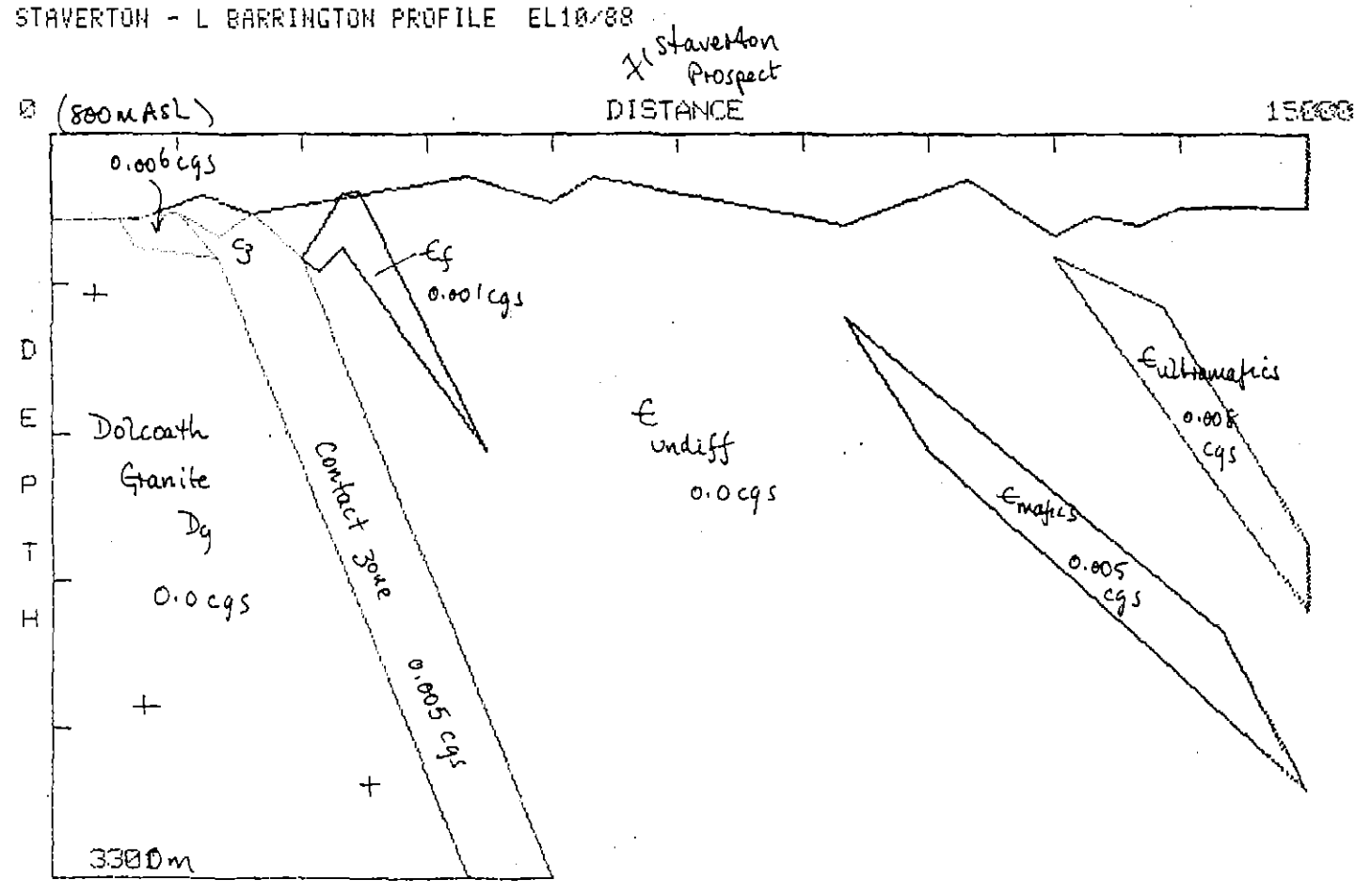

EL 10/88 GOWRIE PARK 2D MAGNETICS MODEL - FORTH RIVER
LAKE BARRINGTON AREA
SHIFT MATCH OPTION 1, NORTH DIPS

FIGURE 7

0070

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LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 15000 500

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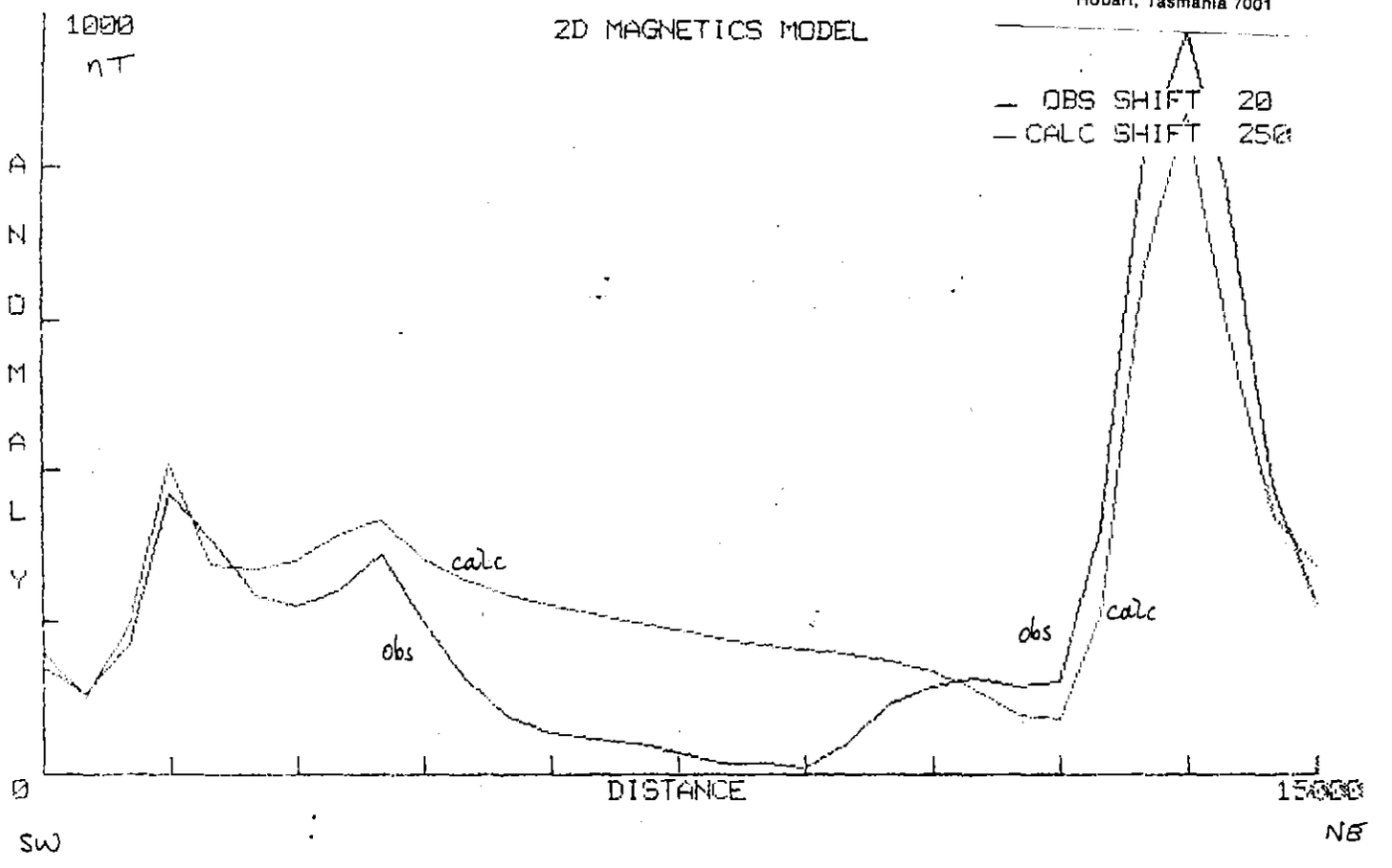
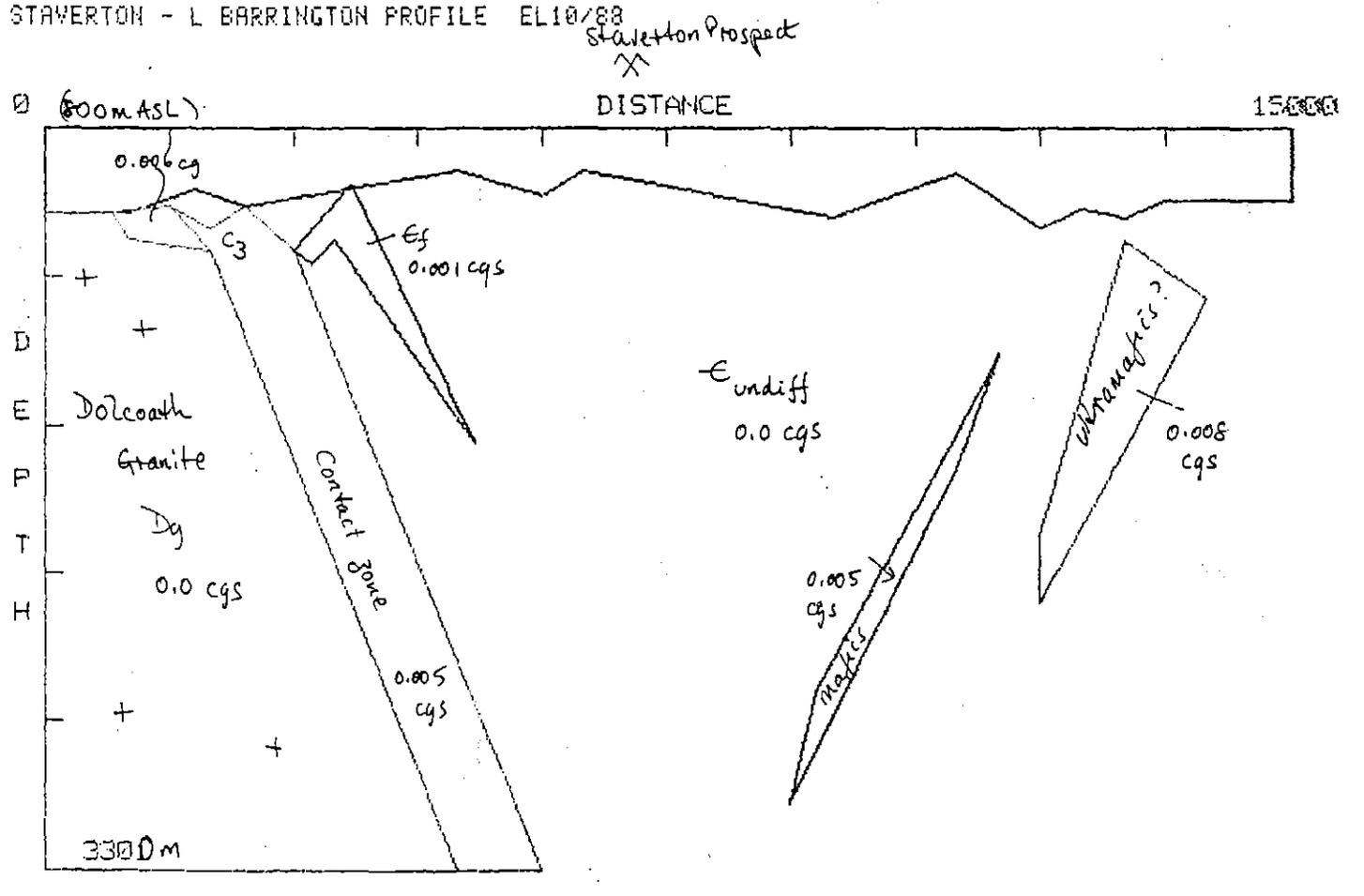


STAVERTON - L BARRINGTON PROFILE EL10/88



EL 10/88 GOWRIE PARK 2D MAGNETICS MODEL - FORTH RIVER
LAKE BARRINGTON AREA
SHIFT MATCH OPTION 1, SOUTH DIPS

FIGURE 8

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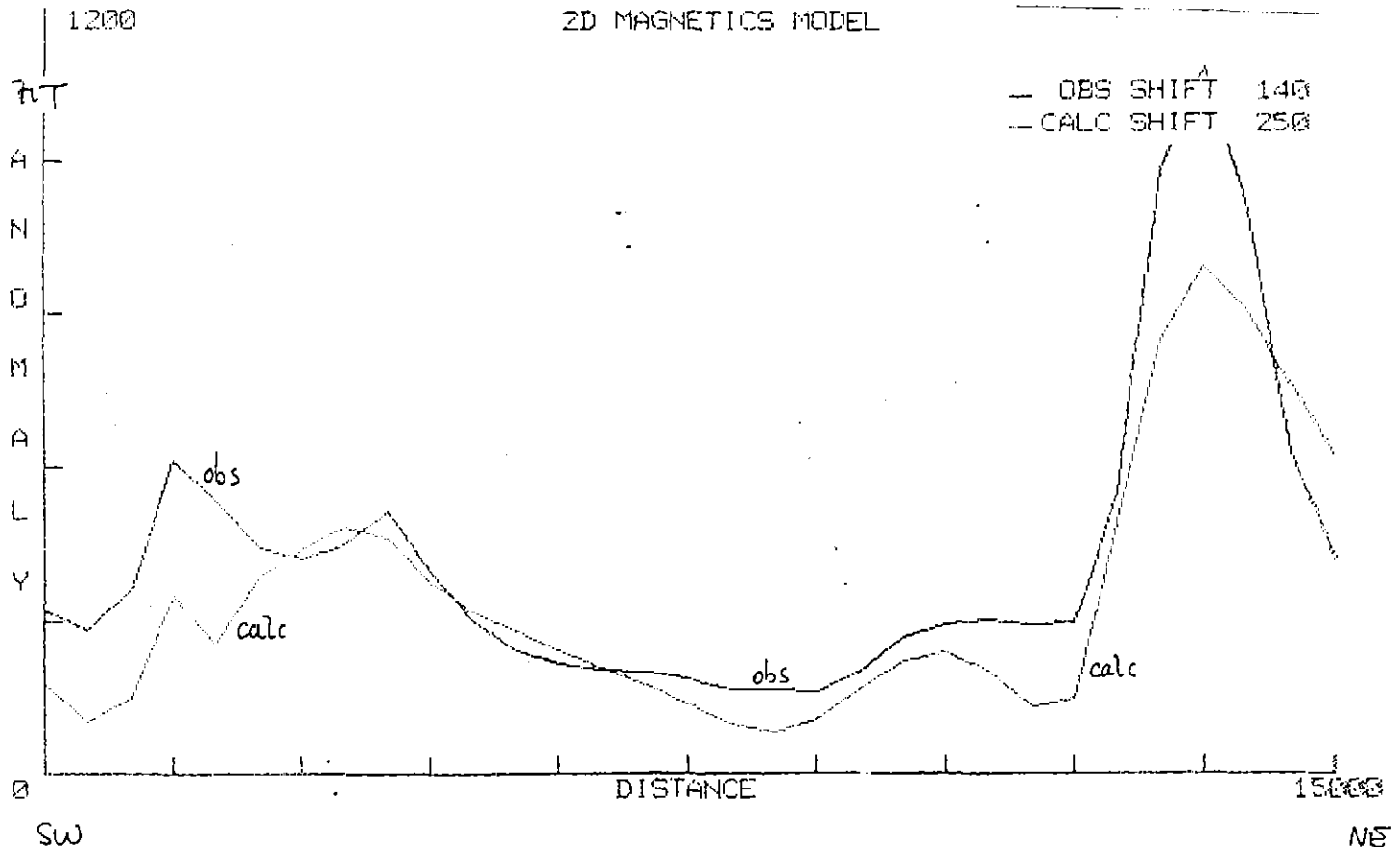
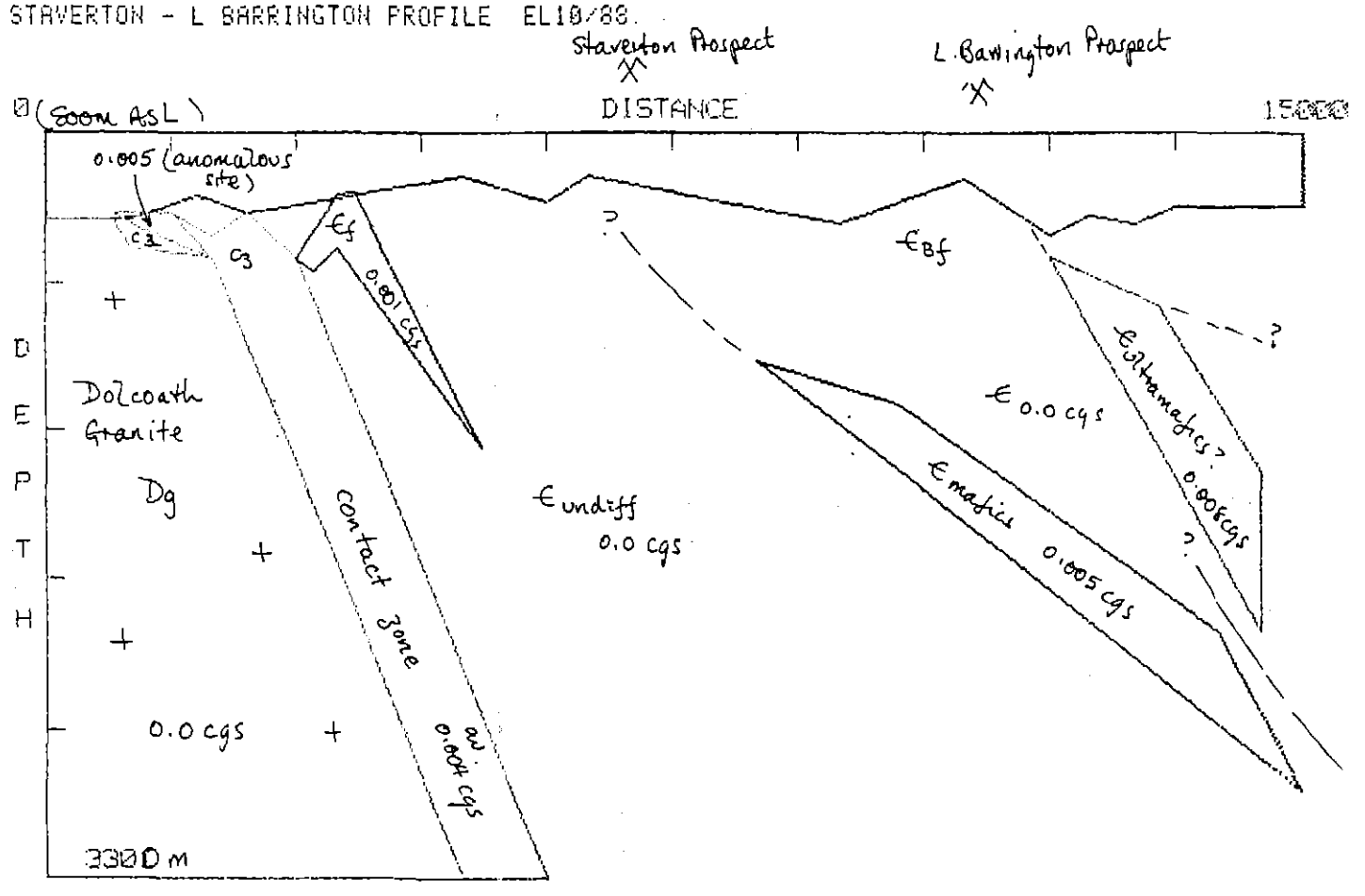
LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 15000 500



STAVERTON - L BARRINGTON PROFILE EL10/88.



EL 10/88 GOWRIE PARK 2D MAGNETICS MODEL - FORTH RIVER
LAKE BARRINGTON AREA
SHIFT MATCH OPTION 2, NORTH DIPS SOLUTION A FIGURE 9

0012

LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 15000 500

395073

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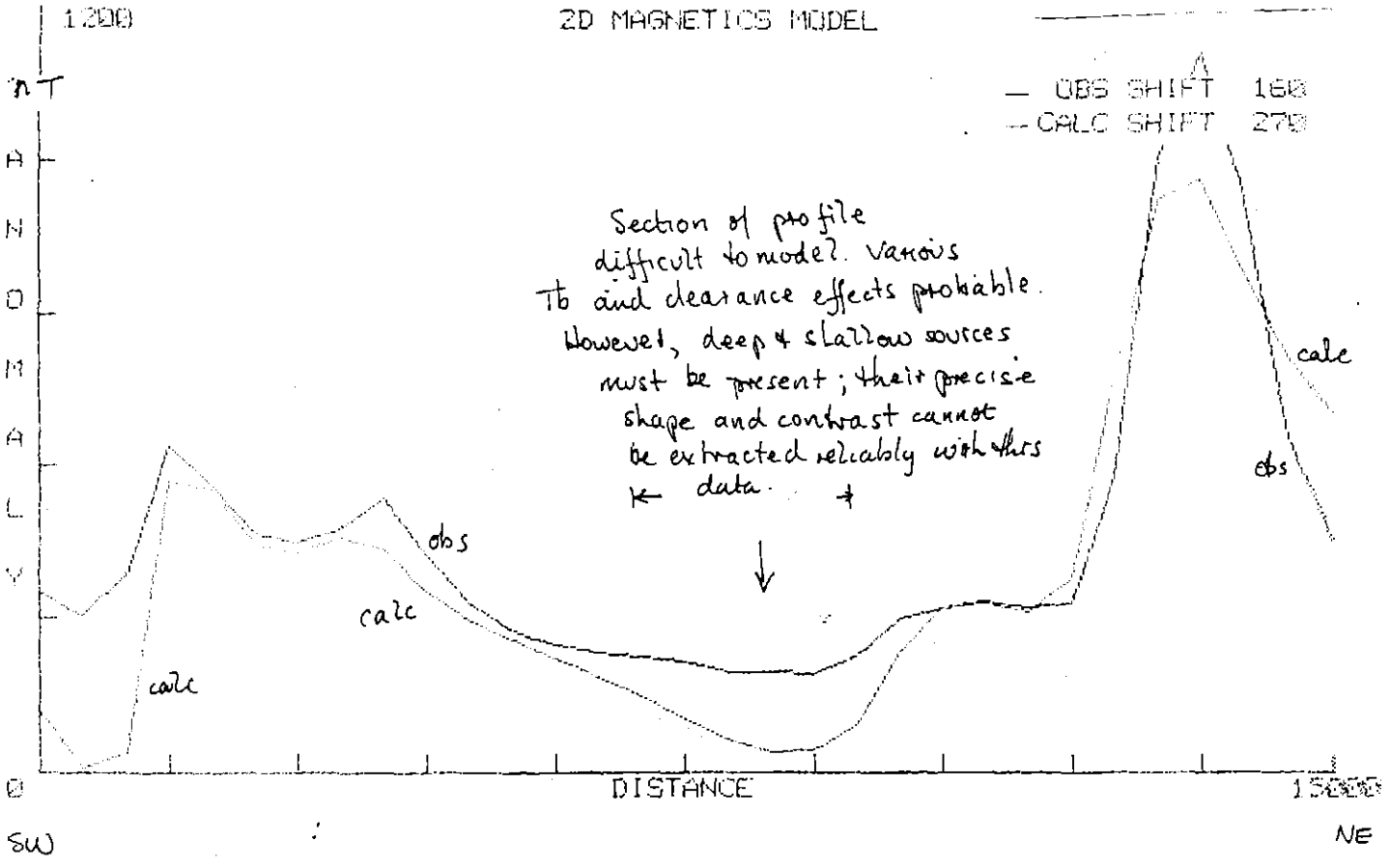
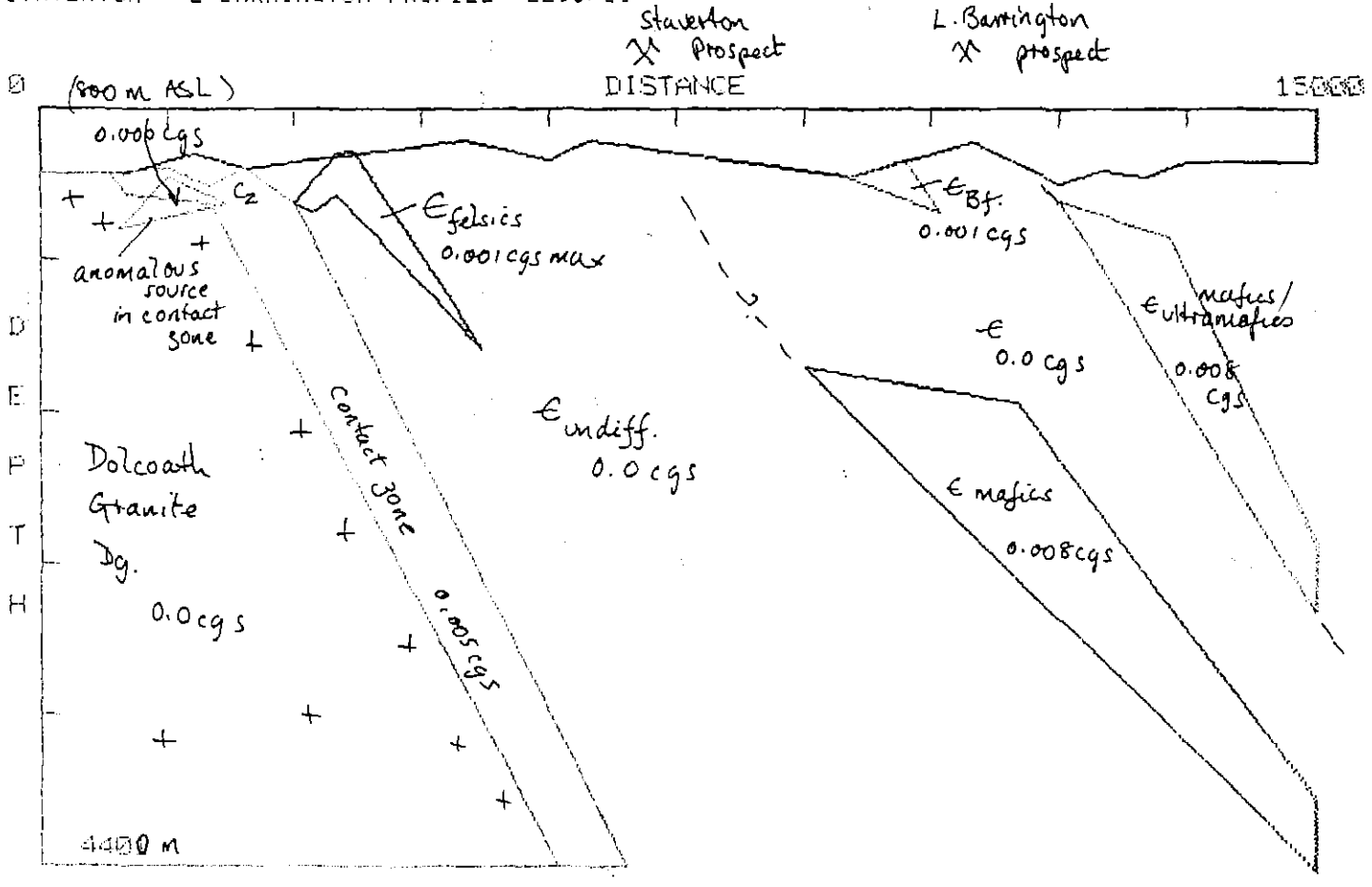
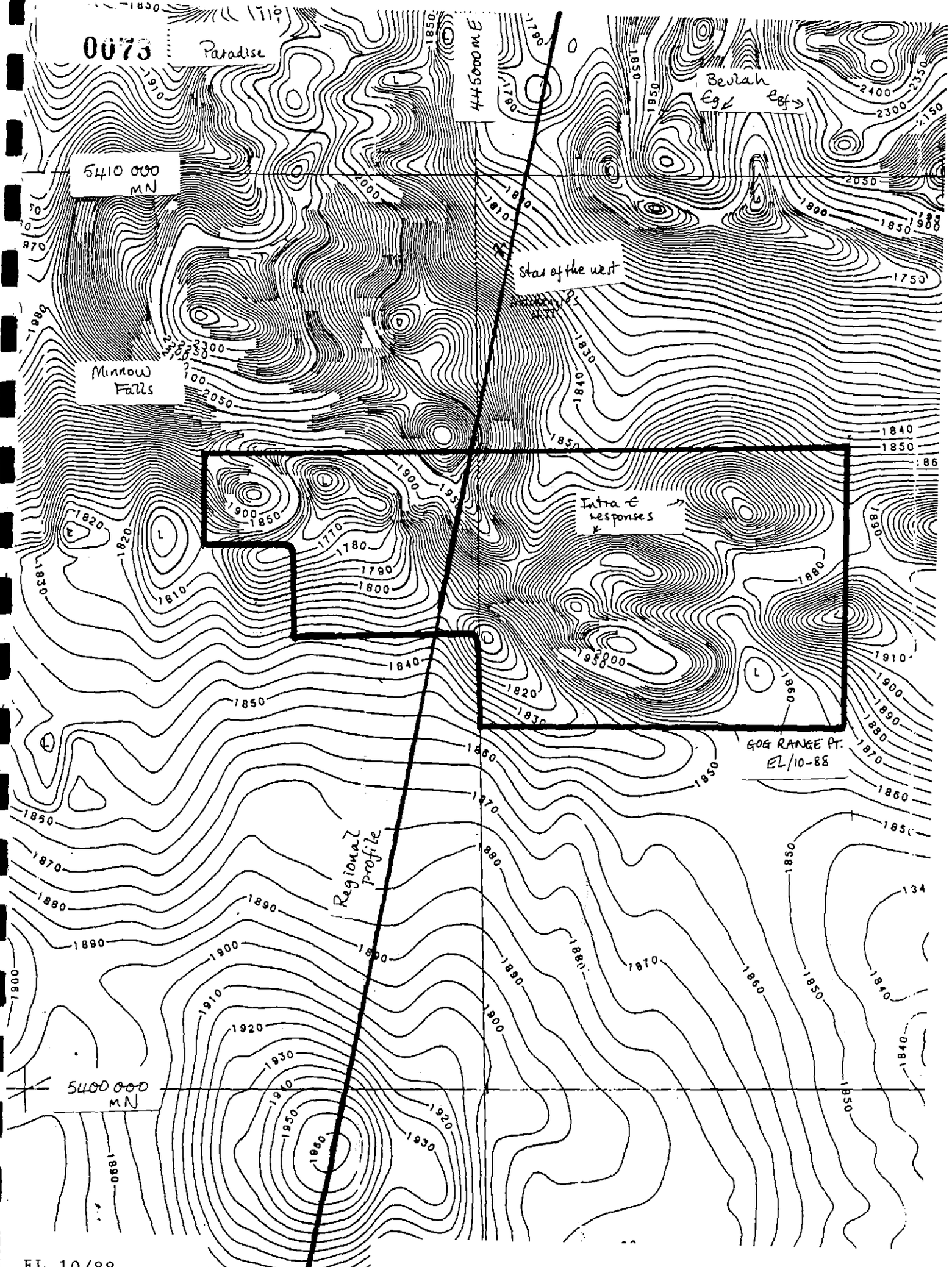




EL 10/88 GOWRIE PARK 2D MAGNETICS MODEL - FORTH RIVER
LAKE BARRINGTON AREA
SHIFT MATCH OPTION 2, NORTH DIPS SOLUTION B

FIGURE 10



EL 10/88

Mines Department Survey

GOWRIE PARK TOTAL MAGNETIC FIELD INTENSITY
GOG RANGE AREA

395074

FIGURE 1

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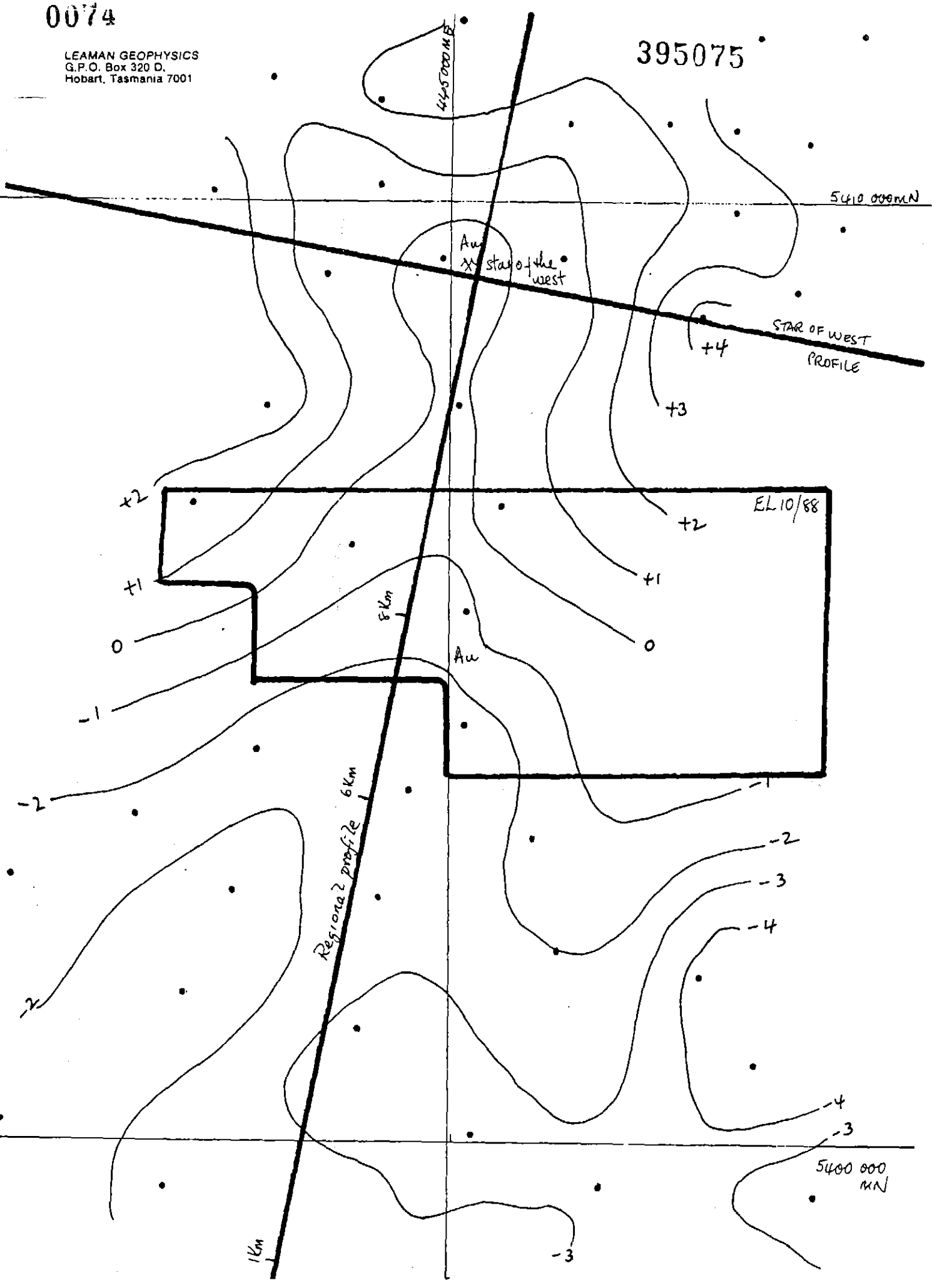

EL 10/88 GOWRIE PARK RESIDUAL BOUGUER ANOMALY
GOG RANGE AREA
Regional separation using MANTLE-88 (Leaman, 1988) FIGURE 12

0075

395076

LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 15000 500

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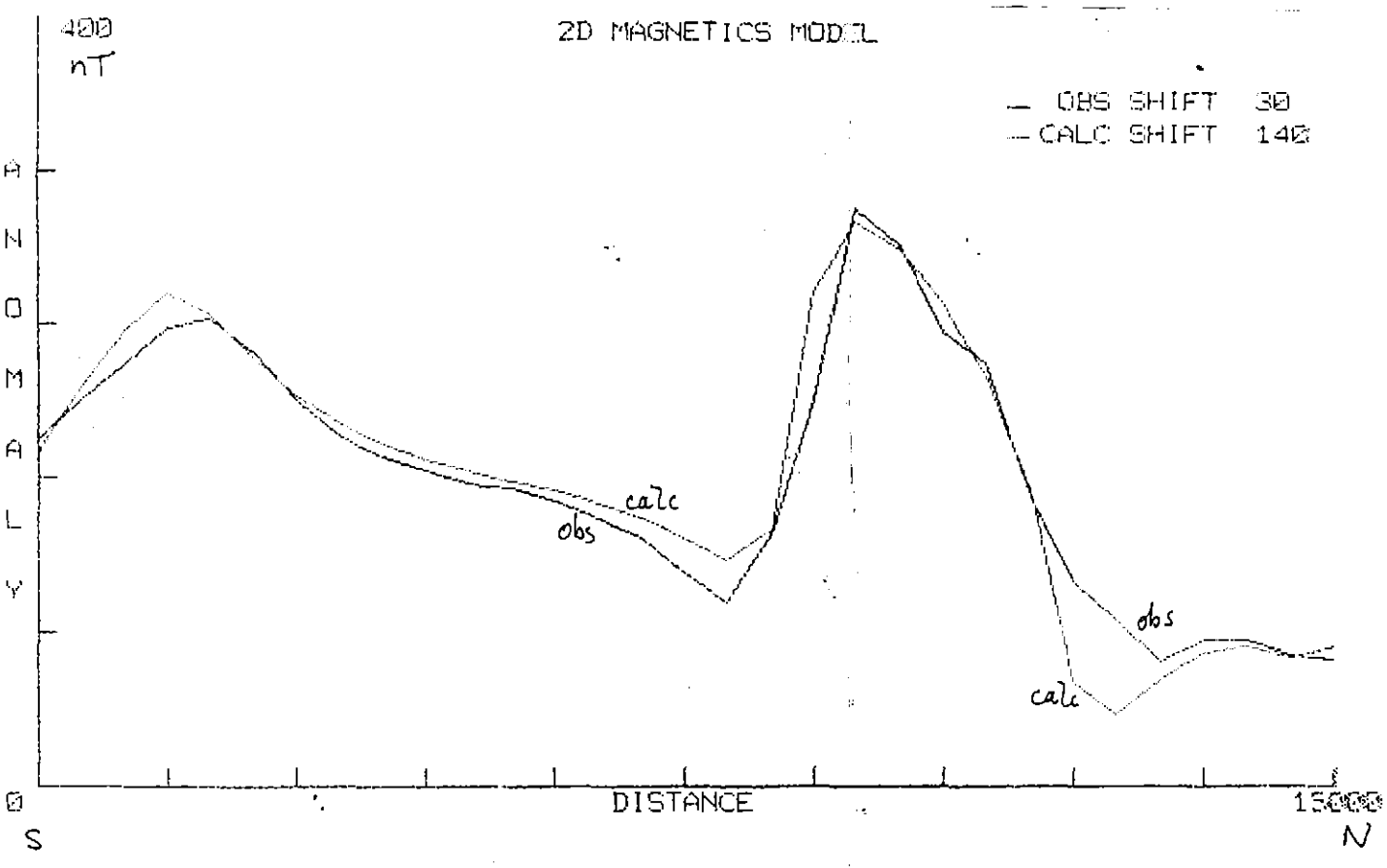

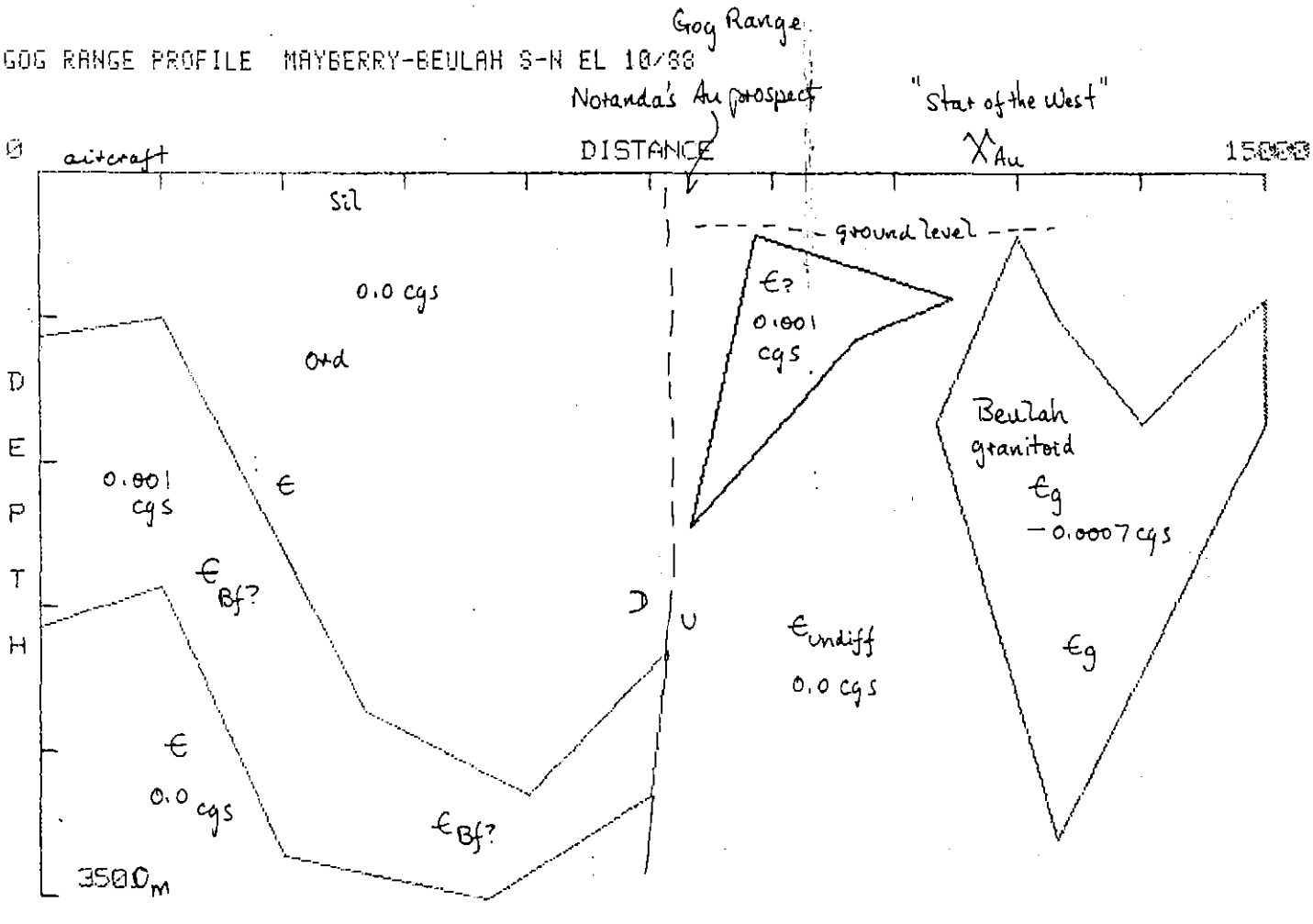

EL 10/88 GOWRIE PARK 2D REGIONAL MAGNETICS MODEL
GOG RANGE AREA
RANGE TOP WEDGE SOLUTION

FIGURE 13

0076

LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 15000 500

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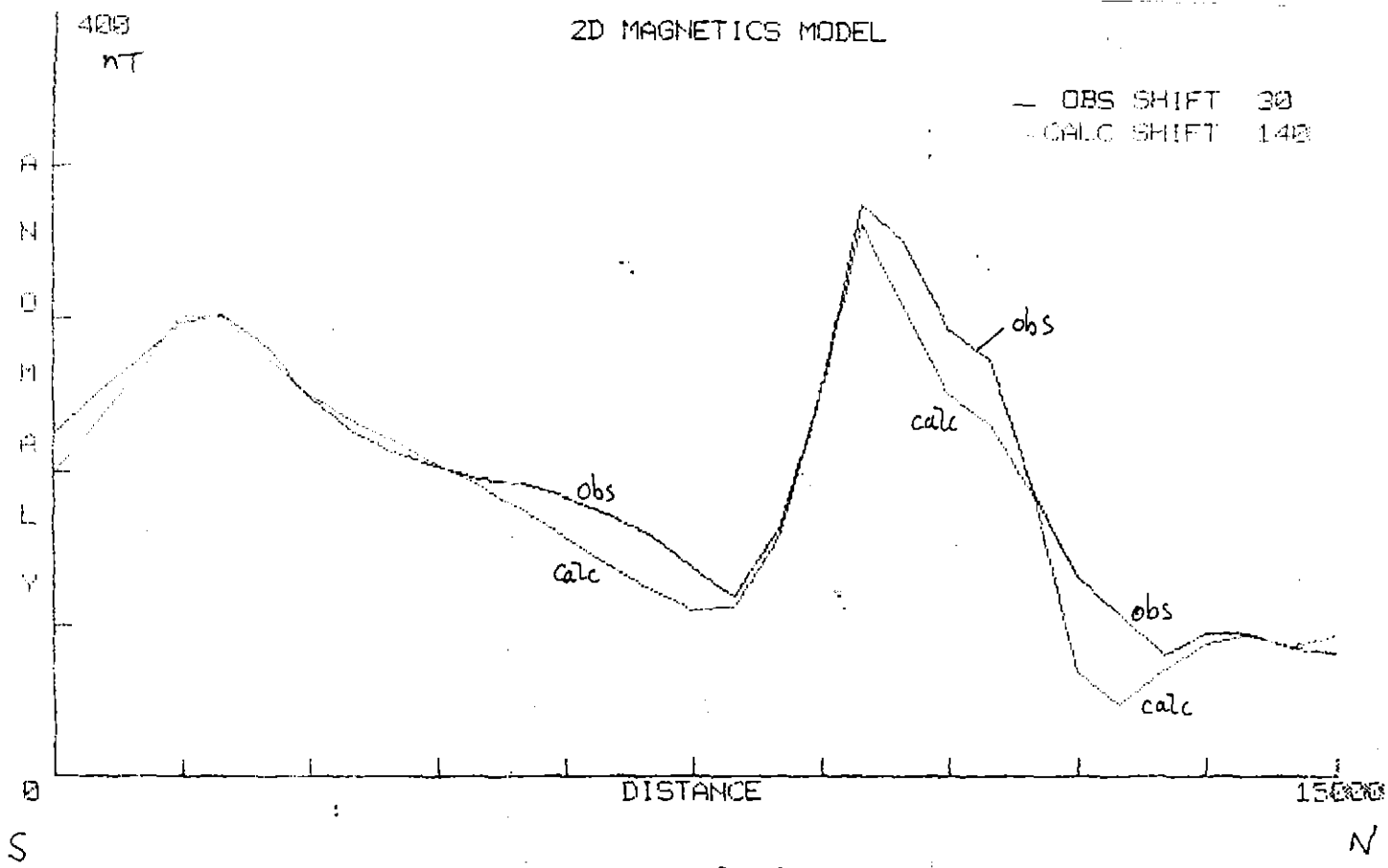

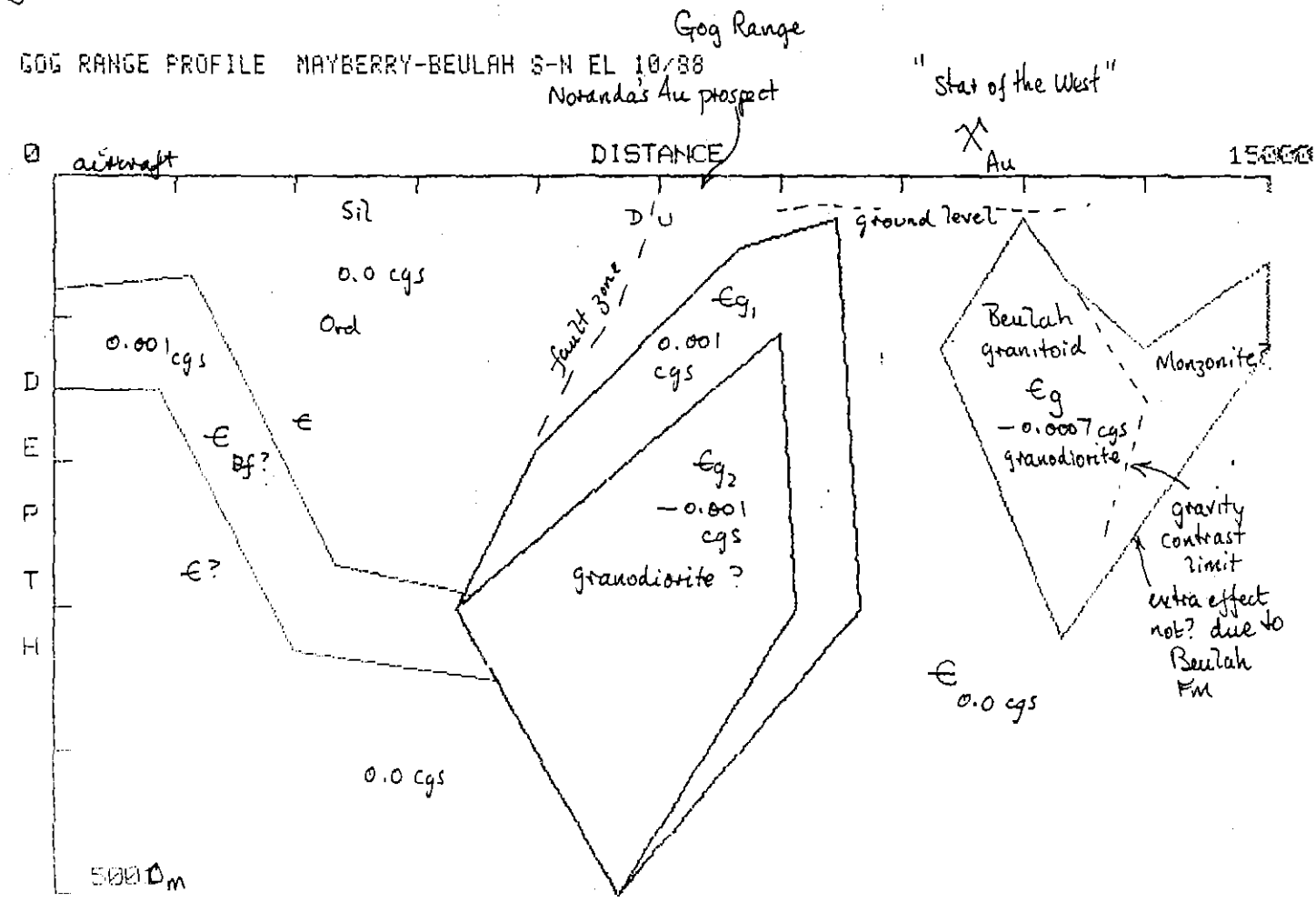

EL 10/88 GOWRIE PARK 2D REGIONAL MAGNETICS MODEL
GOG RANGE AREA
CONCEALED SMALL GRANITE IN RANGE SOLUTION

FIGURE 14

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LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 15000 500

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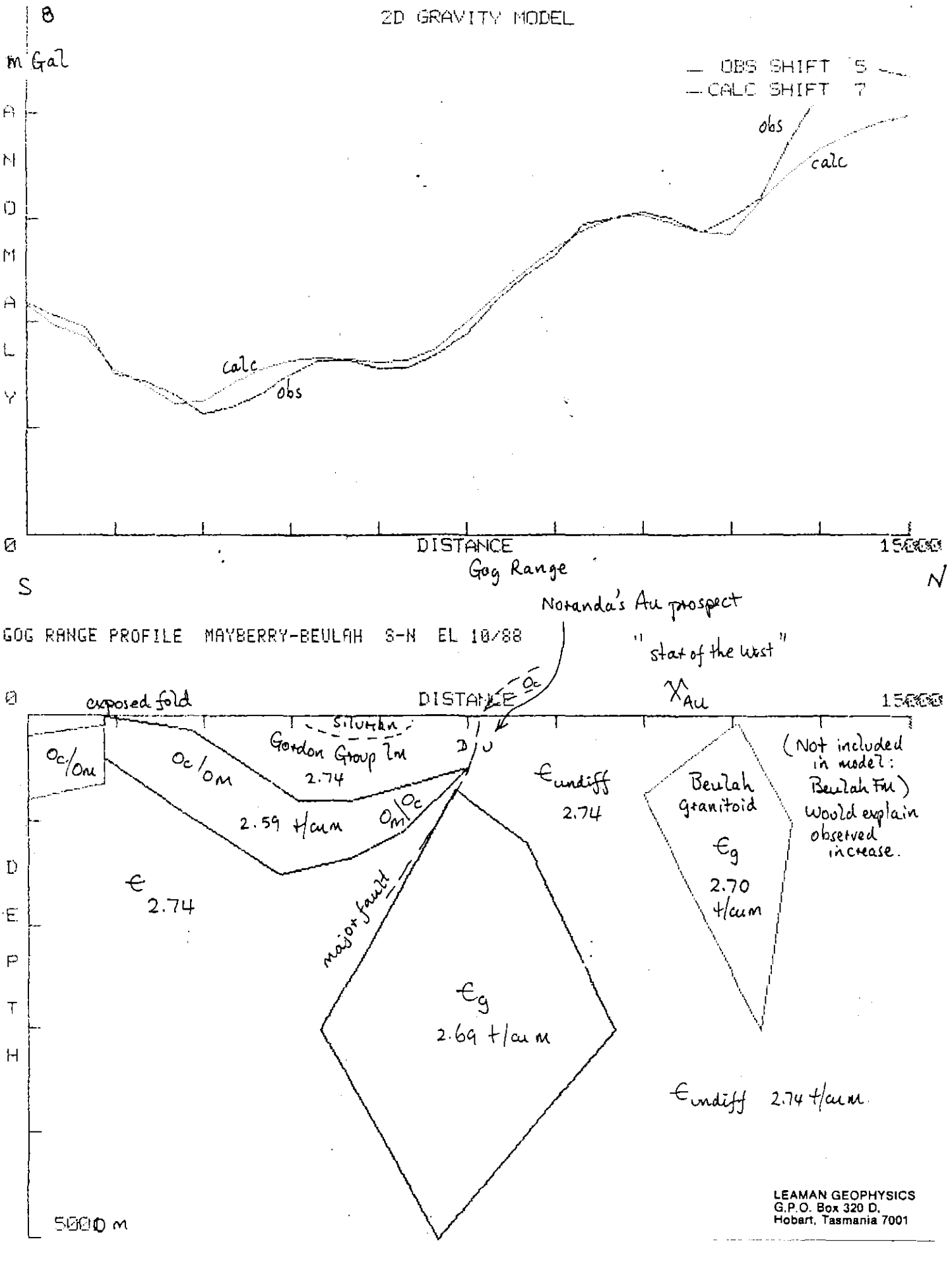

EL 10/88

GOWRIE PARK 2D REGIONAL GRAVITY MODEL
GOG RANGE AREA
MULTIPLE SMALL GRANITES SOLUTION

FIGURE 15

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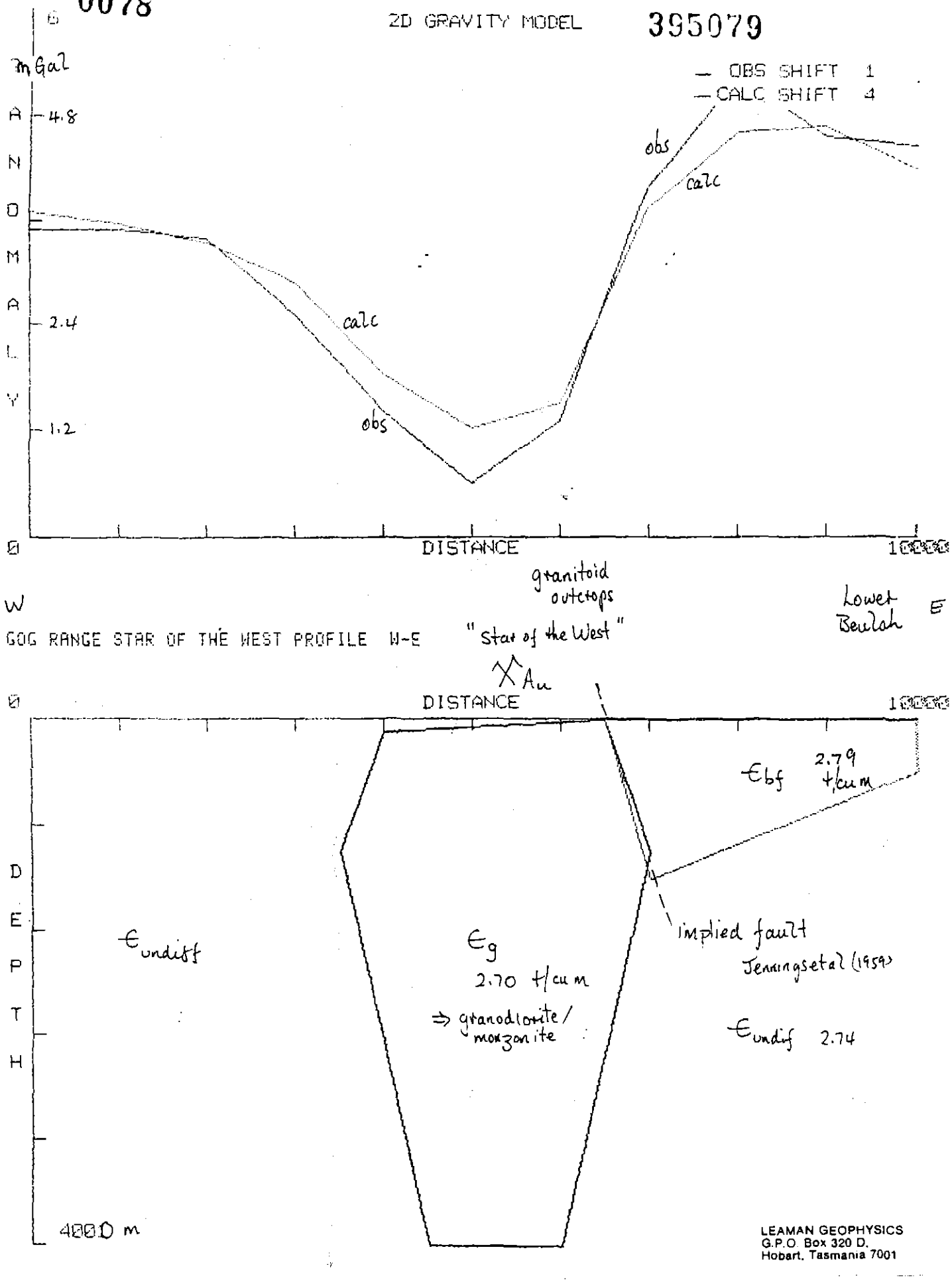

EL 10/88

GOWRIE PARK 2D BEULAH GRAVITY MODEL
NORTH GOG RANGE AREA
TEST OF GRANITE SOLUTION AT STAR OF WEST MINE

FIGURE 16

APPENDIX 2

Review of Gravity Data EL 10/88 - Dr. D. Leaman April, 1990

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

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REVIEW OF GRAVITY DATA

EL 10/88 LAKE BARRINGTON

for
NORANDA PTY LTD

by
Dr. D.E. Leaman

April 1990

BARRINTN

SUMMARY

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Improved gravity coverage of the Lake Barrington area (EL 10?88) of northwestern Tasmania has revealed several large structures which are not clearly reflected in exposed geology or current mapping. Many of these features represent primary basement discontinuities or their impression or rejuvenation within subsequent structures.

The valley of the Forth River is controlled by these structures. The Cambrian sequence, and structure, is different on either bank, especially in the region of the Staverton Prospect. The largest features trend NE-SW and can be traced into regional features first exposed near the Vale of Belvoir many kilometres to the south west. Lesser NW-SE trends may be associated with known fold axes and trends in this area. Some E-W character is also evident.

Two zones with persistent and continuous gradients cross the EL. One outlines the roof phase and shallow projection of the Devonian Dolcoath Granite; the other lies along an axis extending from Mt Roland - Staverton - S Nietta.. This latter gradient lies north of the mapped fault/thrust zone exposed west of Erriba and cannot be correlated directly with any known structure. Its trend is often mirrored in Devonian displacement structures.

Most known mineralisation within the Cethana region is associated with the roof of the Dolcoath Granite. All other sites can, however, be associated with the defined gravity features within the precision allowed by the data density. Several isolated sites, including Staverton, can be associated with the Erriba gradient, while the Lake Barrington prospect lies on another feature (N-S).

Three minor, probable, granite protrusions have been identified in the southern part of the EL. While it is possible that these are apophyses of the Dolcoath Granite their location, indicated density, size and magnetic response suggest Cambrian granitoids. Each is asymmetric and the intrusion has been structurally controlled.

Precambrian basement lies at shallow depth in the central east of the EL and Beulah Formation correlates appear to overlie it. These units vary in thickness and composition and must locally form significantly more mafic pods. Their presence enables some mapping of structure and the alignments along the Forth River appear to disguise major fold closures and possible early Cambrian growth faulting.

The region immediately west and south west of the Staverton Prospect is anomalous and possibly prospective. The strong NE-SW lineaments intersect the Erriba gradient zone in this area and the latter is both displaced and distorted. Both features carry mineralisation elsewhere.

INTRODUCTION

EL 10/88, Lake Barrington, is located north of Cethana in NW Tasmania (Figure 1).

A review of gravity and magnetic data in the region was prepared in 1989 (Leaman, 1989). This suggested that both data sets might assist understanding of the setting of known mineralisation and definition of controlling structures. Geological mapping in the area is dated and the surface geology, where not obscured by Tertiary materials, is not well understood or described. Interpretation undertaken as part of the review suggested that several major, basement-involved structures - possibly thrusts, might intrude into the Lake Barrington area.

Data available for review in 1989 was either patchy (gravity) or lacking in resolution and detail (gravity and magnetics). Infill (gravity) or resurvey (magnetics) was recommended.

This report describes the revised gravity data base and some possible implications. A fuller analysis will be possible after acquisition and preliminary assessment of the new magnetic survey.

GRAVITY DATA

The pre 1989 content of the Tasmanian gravity data base for the Lake Barrington area was presented in Figure 3 of Leaman (1989). This data was in the public domain and available from the Tasmanian Department of Resources and Energy (Mines Division).

The coverage was infilled as a joint venture between Noranda Pty Ltd and the Department at comparable specifications. Suspect stations were duplicated or replaced.

All stations are linked to the state tie network and have been terrain corrected to a radius of 22 km. Elevations were barometrically determined and elevation errors limit the RMS accuracy of the survey to about 0.5 mGal. This is more than adequate for regional and structural applications.

A compilation of the revised data base is presented in Figure 2. An enlargement is provided as Map 1 (folder). The additional detail provided by the survey augment confirms many elements of the gravity field which were only inferred previously and also suggests many unsuspected features. It may be noted that there remains scope for further detailing and infill.

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DATA TREATMENT

The original presentation of gravity data by Leaman (1989) was in the form of a residual Bouguer anomaly generated using the crustal model for Tasmania known as MANTLE-88 (Leaman, 1988; Leaman & Richardson, 1989b).
This presentation retained the effect of the Dolcoath Granite, the next largest contributor to the total field in this area (see Leaman & Richardson, 1989a). Leaman (1989 - Figure 4) presented part of a refined 3D model of the granite derived from the basic work reported by Leaman & Richardson (1989a) and specific 3D analysis commensurate with the data base available in December 1988. All long wavelength characteristics are satisfied by this model.

In order to enhance the new compilation (Figure 2) and more clearly define structural trends unrelated to the Devonian granite the effect of the granite, as determined by this 3D model, has been removed. The effect of ocean water has also been removed in order to fully comply with MANTLE-88 (see Leaman, 1988).

The resulting compilation after correction of the observed Bouguer anomalies for crust, ocean and Dolcoath Granite is shown in Figure 3. The residuals presented are true values and contain no disguised or undefined filter effects. All values apply at the station locations on the land surface and interpretation must allow for this.
Profiles used for modelling have been sampled from this data set and differentially continued to a reference level of 700 m ASL in order to allow inclusion of topographic shapes and interaction with near surface sources in the models.

COMMENTS ON THE RESIDUAL FIELD

The residual field clarifies the features of the observed field but emphasizes the anomalous character and location of the features observed.

A negative response has been retained above the roof of the Dolcoath Granite. This shows that the density of this body, at least in its upper part, is less than the bulk assumed value of 2.62 t/cu m. A lighter roof phase of 2.58-2.60 t/cu m is implied.

Most mineralisation within the Moina - Lake Cethana area lies close to the -5 mGal contour and almost certainly reflects roof irregularities and the siliceous phases of the granite.
Other, more distant mineralisation, near Cethana - Round Mt, is related to the ultimate margin of the granite; the zone in which low angle roof forms are converted to high angle walls. I

believe these prospects lie in, or near, the projection of the wall fracture system (see Leaman, 1989 Figure 4; also Figures 5 and 6 of this report for relationships).

The more scattered remaining prospects cannot be related to the Devonian granite in any way. Many of the sites which can be related to the granite forms may also represent some remobilised material (below).

The residual field (Figure 3) reveals a 3 mGal step anomaly across the area at a nominal northing of 5411 000 mN (actual trend ESE). This trend is extensive (Map 2). The feature was suggested in the earlier compilation of Leaman (1989, Figs 3 and 5) and noted to occur near the Staverton prospect. Small prospects near Gowrie Park, Mt Roland and south east of Staverton are all within this gradient band (see Figure 4, Map 2). This band is subsequently referred to as the Erriba gradient.

The two zones of anomalous gradient, one clearly related to the granite roof, the other to some large concealed structure, account for most mineralised sites in the area.

The gravity field north of the Erriba gradient is strongly positive for many kilometres in all directions. This indicates a thick, Cambrian sequence. Map 2, however, shows this effect to be part of a belt which is enclosed to the north and east by a moderate, smooth and areally large negative anomaly whose form is not consistent with known elements of surface geology.

Negative anomalies are not consistent with Cambrian rocks since no substantial Cambrian unit has been found whose bulk density is less than 2.67 t/cu m (typical siliceous Precambrian basement or the reduction density), or even less than 2.73 t/cu m. Review of the anomaly patterns of Figure 3 will show that the Tertiary cover does not significantly influence the gravity field. This is consistent with the station spacing and the relative thinness of the Tertiary cover.
Ordovician rocks, which may generate negative anomalies, are too thin and too localised to produce the effects observed.
The gross negative effects observed north and east of EL 10/88 can only be explained by another large Devonian granitoid - the Beulah Granite of Leaman & Richardson (1989a). Its composition must be dioritic or granodioritic, however, since regional contrasts of only -0.03 t/cu m seem likely (below). This composition could also account for the moderate anomalies observed.

Many gross trends are defined by the Cambrian-related anomalies (see Figure 4) and the largest of these, north west of the EL can be traced far to the south west to the Vale of Belvoir and beyond. Others indicate that different sequences and exposures across the Forth valley are no accident; major structures transect or underlie the regional grain of the surface geology. The Lake Barrington prospect can be associated with a second

order N-S structure or trend.

Mineralisation near Mt Claude can be correlated with a trend parallel to the Erriba gradient.

Inferred trends and relationships are suggested in Figure 4. Not all are well defined. Some are major and emphasized. Further, more regular, infill might well lead to some revision - especially in the region of Round Mt, Mt Claude and Mt Roland. The contrasts and correlations with the geological base map are evident.

Three other features should be noted in Figures 3 and 4. Two lie within the EL. These relatively negative features may be observed at 428 500 mE, 5409 000 mN; 430 500, 5408 500 and 431 500, 5406 500 (see Figure 3). These are shown with symbols in Figure 4.
These anomalies could be due to local spines or apophyses of Dolcoath Granite, minor Cambrian granitoids or data errors.
Inspection of the character of the features and the required general disposition of the Devonian granite for the 3D model suggests that any spines or apophyses present would be of very high relief (over 2000 m) and unlikely to generate the local responses observed.
Data errors have also been considered; the most likely sources being in elevation or terrain correction. Review does not indicate any such problem and certainly not one which could result in 1 to 2 mGal in the Bouguer anomaly. Each site lies in different terrain and geology but within a consistent zonal style of the gravity field. The features must be accepted pending additional survey.
The anomalies can, however, be explained by small Cambrian granitoids with a density of 2.68-2.71 t/cu m whose roofs are quite shallow, perhaps directly beneath the local thrusts and unconformities.

Several of the issues raised by inspection of the data have been tested by analysis.

ANALYSIS

Three representative profiles have been interpreted. These are shown in Figure 3 and are labelled in kilometres from their origin in order to permit correlations between modelled section and the basemap shown in Figures 2 to 4.

Each profile extends beyond the confines of EL 10/88 in order to provide a regional setting for the features described.
Profiles 1 and 2 may be contrasted with Figures 5 and 6 of Leaman (1989).

Profiles 1 and 2 (Figures 5 and 6) contain a representation of the Dolcoath Granite even though its effects have been removed from the data set. This has been done to scale other elements of the structure and also allow assessment of the volume of the ligher roof phases. The residual negative anomalies associated with the granite can be explained by reducing the bulk density for the entire granite to about 2.60 t/cu m or a substantial roof phase of about 2.58 t/cu m.

The profile match parameters for these profiles are neutral (observed data shift = calculated data shift) reflecting the true residual status fo the compiled data set.

Profile 1 (Figure 5) shows that the Cambrian sequence is up to 4 km thick at normal bulk densities. In the particular model shown (many variants have been assessed for each profile) an asymmetric wedge of Ordovician is coupled with a denser basal Cambrian unit. The curve fit suggests that the wedge of Ordovican should be thinned to the SW. The dense unit, on the basis of this section, could be placed almost anywhere within the Cambrian succession. Other sections are more definitive.

The negative feature at the NE end of the profile can only be explained by a large volume of moderate contrast and considerable depth range. A large granitoid with properties comparable with the Housetop Granite, or a granodiorite, is implied. Its scale would suggest that it is Devonian in style and age. The precise mass balance and shape cannot be determined reliably with current data but the denser Cambrian unit is involved and perhaps thickened. Were this increased thickness to be carried across the section the entire sequence could be thinned by several hundred metres.

Profile 2 (Figure 6) is apparently similar in style but review of Figure 3 shows that it is very different. So is any model solution. The Cambrian section is thinner and patchier and the denser unit cannot be associated with exposed Beulah (?) Formation near Lake Barrington. The implication is clear. If any intermediate-mafic sequence is present and within the exposed materials then it is very thin near the lake but rapidly thickens and dips west (see Figure 7, compare Figures 5 and 6) and north. The model suggests thrusting and the style of solution is comparable with that deduced from regional magnetic data (see Figures 6, 7, 9 and 10 of Leaman, 1989).
Space requirements near the lake indicate that the denser unit is either exposed or virtually exposed and that it is basal to the Cambrian succession envelope. It is probably also variable in thickness, composition and bulk density but significantly denser than the felsic or sedimentary rocks.

Profiles 1 and 2 show that there is room for small Cambrian granitoids with root depths of up to 4 km within the zone marginal to the walls of the Dolcoath Granite. The form of

profile 2 suggests the location of such a body - near 5 km - gi en the shape of the profile and the absence of other possible sources. Model tests confirm that a small body of granodioritic composition could explain the data.

Profile 3 (Figure 7) provides one solution for the E-W differences across the Forth River near the crest of the structures implied in other profiles. It shows that it is possible to account for the differences by folding. The structure cannot be as simple as this, as shown by Figure 6. It is also possible to explain the profile by faulting and direct changes in thickness of the basal, dense member. All options stress, however, the fundamental nature of the location and its structural development and the options could be considered to include growth faulting and similar basic controls.

The model shown is consistent with Figures 5 and 6 and accounts for the differences in thickness of the Cambrian succession.

It may be observed that the curve fit parameters have been offset by 2 mGal. This is necessary for any 2D model with the orientation of this profile and reflects the lateral 3D influence of the Dolcoath Granite (-1.7 to -2.2 mGal along the profile) which cannot be properly represented in this simpler format. Thus the calculated effect is about 2 mGal too high and must be matched by shifting the observed profile.

Extant magnetic data (e.g., Figure 2 of Leaman, 1989) confirms the presence of more mafic materials in zones where the residual Bouguer anomaly exceeds +5 mGal. This data also shows that a magnetic anomaly can be associated with each of the three small negative features offset from the Dolcoath Granite. While such anomalies can be produced by thermal alteration about small extensions from the large intrusion they are also consistent with small Cambrian granitoids of the composition implied. Pending acquisition of more detailed gravity data and review of new aeromagnetic data it must be concluded that these anomalies are related to small granitoids and that any mineralisation nearby is probably remobilised Cambrian material. This explanation cannot be used to account for the Staverton and Lower Barrington prospects which could be early Cambrian in age and not remobilised.

CONCLUSIONS

New gravity data enables new explanations to be offered for all the known mineralised sites in the Lake Barrington region. Within EL 10/88 these are associated either with small Cambrian granitoids included in or near the thermal halo of the Devonian Dolcoath Granite, or with major basement fracture zones. It

might be expected that the former would indicate a hybrid Cambro - Devonian age while the latter should be early Cambrian and be associated with basal sequences and variable volcanic products.

The largest basement-involved structure lies beneath Lake Barrington and has probably dominated both fold patterns and deposition and may hav controlled local growth faulting and volcanism. The critical interaction of many of these structures lies immediately NE of the Staverton prospect but there is no proof that this dislocated zone is mineralised or has not been shifted from the original site of control. It can be argued that this complex structure has been described and is not anomalous.
This cannot be said for the features to the SW of the Staverton Prospect where NE-SW basement fractures intersect the WNW-ESE Erriba gradient zone. The largest spine of Cambrian (?) granitoid lies immediately south of this intersection, the gradient zone itself is mineralised and it is distorted NE toward Staverton at the intersection. These observations indicate a major confluence with anomalous distortion of all characters.

The zone W and SW of Staverton prospect should be closely examined. Is, for example, the thickening westward sequence massively altered? Any target will lie beneath the thrusts implied. While these are thought to lie north of the prospect any structure south of it could well conceal the altered volume if it exists. Magnetic data might assist this assessment which also requires careful geological groundwork.

The present data set has not been exhausted but further analysis should await receipt of magnetic data.

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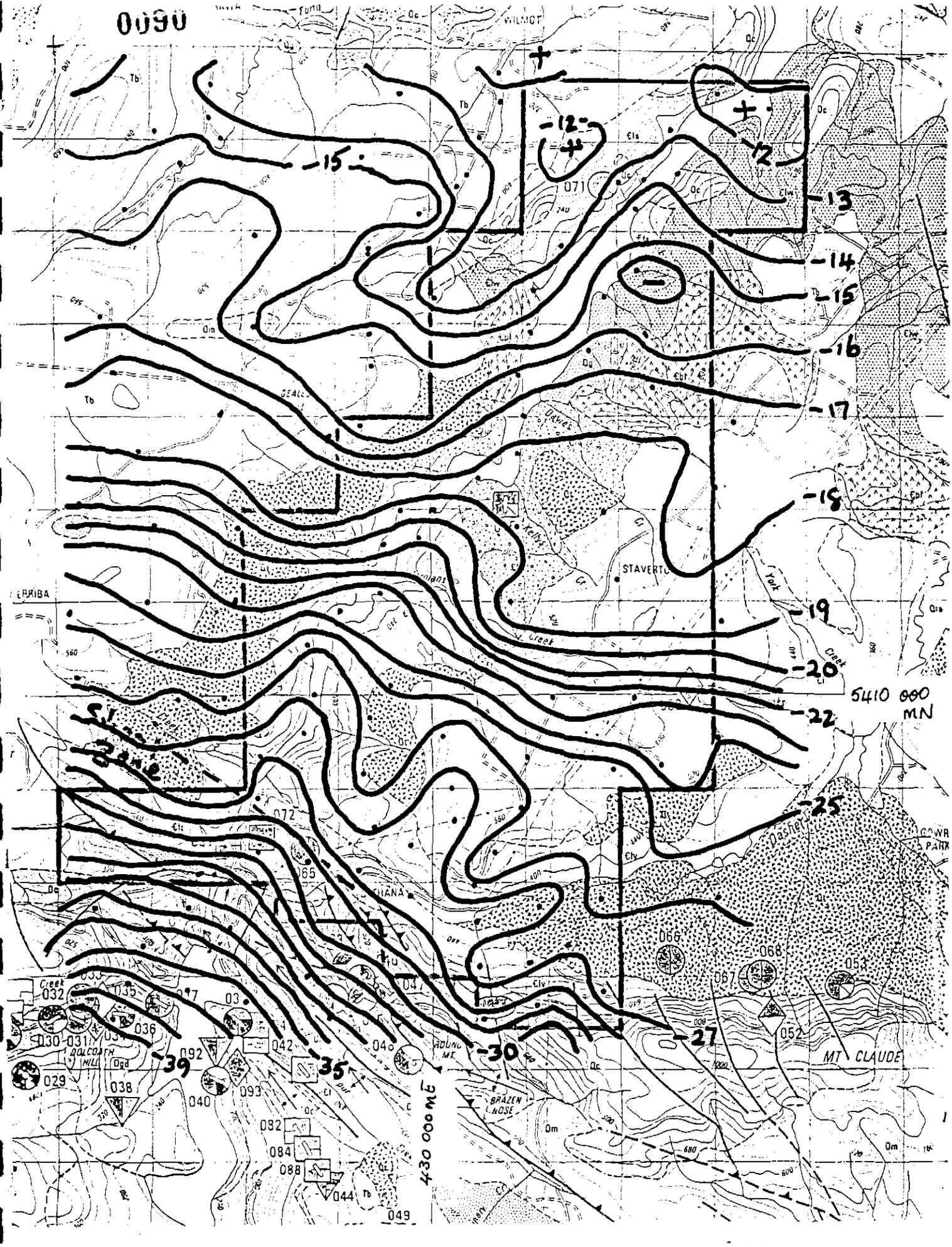
EL 10/88 GOWRIE PARK LOCATION FIGURE 1



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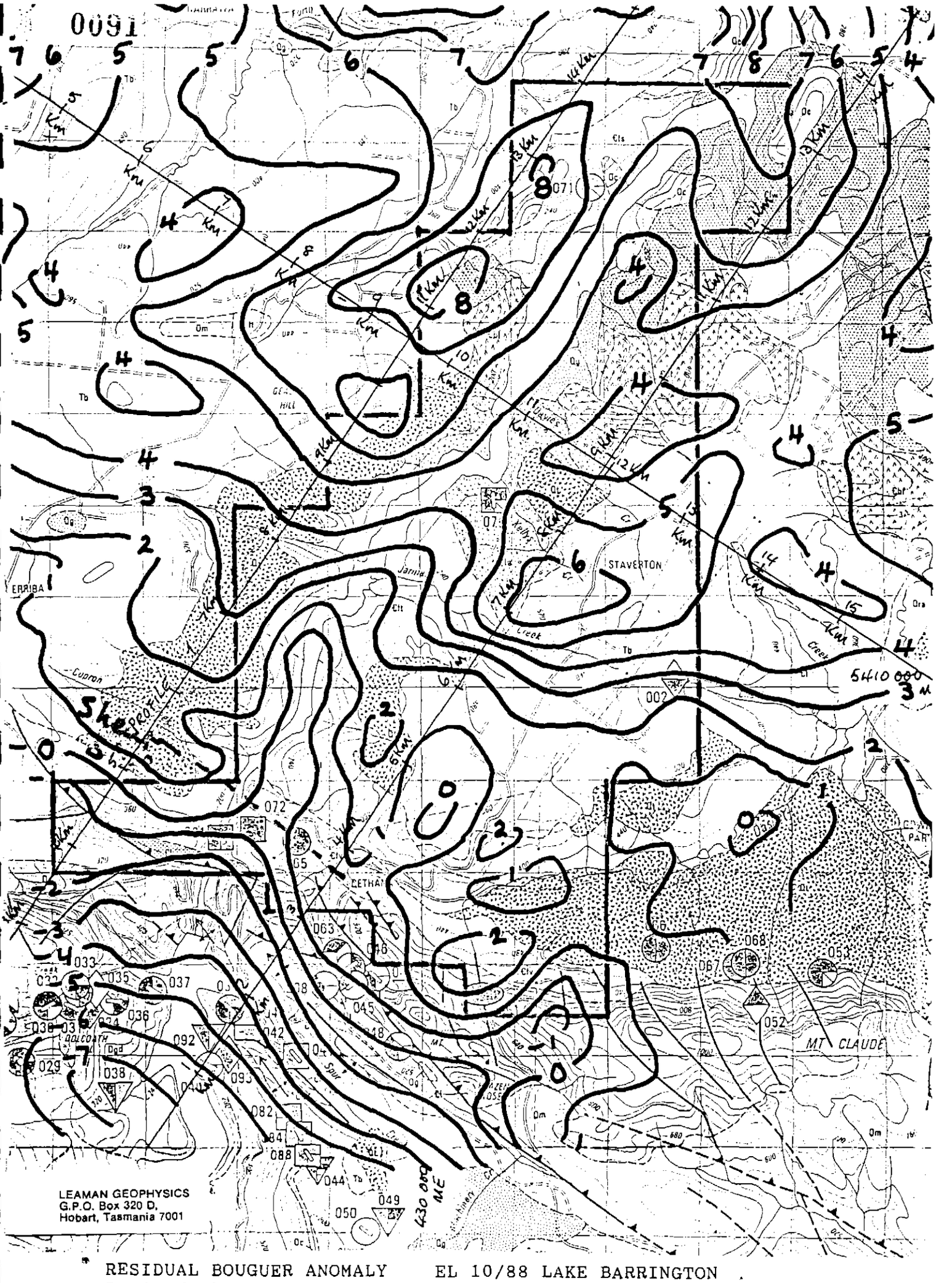
BOUGUER ANOMALY EL 10/88 LAKE BARRINGTON
Sources: TASGRAV and Noranda. Basemap: Bamford & Green (1988)
Reduction density: 2.67 t/cu m

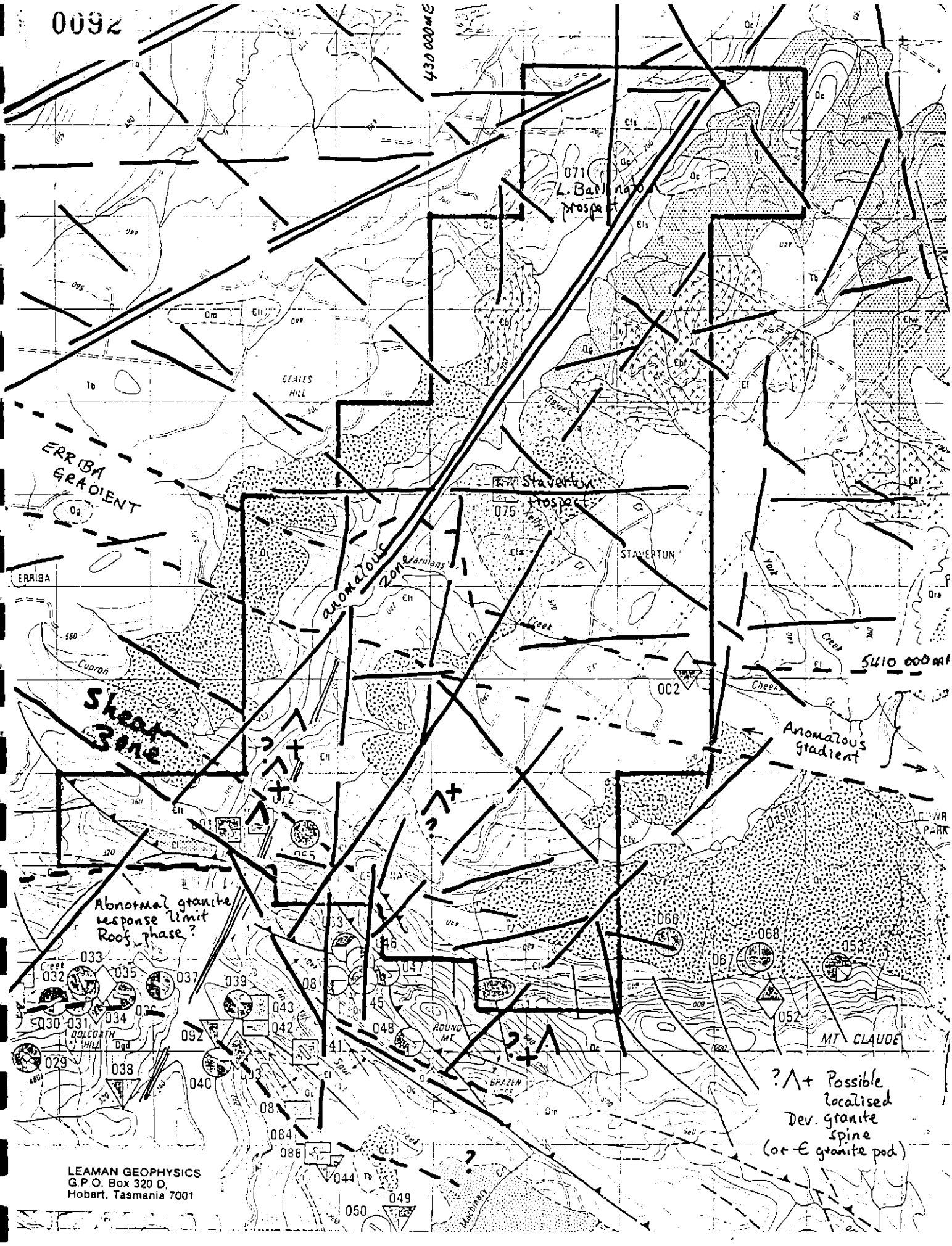
FIGURE 2



RESIDUAL BOUGUER ANOMALY EL 10/88 LAKE BARRINGTON .
Derived by subtraction of crust, ocean and Dolcoath Granite (see text). Modelled profiles are shown.

395092

FIGURE 3



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PRIMARY TRENDS AND STRUCTURES INFERRED FROM RESIDUAL ANOMALIES
EL 10/88 LAKE BARRINGTON

FIGURE 4

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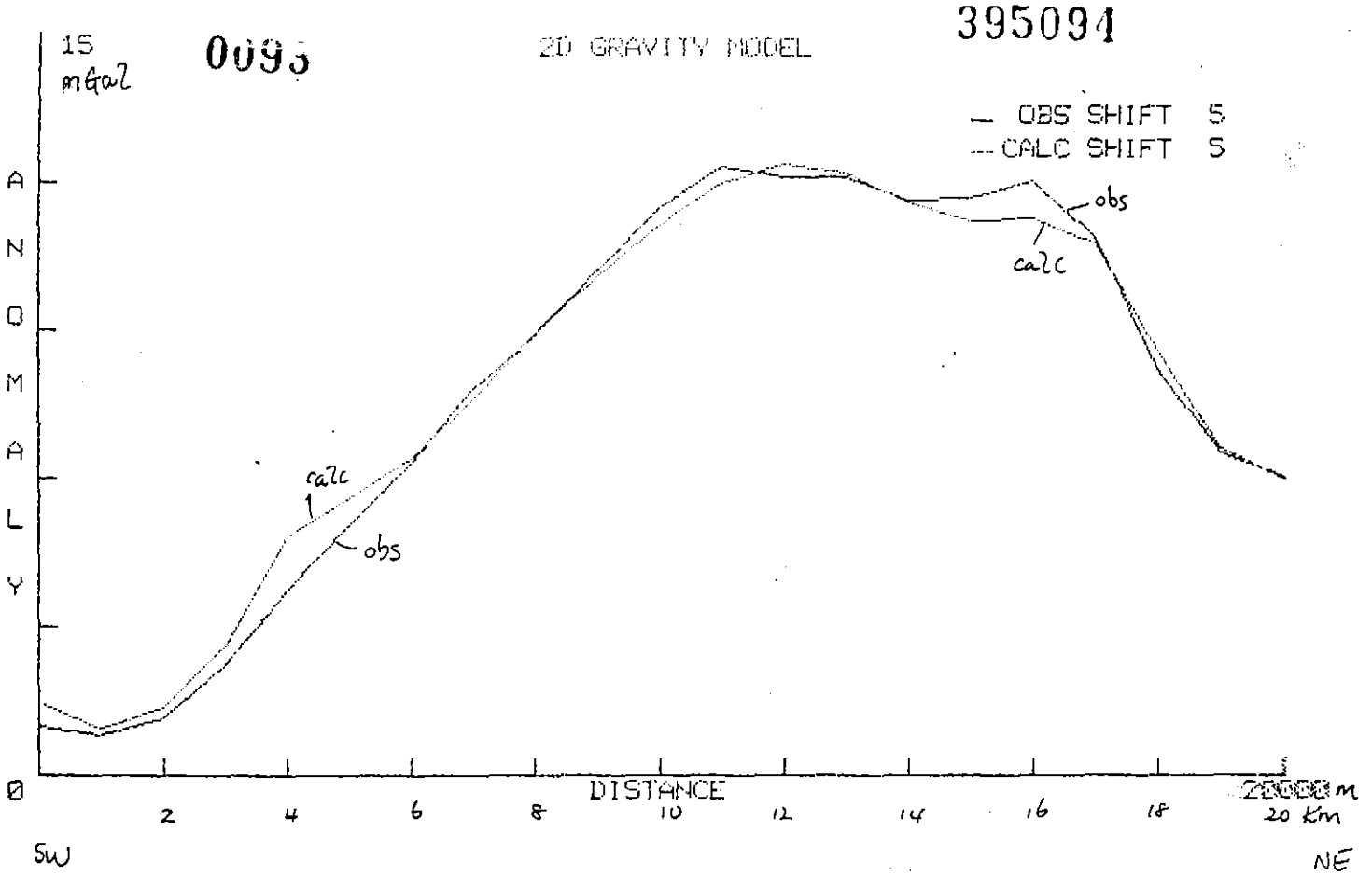
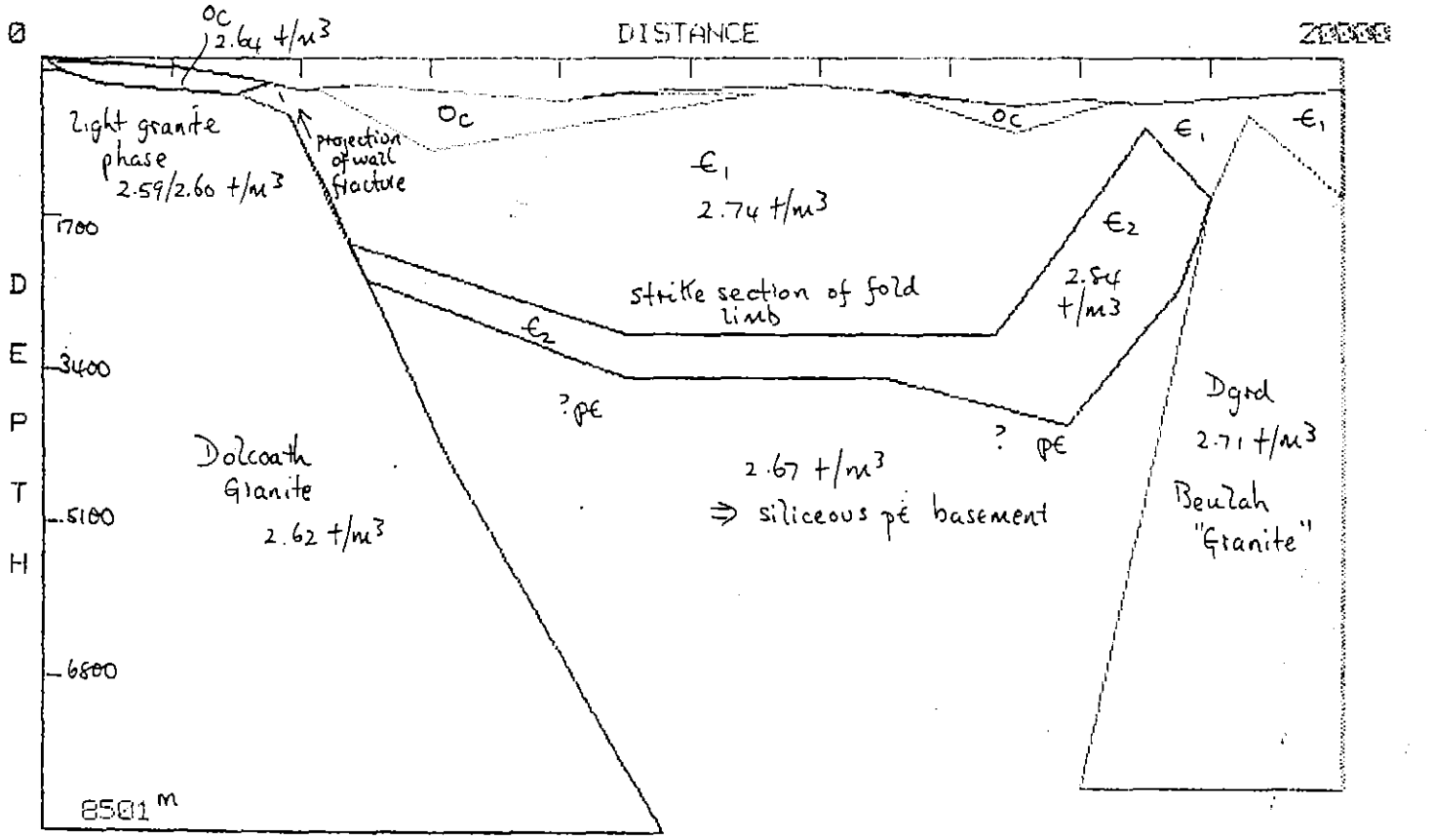


BARRINGTON G1 422/405->437/420 AT 700M



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2D GRAVITY MODEL PROFILE 1 EL 10/88 LAKE BARRINGTON
FIGURE 5

LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 20000 1000

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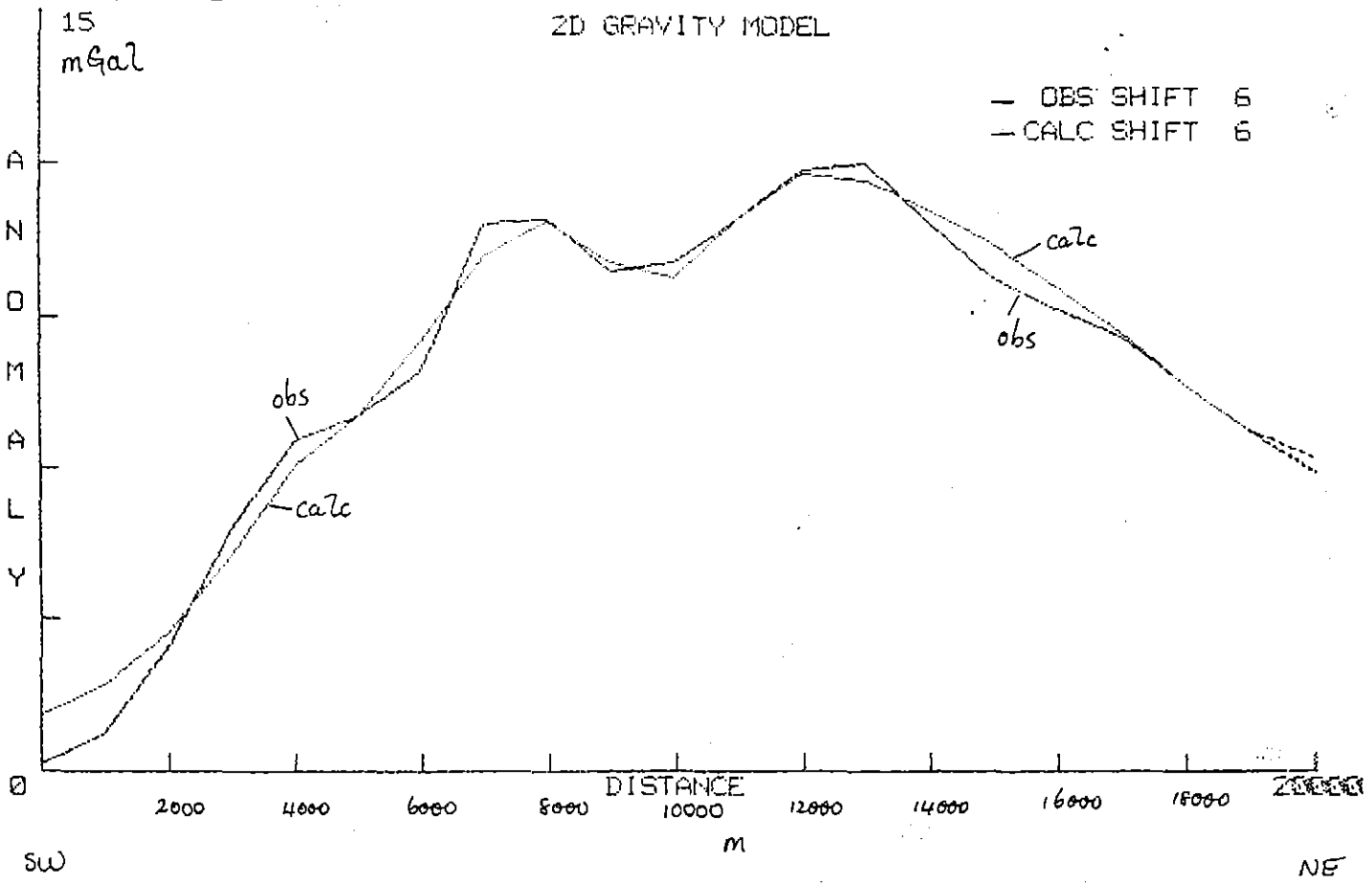
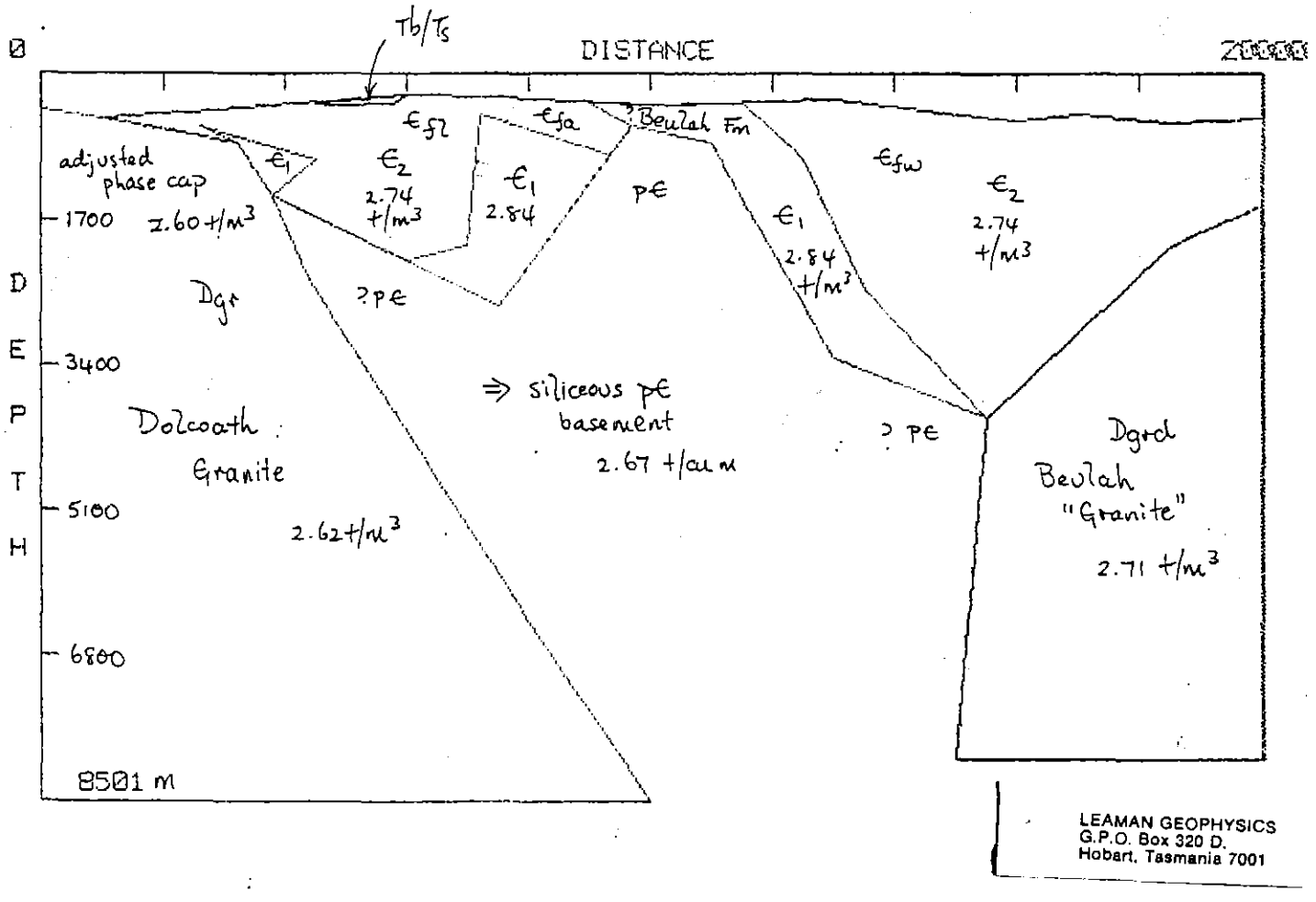


BARRINGTON G2 427/405-437/420+ AT 700M



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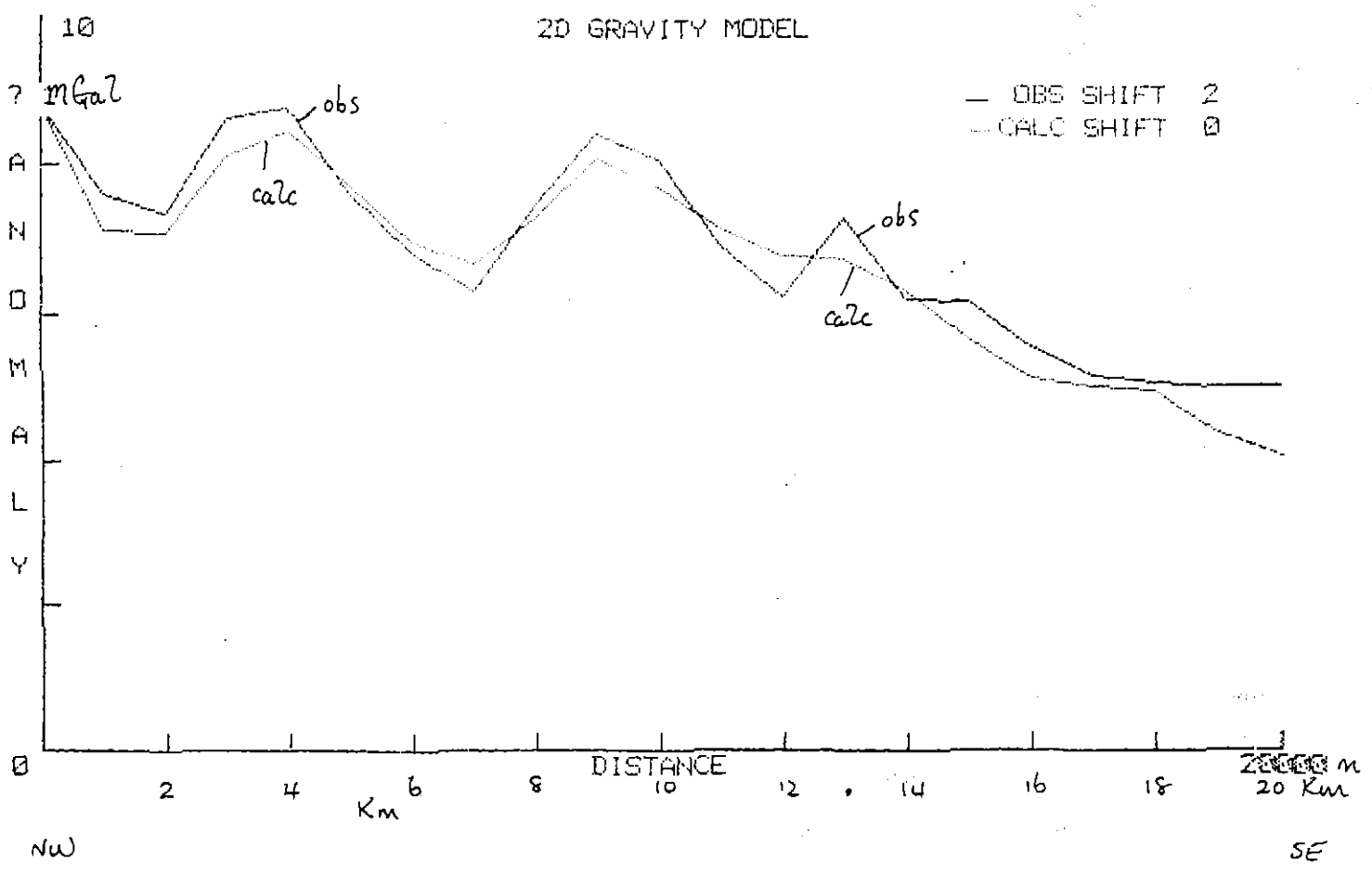
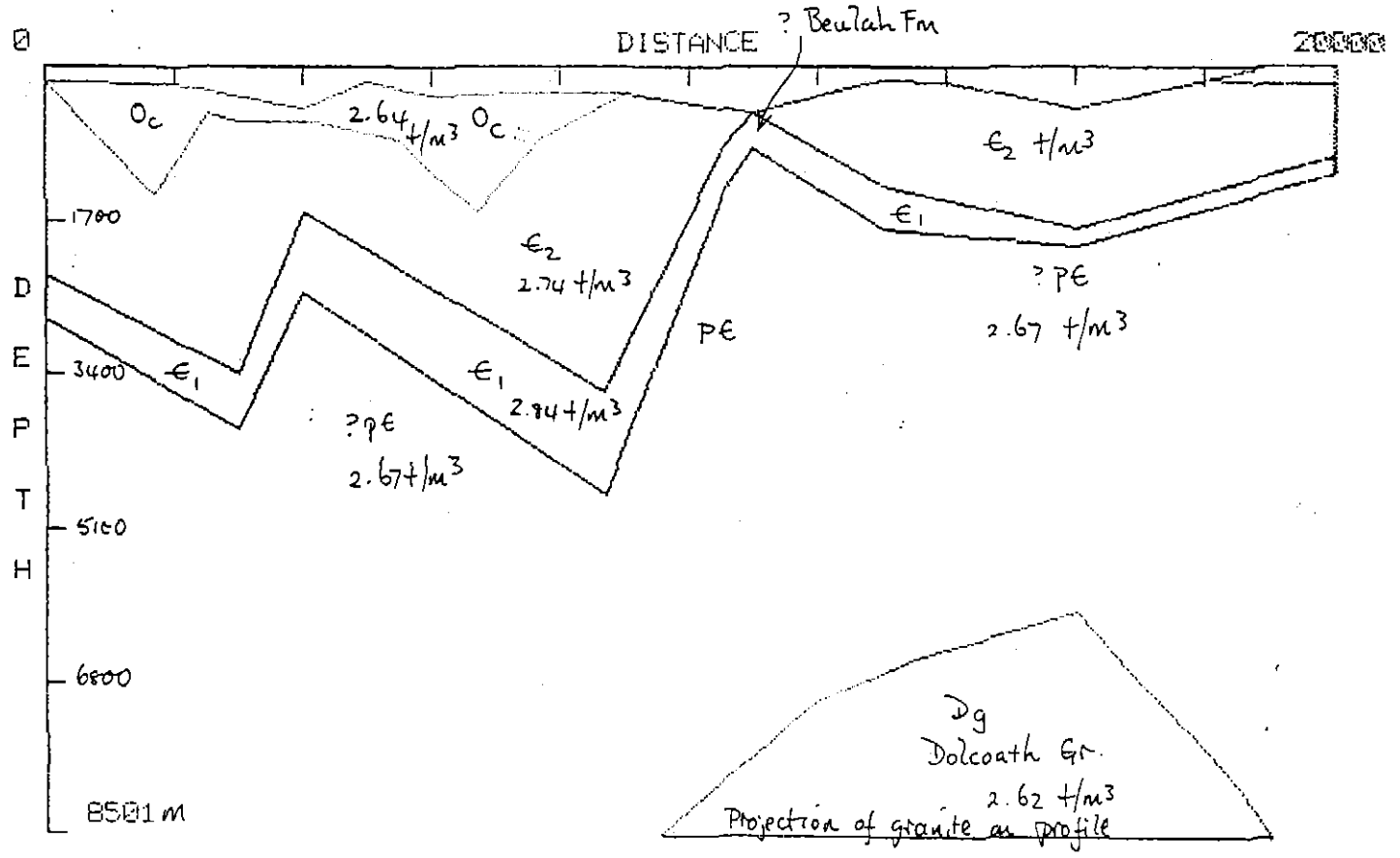
2D GRAVITY MODEL PROFILE 2 EL 10/88 LAKE BARRINGTON
FIGURE 6

LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 20000 1000 395096 LEAMAN GEOPHYSICS G.P.O. Box 320 D, Hobart, Tasmania 7001

0095



BARRINGTON G3 422/419-437/409+ AT 700M



2D GRAVITY MODEL PROFILE 3 EL 10/88 LAKE BARRINGTON
FIGURE 7

0096

395097

Report submitted on behalf of
Leaman Geophysics
by

D. Leaman

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

2-4-90

420 000 mE
425 000 mE
430 000 mE
435 000 mE
440 000 mE
5420 000 mN
5415 000 mN
5410 000 mN
5405 000 mN

NIETTA
WILMOT
EL 10/88
L. Barrington
Staverton
CETHANA

* gravity station
⚒ prospect, old mine or representative location for closely grouped workings

N

BOUGUER ANOMALY

Reduction density 2.67 t/cu m

Source data : Tas. Dept. Resources & Energy, TASGRAV data base; Noranda

Compilation : D.E. LEAMAN Leaman Geophysics Hobart March 1990

For : Noranda

Exploration licence : 10/88 "LAKE BARRINGTON"

5 cm

MAP 1

420 000 mE
430 000 mE
440 000 mE
5420 000 mN
5415 000 mN
5410 000 mN
5405 000 mN

NIETTA
WILMOT
L. Barrington
Staverton
CETHANA

EL 10/88

Moina prospects shown are subset of actual mineralised sites and indicate general location of mineralisation with respect to gravity field.

Exposure of Dolcoath Granite

91-3231

RESIDUAL GRAVITY FIELD

(Bouguer anomaly at 2.67 t/m³ with effect of mantle, ocean and a comprehensive 3D model attraction of Dolcoath Granite removed. Refer text for details of procedure and limitations)

Source data: Tas. Dept. Resources & Energy, TASGRAV data base; Noranda

Processing: D. E. LAMAN Leaman Geophysics, Hobart March 1990

For: Noranda

Exploration licence: EL 10/88

"LAKE BARRINGTON"

5 cm

MAP 2

395100

APPENDIX 3

Aeromagnetic Survey EL 10/88 - Acquisition Report and Preliminary Interpretation - Dr. D. Leaman, April 1990

0098 MAN GEOPHYSICS
Survey Review, Specification, Reduction, Interpretation
Gravity, Magnetic and Seismic Methods
Structure and Prospect Evaluation

Registered Office:
21 ZOMAY, AVENUE, DYNNYRNE, TAS. 7005
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395101

AEROMAGNETIC SURVEY
EL 10/88 LAKE BARRINGTON

ACQUISITION REPORT
(INCLUDING PRELIMINARY INTERPRETATION)
for
NORANDA PTY LTD

by
Dr. D.E. Leaman

April 1990

BARRMAG1

0099

395102

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1. EL 55/83 location
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3. NE/NW illumination colour images of magnetic field
4. Monochrome images of magnetic field and horizontal gradient
5. Fine colour images of magnetic field/total count radiometrics
6. Contours of magnetic field (6B with geological base)
7. Prospect location map (overlay in pocket for map 1)
8. Interpretation summary
9. Residual gravity field (overlay in pocket for map 2)

MAPS

1. 1:25000 Line location map and fiducial references
2. Stacked profiles of magnetic field.
3. Contours of residual magnetic field.

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SUMMARY

A new high resolution helicopter aeromagnetic survey of the Lake Barrington region has shown that systematic variations in the magnetic field occur and may be associated with primary structure and fracture systems.

This report describes specification and acquisition of the survey. It also includes a discussion of possible implications but further interpetation requires some re-examination of specific features observed at, or near, known mineralised sites and use of observed rather than processed data.

The most persistent and largest features trend WNW-ESE. These clearly reflect gross structure or basement involvements. Some other lesser trends and lineaments can be recognised. These display NE-SW and NW-SE orientations approximately. It is not possible to define the relative significance of these features due to their variable presentation in different image or contour displays. Such features probably represent transverse or conjugate fracture sets.

The largest responses observed in the survey area can be associated with mafic members of the Cambrian sequence or local aureole effects around irregularities in granites, most of which appear to be relatively small, and probably, Cambrian bodies.

Mineralised sites can be consistently explained by the defined elements of the magnetic field. Those sites far removed from the influence of granites appear to lie near intersection of NW-SE and E-W lineaments although the ultimate control may be NE-SW. Few sites are present and this restricts confidence in the association suggested. The relative simplicity of the alignment patterns does mean, however, that the propositions may be readily tested and reviewed.

The locations of known mineralised sites and implied lineaments should be determined as accurately as possible and literature reviewed to assess suggestions of apparently more subtle fracture orientations or stress controls at the site. Both gravity and magnetic data sets imply similar patterns and a complementary interpretation although the magnetic data offer a capacity for more precise location of character. The region immediately west and south west of the Staverton prospect remains the most obviously anomalous and initial detailed work should be undertaken there.

The survey has shown that detailed airborne magnetic surveys can add to the structural appraisal and possible understanding of the setting of known mineralisation. No analysis of local rock alteration is included but this should be undertaken as soon as tapes of corrected data from the survey are supplied by the contractor.

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INTRODUCTION

EL 10/88, Lake Barrington, extends north from Cethana along the valley of the Forth River in north west Tasmania (Figure 1).

The area has been subject to previous exploration and has been covered by regional gravity and magnetic surveys (e.g., Bishop, 1987). This data was reviewed by Leaman (1989) who recommended much improved magnetic coverage and some infill of the gravity data base. Existing data were suggestive but lacking in resolution.

The gravity infill survey was recently completed and reported (Leaman, 1990). The clarification provided by the improved coverage coupled with a reliable regional separation revealed primary structural alignments which, though often suspected but not demonstrable from current exposure or surface mapping, have influenced evolution and mineralisation of the area. Gravity data also imply presence of several small Cambrian granitoids fringing the NE face of the Devonian Dolcoath Granite and a distinctly anomalous region SW of the Staverton Prospect (430 800 mE, 5412 000 mN). The distribution of Cambrian granitoids implied suggests that a small cluster of these bodies have been dilated or separated by the emplacement of the larger Devonian mass.

Previous aeromagnetic surveys have been undertaken with quite coarse line spacings and often erratic flight clearances. The latter are inevitably imposed in this area by use of fixed wing aircraft. These deficiencies have not greatly affected regional evaluations but have prohibited any prospect evaluation or predictive application. Tertiary materials, which cap the divides, have also tended, or have appeared, to dominate the presentation due to lack of resolution.

The new aeromagnetic survey was specified with the lowest feasible terrain clearance, close line spacings (as survey and tie lines), and a sensitive magnetometer. Helicopter acquisition was essential.

This report details the new survey and preliminary implications. It is intended as an outline of specifications and to foster discussion and close inspection of the observations and their correlation with the complex geology of the area.

MAGNETIC SURVEY

SPECIFICATION

Specifications for the survey were determined by the previous experience provided by the Mines Department survey (Bishop, 1987) and the need to resolve possible alteration features, subtle trends, and the contribution due to Tertiary materials. Leaman (1986, 1987) has established the general viability of magnetic methods for assessment of alteration and mineralised sites in areas free of strong interference effects such as introduced by Tertiary basalt. The responses sought are known to be subtle and all previous data has lacked the necessary data resolution - in terms of low clearance, close sampling and line density. Detail, once lost due to variable or excessive clearances, is not recoverable.
Since it is not yet known whether the magnetic method is of direct exploration value in the Barrington environment it was important to ensure that a fair and substantial trial of the application was permitted. The best practicable specification was defined.

Line spacing: 150 metres E-W
Tie line spacing: 500 metres N-S
Nominal terrain clearance: 80m.
Sample interval: < 10 m.
Magnetometer sensitivity: < 0.01 nT.

The line balance and orientation reflects the general form of the terrain and the need to define sub E-W or NW-SE and SW-NE trends as suggested by gravity surveys and the Mines Department survey. Rigorous draping necessitated use of a helicopter. Use of fixed wing aircraft, a higher nominal clearance and general wide variation in that clearance effectively destroyed the resolving power of the Mines Department survey across the important, relatively low relief magnetic field environment associated with the window of Cambrian rocks along the valley. The tie line density reflects the need to properly define, or separate, any effects induced due to the capping of Tertiary materials on the divides.

Multichannel radiometric data were also specified but no commitment was made toward processing of that data pending inspection of the raw data.
(This data has not yet been fully processed and it is possible that no further analysis will be undertaken).

SURVEY

The survey was flown in February 1990 by Geo Instruments Pty Ltd under the supervision of Zoltan Beldi using a G-813 proton precession magnetometer in a towed bird and a GR 3001 spectrometer with 16.8 l capacity.

An equivalent magnetometer was used as base station and the

survey was completed in one day.

Survey tracking was visual supported by colour video using topographic basemaps and aerial photographs with a recovery scale of 1: 10000. The only problem experienced in this area related to avoidance of high clearance power lines.

Total line coverage was about 380 km. Line recovery and line location details are presented in Map 1 (folder).

PROCESSING

Flight path digitising, processing, gridding and mapping were performed by Pitt Research Pty Ltd of Sydney.
IGRF 1985 was removed from the data and a scalar of 5000 nT added to residual data.
The stability of gridding and acquisition was tested by preparation of pixel image maps which expose line misties. The many cross ties generated by this survey were adjusted by spline interpolations in both directions.

A contour interval of 5 nT was selected for the primary presentation (Map 3 - folder) as a compromise separation able to provide a reasonable amount of detail in areas with subtle variations in magnetic field. Stacked profiles are presented in Map 2.

Radiometric data has not been corrected, levelled or compiled beyond the raw presentation shown in Figure 5.

DATA PRESENTATION

Maps 1, 2 and 3 (folders) provide detailed presentation of the survey coverage, observed profiles and contours of the magnetic field at 1: 25000 scale.

Figures 2 to 5 provide pixel image versions of the magnetic data using various colour and lighting combinations. Figure 4 presents the horizontal gradient. Figures 6A and 6B provide reduced versions of Map 3.

All images were prepared by Pitt Research Pty Ltd.

Figure 7 supplies a plot of past workings or known mineralisation based on the compilation of Bamford and Green (1988) and is not necessarily complete. This plot is at the same scale (1: 100000) as the images and a transparency is included in the pocket with Map 1.

395107

INTERPRETIVE COMMENTS

The following comments outline possible correlations and implications within and of the data set with respect to exposed geology and mineralised sites.

The principal object of this discussion has been to assess observed features and possible identification of patterns and relationships which may lead to explanation of known sites and prediction of possible targets for follow-up study.

All styles of presentation have been reviewed.

FIGURE 2 suggests the first order character of the magnetic field. The features illustrated in this coarse colour image are comparable with those observed in the Mines Department survey (Bishop, 1987).

Several magnetic regimes are suggested by this figure which reduces the survey to regional character due to broad banding of amplitudes. High frequency character has been subdued. Figure 8 provides clarification of terminology and location.

The first regime lies south of 5410 000 mN and is a broad belt of raised intensity. It is disturbed east of 430 000 mE and may be composed of two ESE-trending zones; one near the Dolcoath Granite, and another near 5410 000 mN. The disturbed area centred on 431 500, 5409 000 lies within a basalt-covered region but the scale of the features observed is not consistent with sources within the Tertiary cover. The extension of this effect along the basalt-capped ridge through Staverton village shows that the basalt contributes little of the response.

Leaman (1989) suggested that the Dolcoath Granite elevated rock magnetisation contrasts in the thermal aureole of the granite and this effect could account for some of the changes S and SW of Cethana. It cannot explain the continuity of the response toward Mt Claude (see Figure 6B for locations).

Leaman (1990) further suggested that some minor Cambrian granitoids may occur N and NE of the Dolcoath Granite. These could account for the more northerly features in this regime, including the disturbed area NE of Cethana. The gravity and magnetic responses can be correlated within the resolution permitted by the gravity station spacing.

The near N-S effect observed near 430 000 mE is also reflected by gravity data.

The centre of the "disturbed" magnetic field at 431 500, 5409 000 lies near a local positive gravity effect which is ringed by gravity residuals up to 2 mGal lower. The correlation between these effects is too close to be accident and suggests the presence of a relatively low density magnetic lithology within a core of denser non magnetic material. This might be explained by a domal fold with variable Cambrian volcanics or a composite, but small, granitoid body. Other responses fringing the outer zone of the Dolcoath Granite are also consistent with this view. The lithologies implied must include intermediate compositions.

A belt of low intensity covers the centre of the surveyed area and this defines the second regime. The reduced field intensity extends far more broadly than might have been suggested by casual inspection of contour maps such as Figure 6 or Map 3.

The southern boundary, trending ESE near 5410 000 mN, is marked and the strong gradient across this zone can be correlated closely with the southern edge of the Erriba Gradient of Leaman (1990) as defined by the gravity survey. The slight trend changes indicated by gravity data near Lake Barrington have also been reproduced.

Figure 9 presents the gravity field in a form which can be compared with the images. A transparency is included in the pocket for Map 2.

The northern limit of this regime is also clearly defined - by a NW-SE gradient and step anomaly. This feature was also suggested by the gravity survey but not precisely located or oriented (see Figure 4, Leaman, 1990).

Figure 2 shows that the source of the regime 2 feature is relatively non magnetic. Comparison with the gravity data set shows that it is also denser than normal Cambrian suites. There is also no direct correlation between the presumed Beulah Formation as exposed and the magnetic field implying either that this unit does not account for the gravity-magnetic responses or that its mafic content is low.

This pattern and association could indicate the presence of shallow basement with non Tyennan compositions.

There are several suggestions of NW-SE trends within the bland presentation of this regime in this figure.

The third regime lies NE of the strong NW-SE gradient through 432 000 mE, 5415 000 mN.

The regime is in two parts; one extending E and NE which is only marginally more magnetic than regime 2 and another centred near 432 000, 5417 500 which is strongly magnetic. The most strongly magnetised rocks in the area lie in this northern segment. The

anomaly pattern, for either type, can not be correlated with Tertiary basalt; it is too regional and extends beyond outcrop or talus. The most positive gravity anomalies can, however, be correlated (compare Figure 3, Leaman, 1990). These observations imply a predominantly mafic sequence NW of Lake Barrington.

Two zones of distinctive response, each trending approximately NE-SW, has been observed within the second regime. Each is linked to another regime. Each could be associated with the Tertiary cover but close inspection shows that this cannot be the entire solution. In each instance the anomalies extend beyond basalt cover, or talus cover, and part of the response lies within the Cambrian rocks exposed or concealed.

The extension of the northwestern feature (marked 4A in Figure 8), which joins the magnetic part of regime 3 (3B), corresponds with the steepest gravity gradient and both gravity and magnetic features are terminated at the northern side of the Erriba Gradient (Leaman, 1990). Correlations with the gravity compilation may be made using Figure 9 and the transparency provided.

Similar properties, correlations and disruptions can be associated with the more patchy south eastern feature (labelled 4B in Figure 8) which joins the disturbed part of regime 1.

All patterns are consistent with the primary structural view presented by Leaman (1990, esp. Figure 4) where the disposition of key units has flagged and generated responses and exposed the controlling trends.

Both data sets confirm the existence of primary ESE, NW-SE and NE-SW structures; features which are poorly reflected in extant mapping and whose continuity and scale have not been suspected previously.

If the prospect map (Figure 7) is overlain on Figure 2 some gross structural correlations may be implied.
Mineralisation W and ESE of Cethana lies along, or close to, a major gradient - the northern edge of the southern anomaly belt defined for regime 1 (1A).

The remaining prospects are best associated with NW-SE structures. This crude image implies regional fracture control and the sites are non random. (Gravity data - Leaman, 1990 - could have been interpreted in this way in light of this data set but were not due to the poorer positional resolution afforded by a 1 km station spacing)

FIGURE 3 presents more highly resolved illuminated colour images. All the primary elements seen in Figure 2 can be recognised but some lateral trends are more obvious. The colour

separation stresses internal character.

The two perspectives provided, coupled with grey tone relief, have enhanced the character of the field. The continuity of ESE trends is now evident between regimes 1A, 1B and 1 and 2. Several NW-SE systems may also be traced across regimes 2 and 3A. These disrupt elements of 3B and 4A, 4B. See Figure 8 for terminology.

Comparison with Figure 7 now stressess the correlations implied above. For the Lake Barrington and Staverton sites, however, an additional factor can be recognised - a sub E-W trend. This is most pronounced at Lake Barrington but it is evident from inspection of offsets at Staverton.
The more uncertainly located prospect (labelled 002 by Bamford and Green, 1988) can be similarly assigned within location precision.

FIGURE 4 provides additional detail on the character of the field, especially in the form of the horizontal gradient.

Comparison of Figures 4 (monochrome field) and Figure 7 is not helpful due to lack of resolution. The gradient presentation is complicated by the high frequency surface detail associated wtih Tertiary rocks but the ESE and NW gradients are reflected - if subtly in zones 1A and the centre of zone 2.

FIGURE 5 presents a high resolution colour image of the magnetic field and an uncorrected image of total count radiometrics.

While the colour magnetic image improves the resolution of some aspects of Figure 2 it does not add anything new.

The radiometric data, however, are more distinctive and tend to reflect the extent of Tertiary cover.
Comparison with Figure 7 would suggest a correlation between low and high count sites but the relationships are not systematic and appear to be artifacts of the relative exposure of Cambrian and Tertiary materials.

FIGURE 6 presents contours of the magnetic field intensity (Map 3) in reduced form. Figure 6B includes a base map. Tertiary sources appear to dominate the field when viewed in this format; a view which is quite misleading - see Figures 2 to 5.

FIGURE 7 provides a prospect location map. A transparent overlay is included in the pocket for Map 1. This diagram stresses the apparently random distribution of known mineralisation in the Lake Barrington area. The considerable spread of Tertiary or Tertiary-derived materials clearly contributes to the paucity of

known sites or patterns. The present magnetic survey, coupled with the gravity survey, suggests the nature and origin of controls on known sites and indicates the particular zones which might repay further exploration.

Detailed work is required at one or two of the known sites in order to assess which of the structural features now defined provides the necessary rather than sufficient condition for mineralisation and indeed whether any of the known sites carries economic quantities and grades.

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CONCLUSIONS AND RECOMMENDATIONS

While it must be stressed that this report provides only a preliminary descriptive evaluation, and there is much scope for expansion and review, any further work must follow careful appraisal of the mineralised sites and assessment of the implications of the structural trends deduced.

The gravity and magnetic data sets are clearly coherent and complementary and are able to suggest concealed structural and lithological patterns.

This preliminary review of magnetic data has confirmed that the 2 to 3 km wide zone beyond the margin of the Dolcoath Granite contains some complex structures and , possibly, Cambrian granitoids. It has also confirmed all the primary trends inferred from gravity data and specifically located several of them. This improvement reflects data density.

There is also considerable evidence to suggest that the mineralisation for removed from granitoids of any type (e.g. Lake Barrington, Staverton) is associated with NW-SE fracture systems and their intersection with sub E-W features. This is clearly established by the horizontal gradients. Gravity data imply dthe insertion of a NE system as well.

The most complex and anomalous zone lies WSW of Staverton where many structures are terminated, stepped and offset. Both data sets suggest close examination of the zone near 429 300 - 430 000, 5411 500 - 5412 000 is justified. The target area covers both sides of the lake north of Jarmans Creek and WSW of Staverton.
Some other possible target areas could be suggested on the basis that the NW-SE and E-W fracture systems are critical. Such sites would lie near 433 500, 5413 500 and 429 000, 5409 300. Other sites lie beneath Tertiary cover.

Current data presentations do not allow assessment of alteration characteristics within each unit. These properties should be reviewed after receipt of the corrected, located raw data tape from the contractor.

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395114

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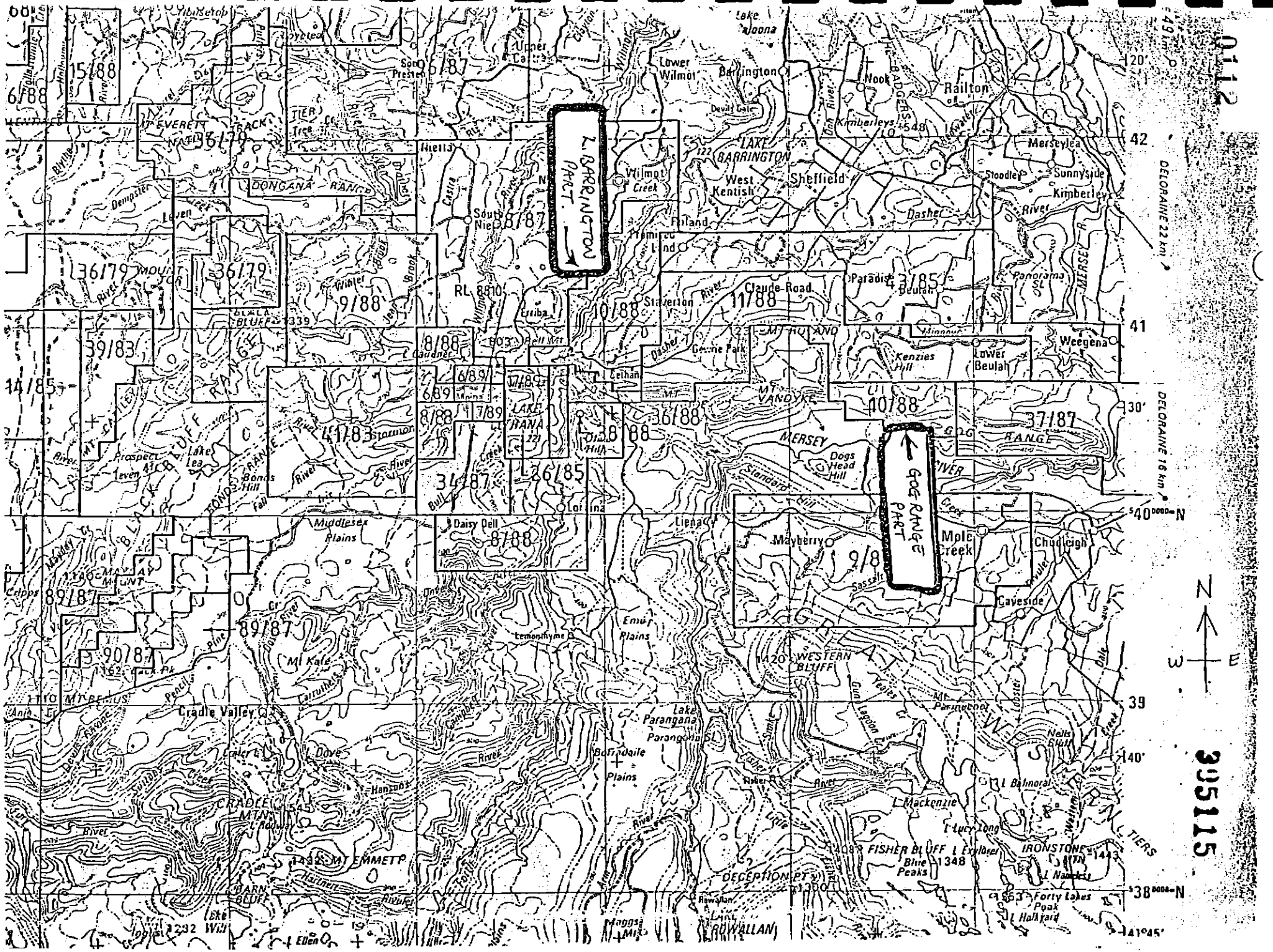
17-4-90


L. BARRINGTON PART
GOG RANGE PART
LAKE BARRINGTON
LAKE PARANGANA
DONGARA RANGE
MERSEY
DELORAINE 22 km
DELORAINE 16 km
Railton
Sheffield
Kimberley
Merseylea
Sunnyside
Stoodley
Wilmot
West Kentish
Claude Road
Paradise
Weegena
Lower Beulah
Kenzies Hill
Mayberry
Mole Creek
Chudleigh
Caveside
Cradle Valley
Dove
Hansons
CRADLE MTN
Lake Parangana
Barfield
Plains
Emus Plains
Middlesex Plains
Lemonthyme
WESTERN BLUFF
Mt Parmeetoo
Mackenzie
L Balmoral
L Lucy Long
FISHER BLUFF
Blue Peaks
IRONSTONE
TIERS
DECEPTION PT
ROWALLAN
Forty Lakes Peak
Hallyard
Daisy Dell
Liena
Loina
Ellen
Maggs Mt
Barn Bluff
Lake Will
Mt Kate
Mt Cradle
Mt Emmett
Mt Vandyke
Dogs Head Hill
Bonds Hill
Prospect
Lake Lea
Standard Hill
Nook
Badgers
Lower Wilmot
Barrington
Upper Castra
Sorell Prest
Wilmot Creek
Castra
Southern Nieb
Flowland
Flowland
Stavertons
Ellinbank
Gaudner
Dell Mt
Gowrie Park
Lake Rana
Pine Hill
Bull Creek
Fall
Monday
Cripps
Pencil Pine
Carruthers
Dove
Hansons
Lake Will
Ellen
Maggs Mt
Rowallan
Nook
Railton
Merseylea
Stoodley
Sunnyside
Kimberley
Dasher
Panorama
Claude Road
Paradise
Weegena
Lower Beulah
Kenzies Hill
Mayberry
Mole Creek
Chudleigh
Caveside
Cradle Valley
Lake Parangana
Barfield
Plains
Emus Plains
Middlesex Plains
Lemonthyme
WESTERN BLUFF
Mt Parmeetoo
Mackenzie
L Balmoral
L Lucy Long
FISHER BLUFF
Blue Peaks
IRONSTONE
TIERS
DECEPTION PT
ROWALLAN
Forty Lakes Peak
Hallyard
Daisy Dell
Liena
Loina
Ellen
Maggs Mt
Barn Bluff
Lake Will
Mt Kate
Mt Cradle
Mt Emmett
Mt Vandyke
Dogs Head Hill
Bonds Hill
Prospect
Lake Lea
Standard Hill
Nook
Badgers
Lower Wilmot
Barrington
Upper Castra
Sorell Prest
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Castra
Southern Nieb
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Stavertons
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Gaudner
Dell Mt
Gowrie Park
Lake Rana
Pine Hill
Bull Creek
Fall
Monday
Cripps
Pencil Pine
Carruthers
Dove
Hansons
Lake Will
Ellen
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Rowallan
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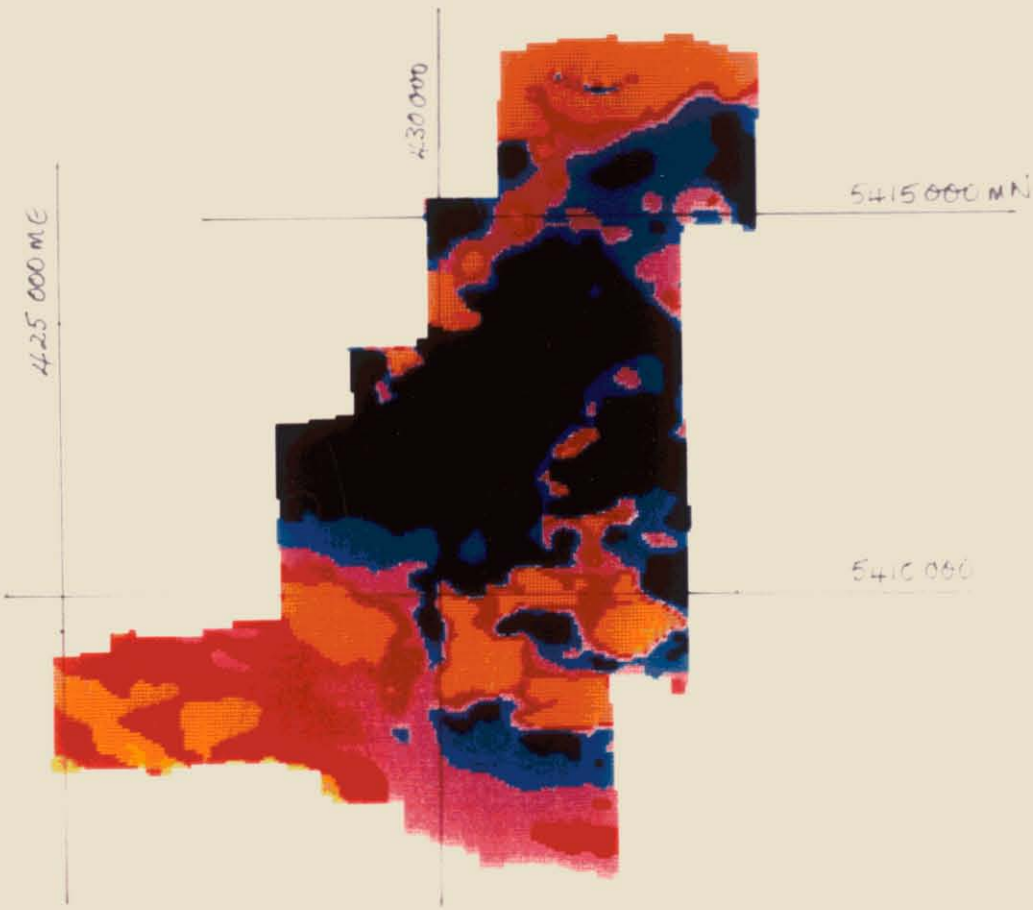

MAGNETIC FIELD
(colour reverse image)

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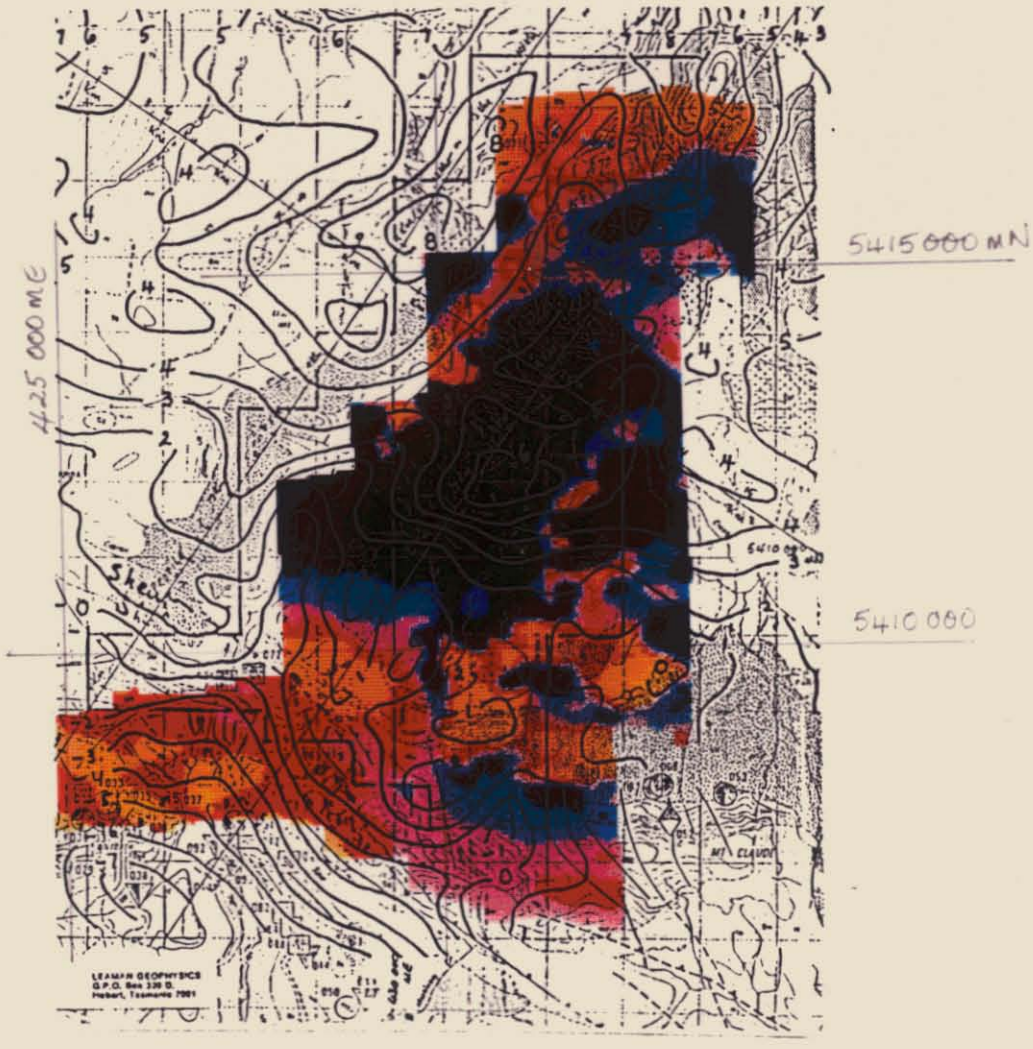

RESIDUAL GRAVITY FIELD LAKE BARRINGTON
(from Leaman, 1990) Available as overlay

MAGNETIC FIELD
(colour reverse image)

FIGURE 9

FIG 2

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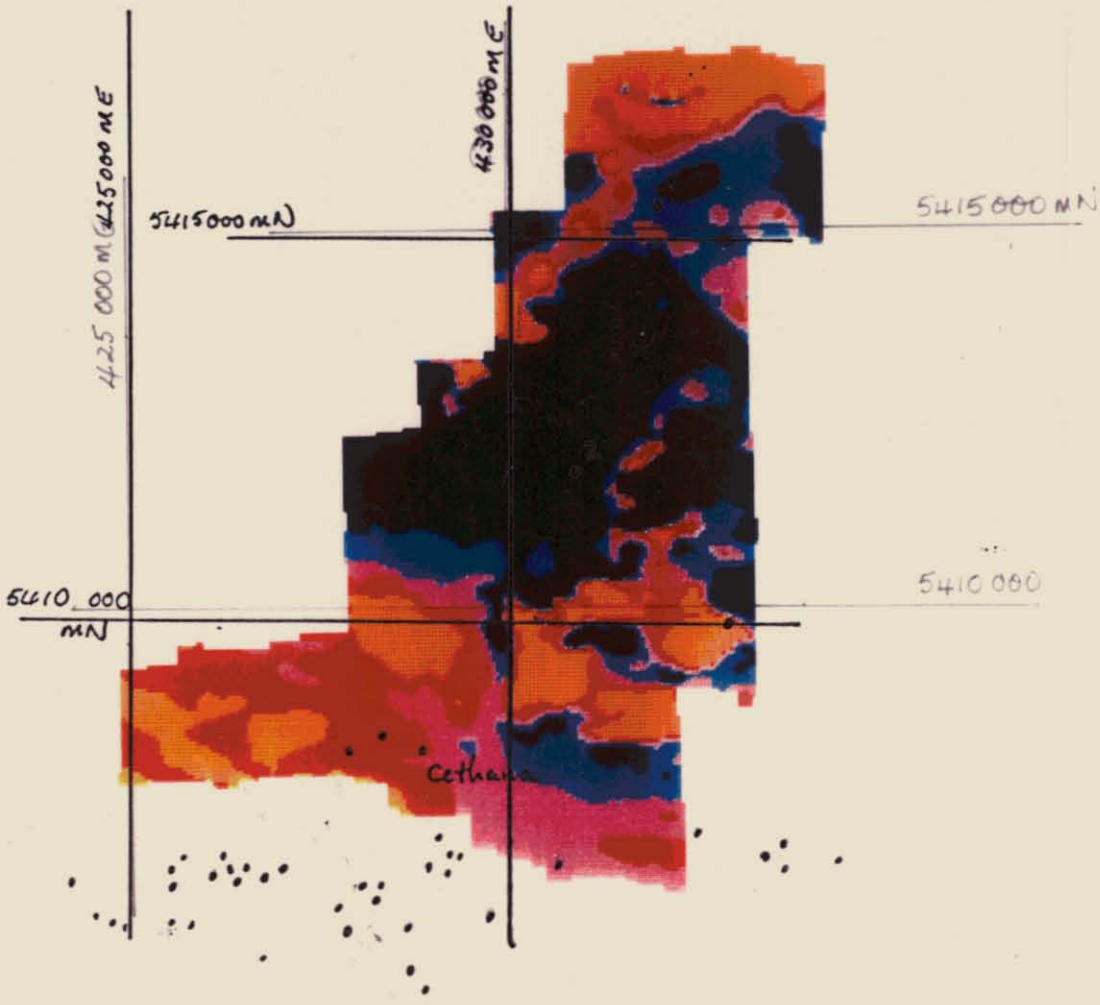

1. Lake Barrington
2. Staverton

Locations after
Bamford & Green (1988)

MAGNETIC FIELD
(colour reverse image)

SITES OF KNOWN MINERALISATION LAKE BARRINGTON AREA EL 10/88
(available as an overlay) FIGURE 7

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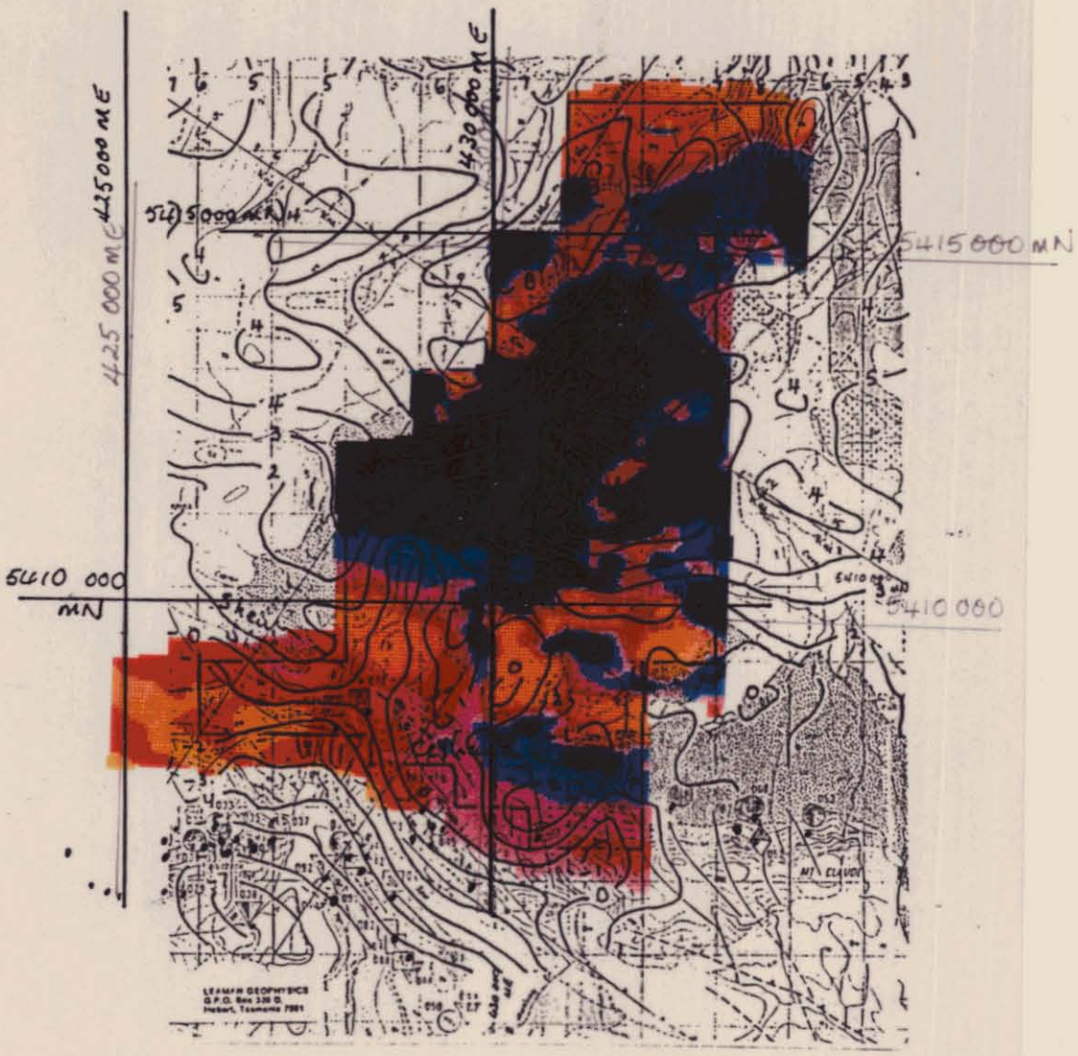
395116

0122

0123

39512 395126



1. Lake Barrington
2. Staverton

Locations after Bamford & Green (1988)

RESIDUAL GRAVITY FIELD LAKE BARRINGTON
(from Leaman, 1990) Available as overlay

MAGNETIC FIELD
(colour reverse image)

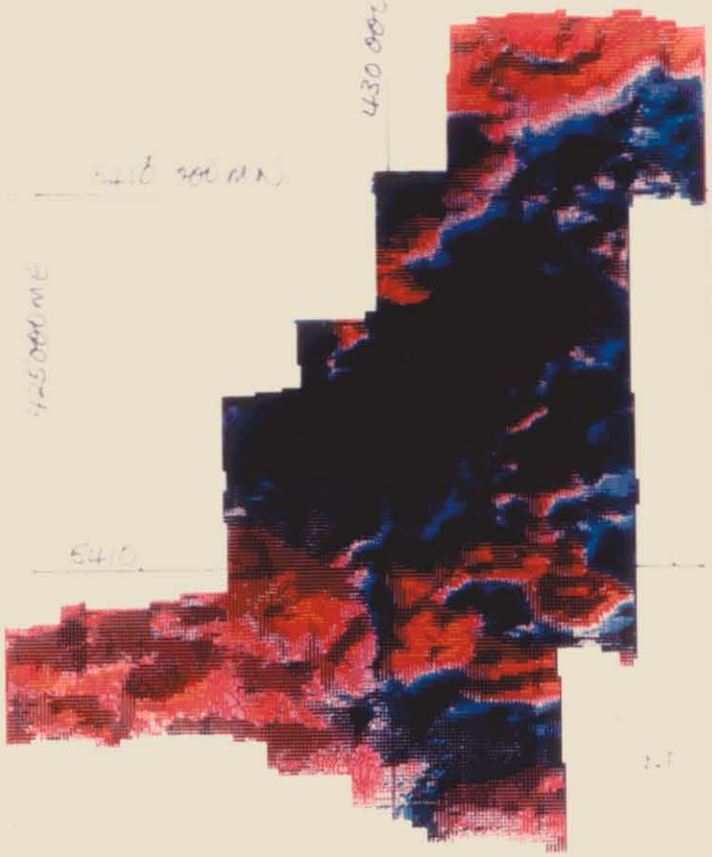
SITES OF KNOWN MINERALISATION LAKE BARRINGTON AREA EL 10/88
(available as an overlay)

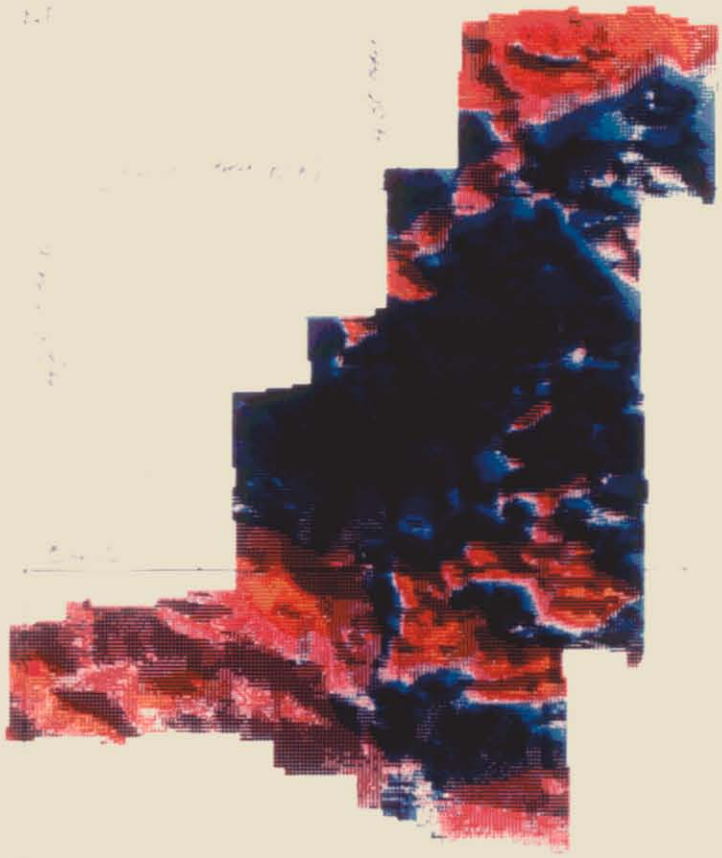
FIGURE 9
FIGURE 7

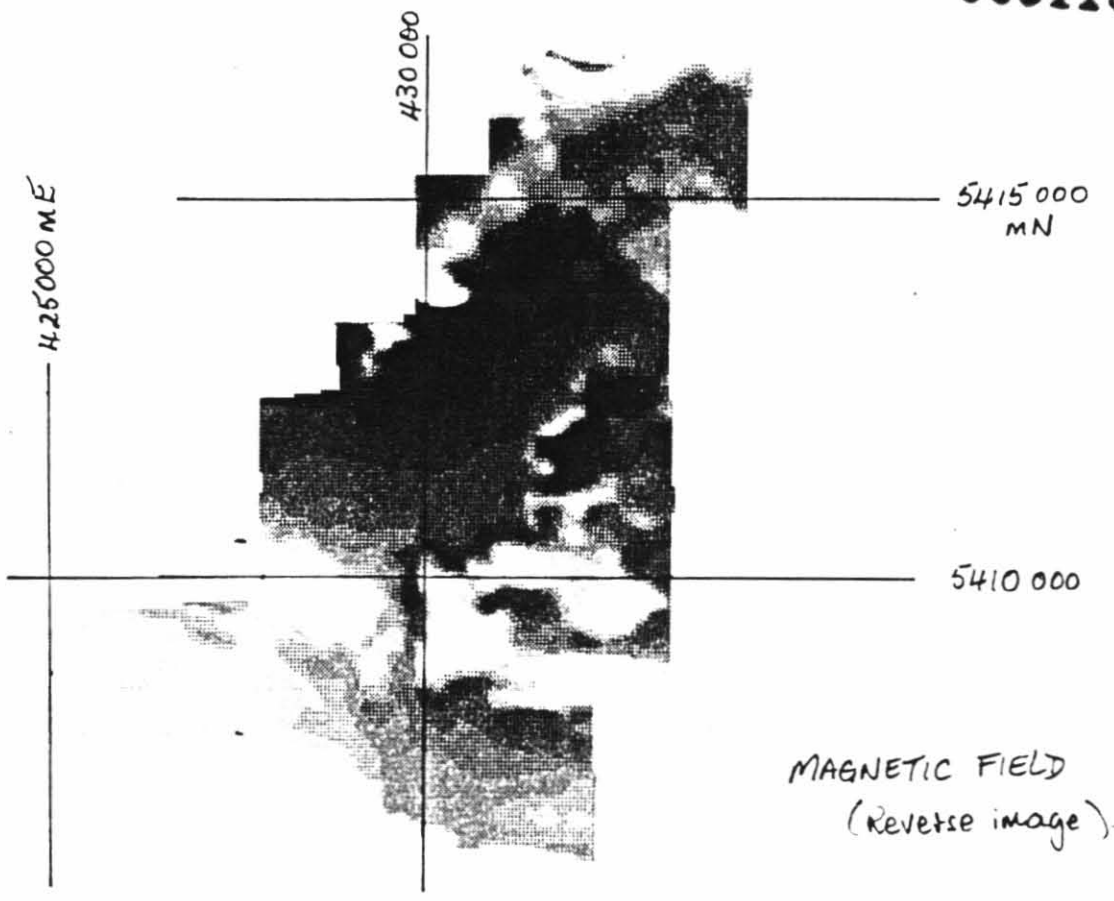
FIG 2

MAGNETIC FIELD

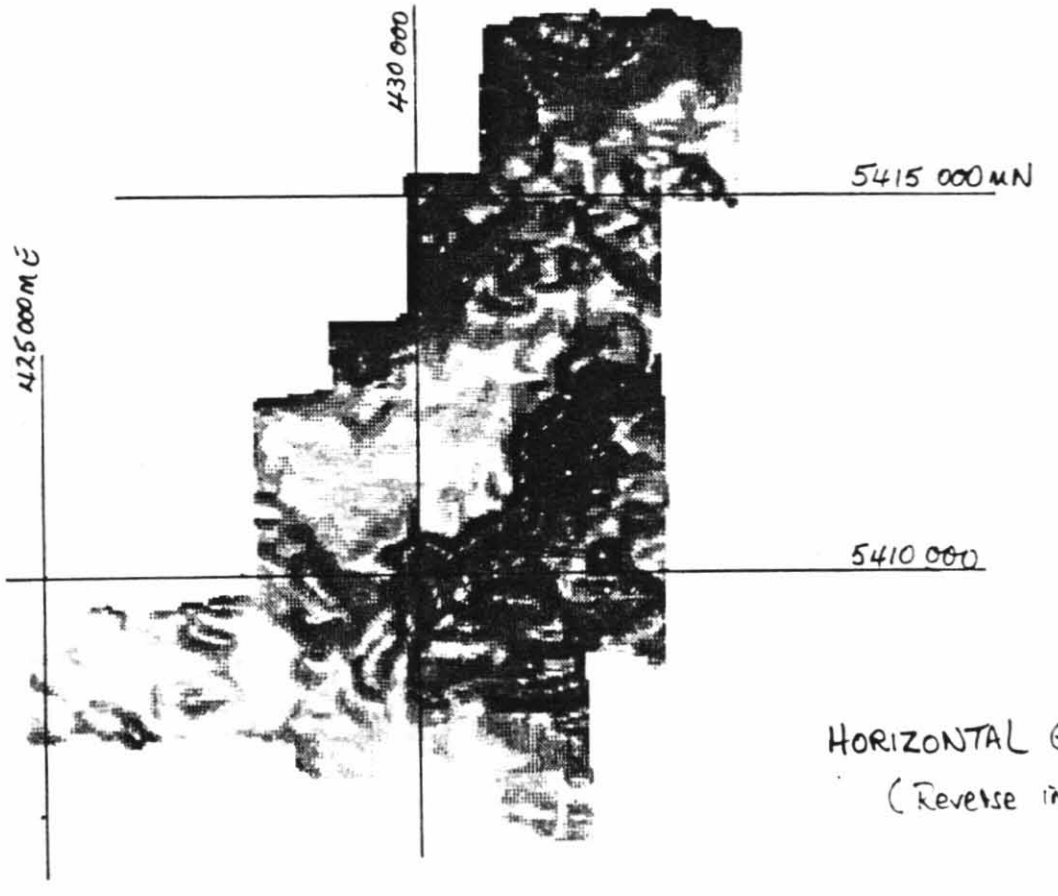
"LIT" IMAGES







MAGNETIC FIELD
(Reverse image)

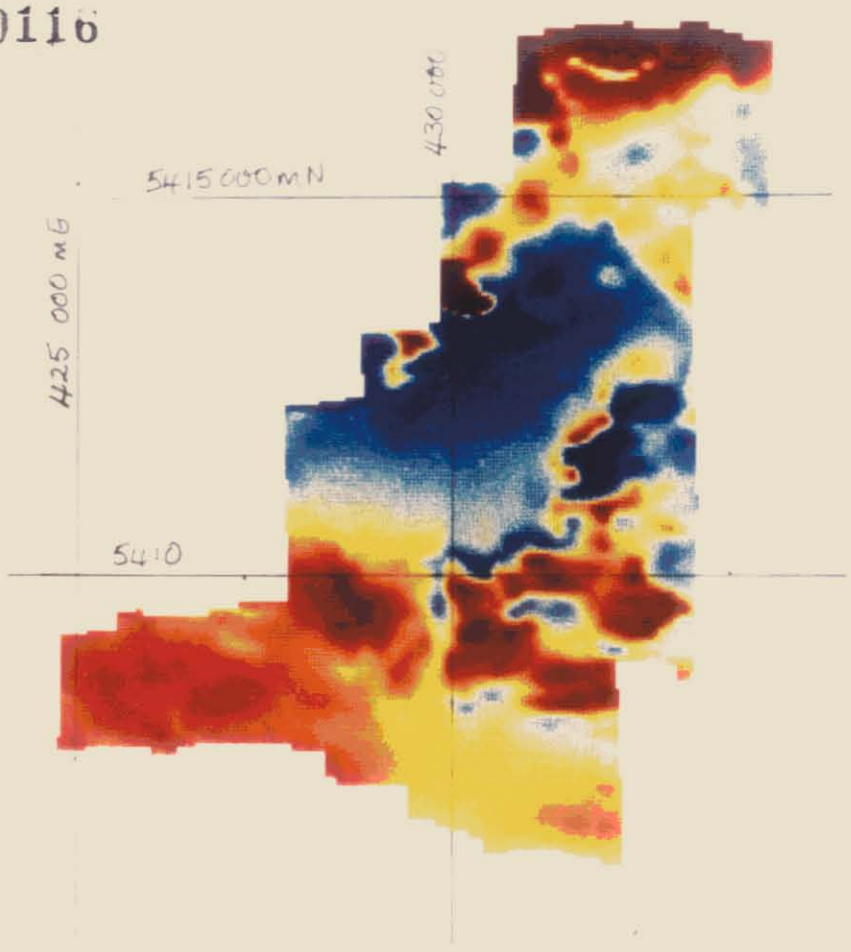


HORIZONTAL GRADIENT
(Reverse image)

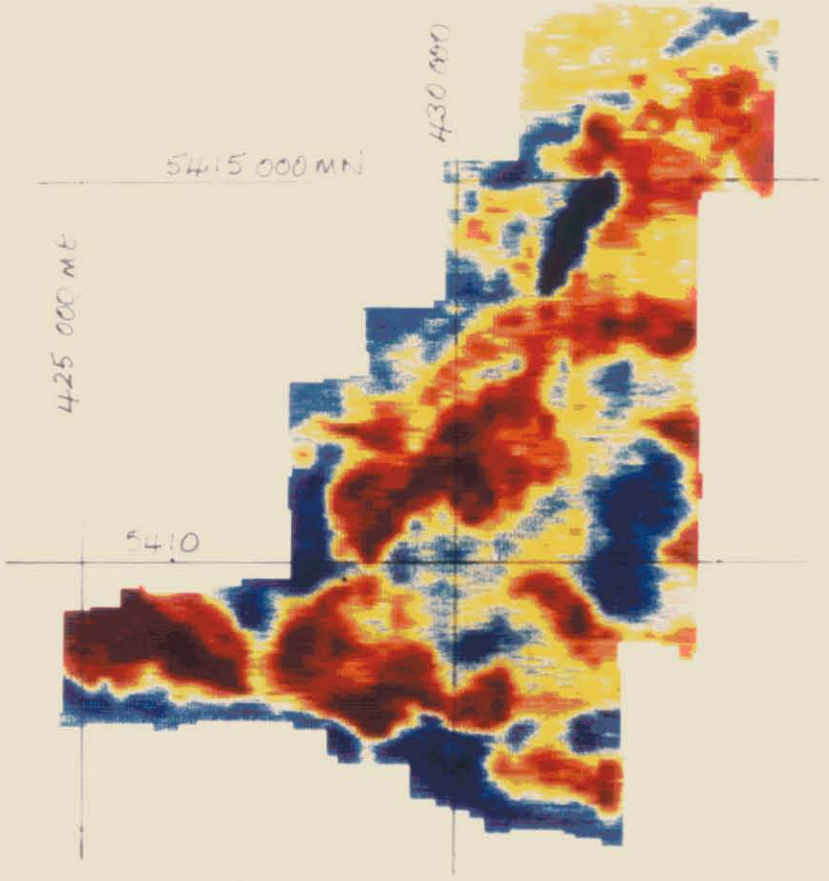
FIG. 4

0116

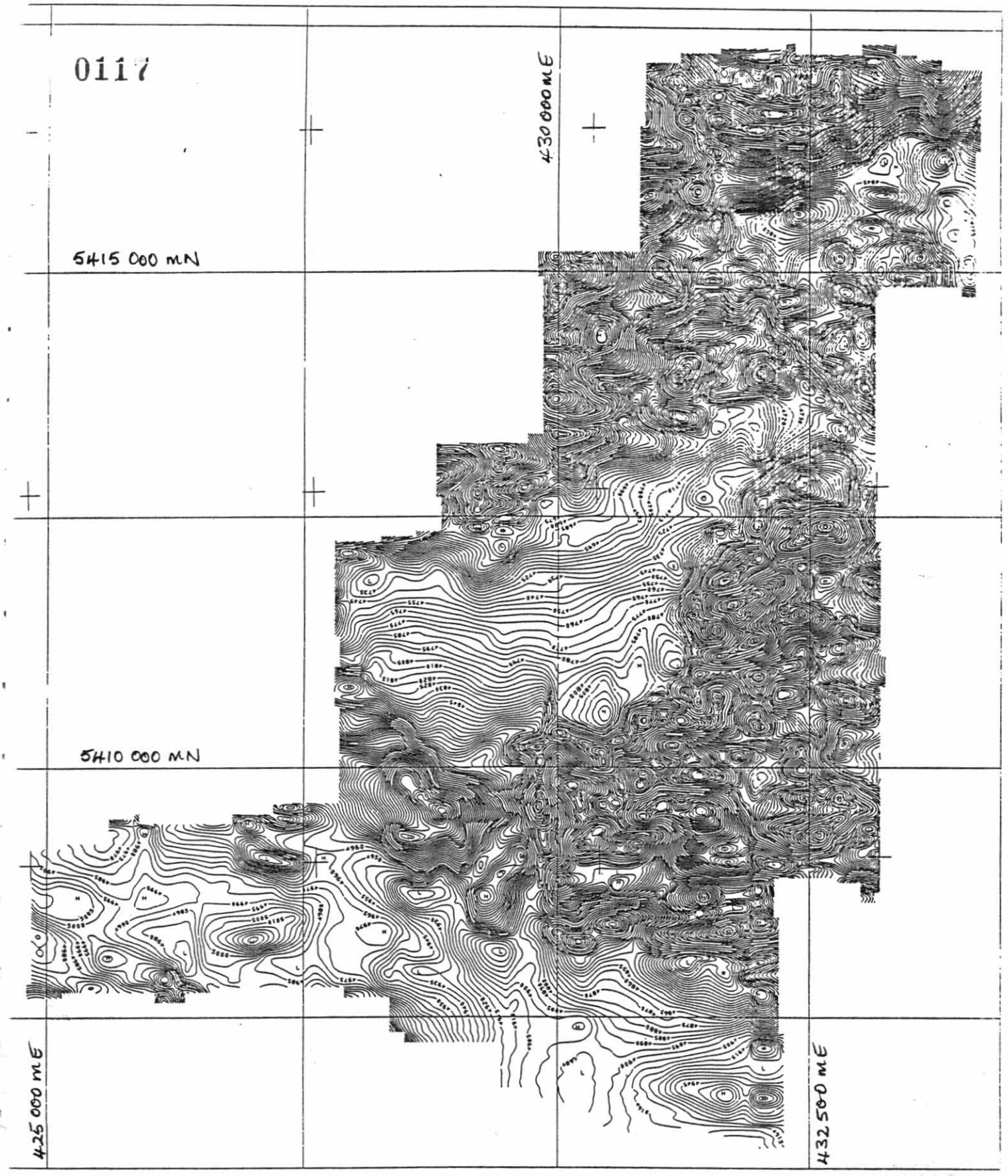
395119



MAGNETIC FIELD
(Hires colour image)



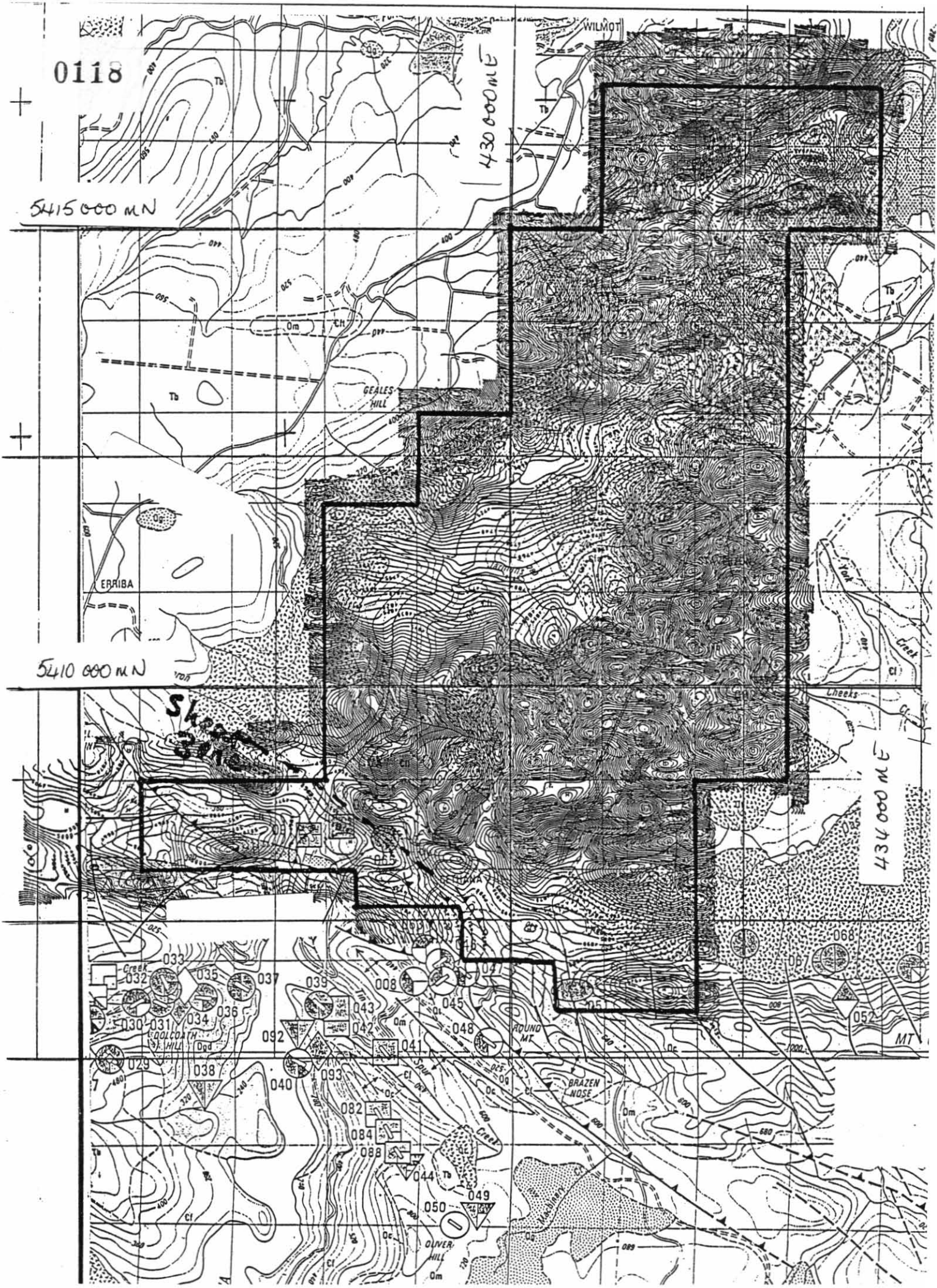
Radiometrics
Total Counts
(INVERSE colour image)



395120

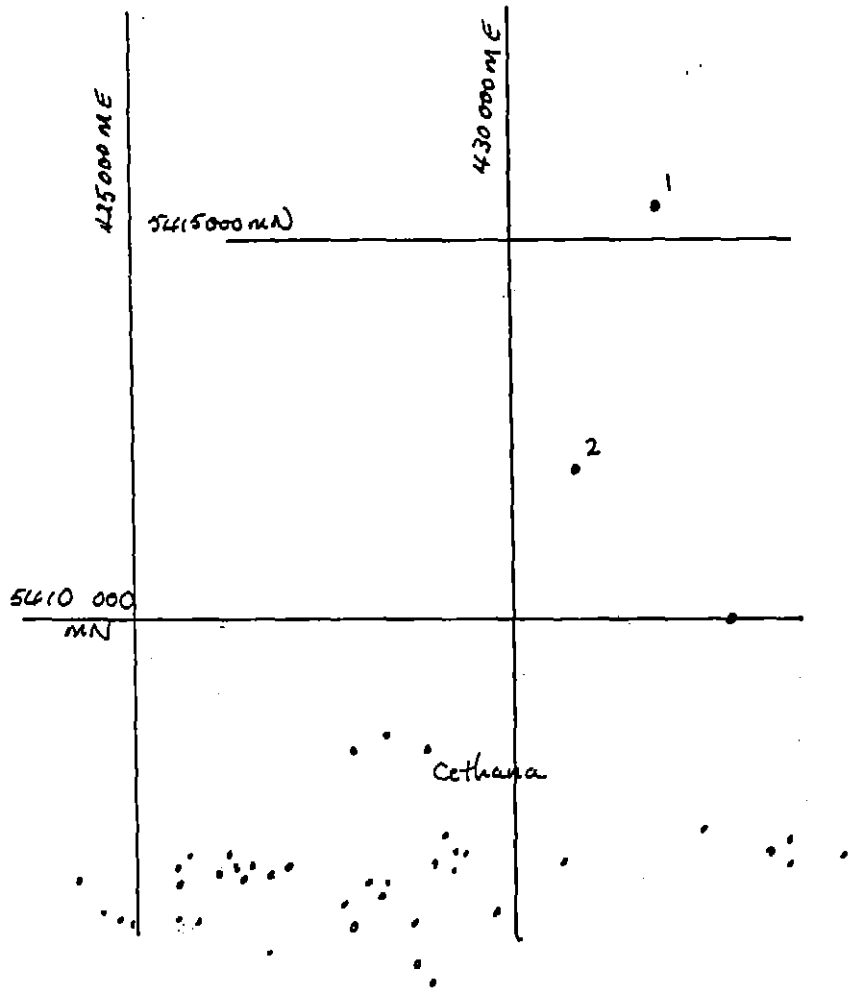
CONTOURS OF RESIDUAL MAGNETIC FIELD
(contour interval 5 nT) See also map 3

FIGURE 6A



RESIDUAL MAGNETIC FIELD AND GEOLOGICAL BASE MAP FIGURE 6B
Basemap by Bamford & Green (1988).

395121



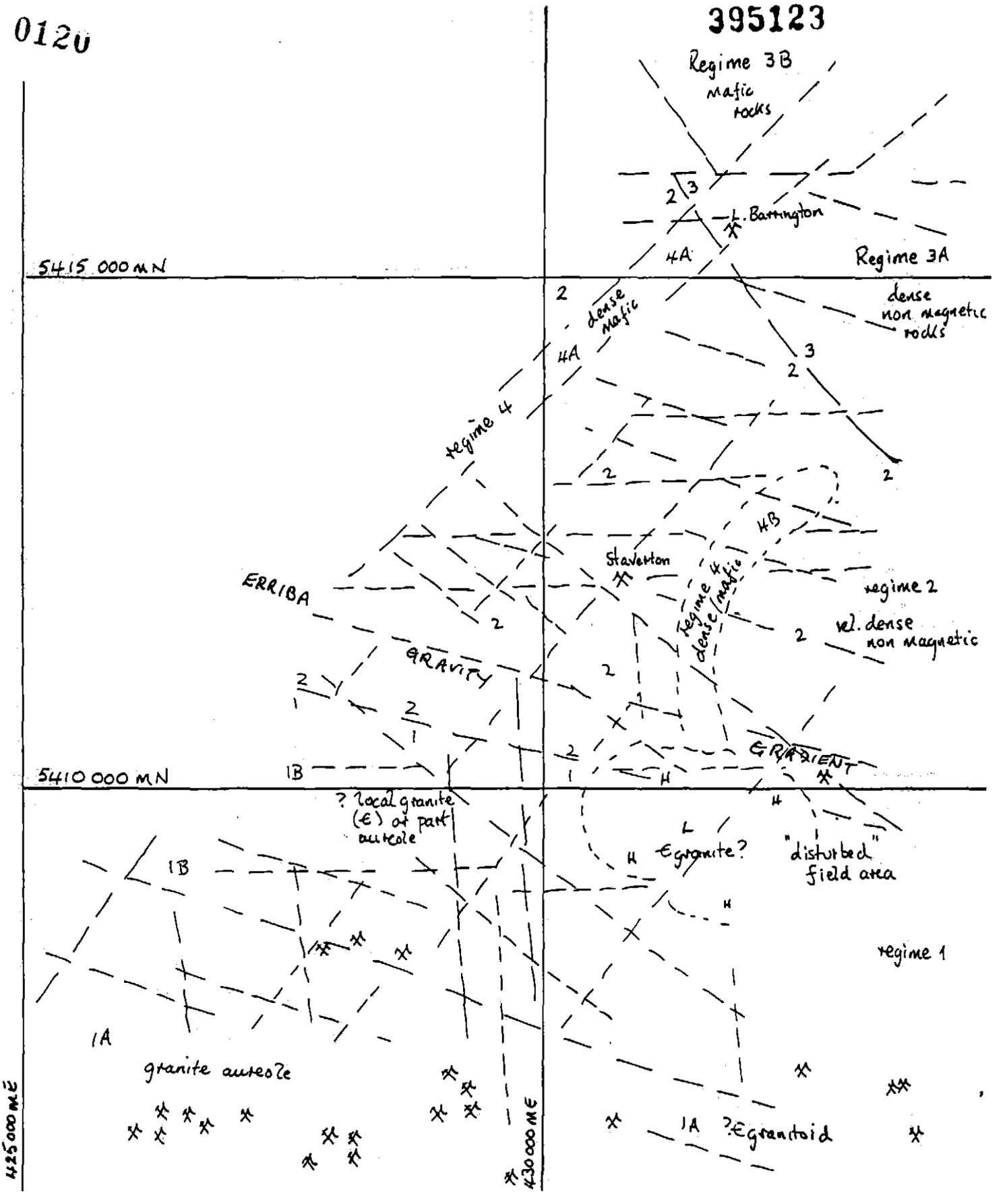
1. Lake Barrington
2. Staverton

Locations after
Bamford & Green (1988)

SITES OF KNOWN MINERALISATION LAKE BARRINGTON AREA EL 10/88
(available as an overlay) FIGURE 7

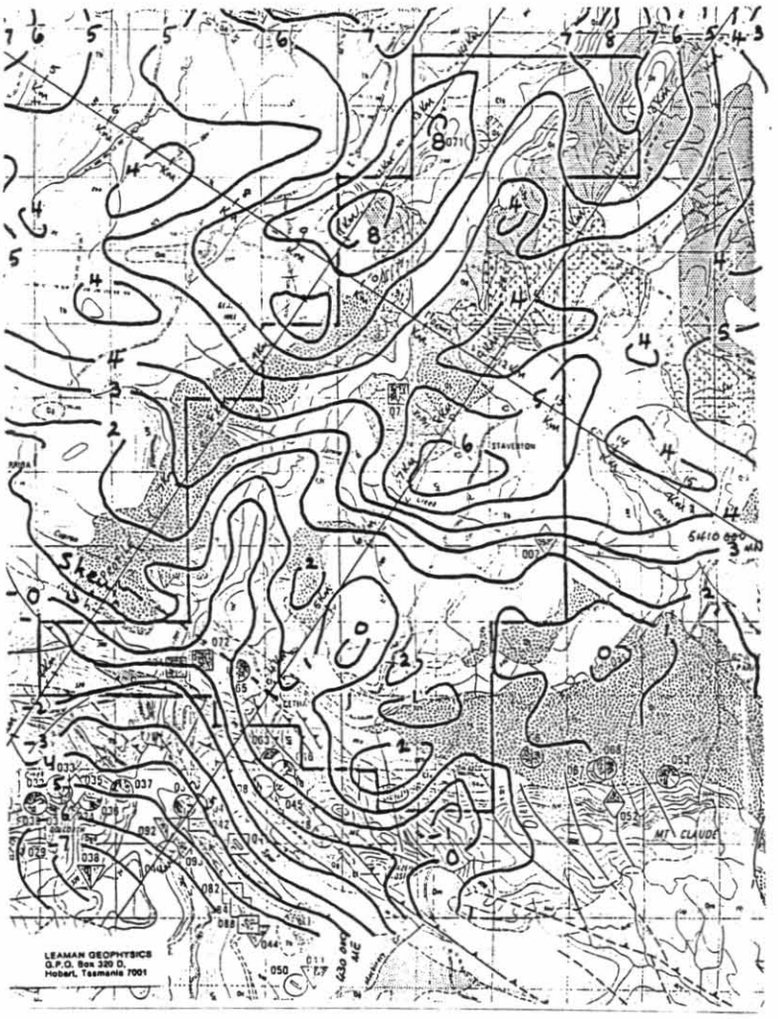
0120

395123



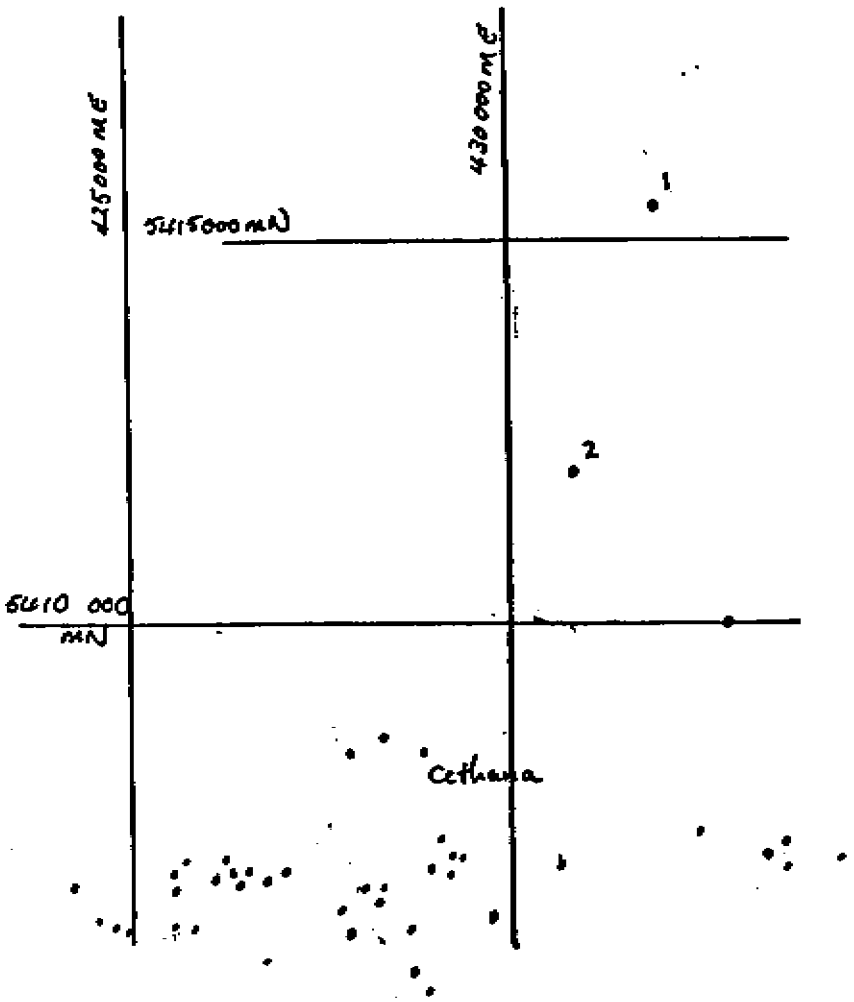
INTERPRETATION SUMMARY LAKE BARRINGTON EL 10/88

FIGURE 8



RESIDUAL GRAVITY FIELD LAKE BARRINGTON
(from Leaman, 1990) Available as overlay

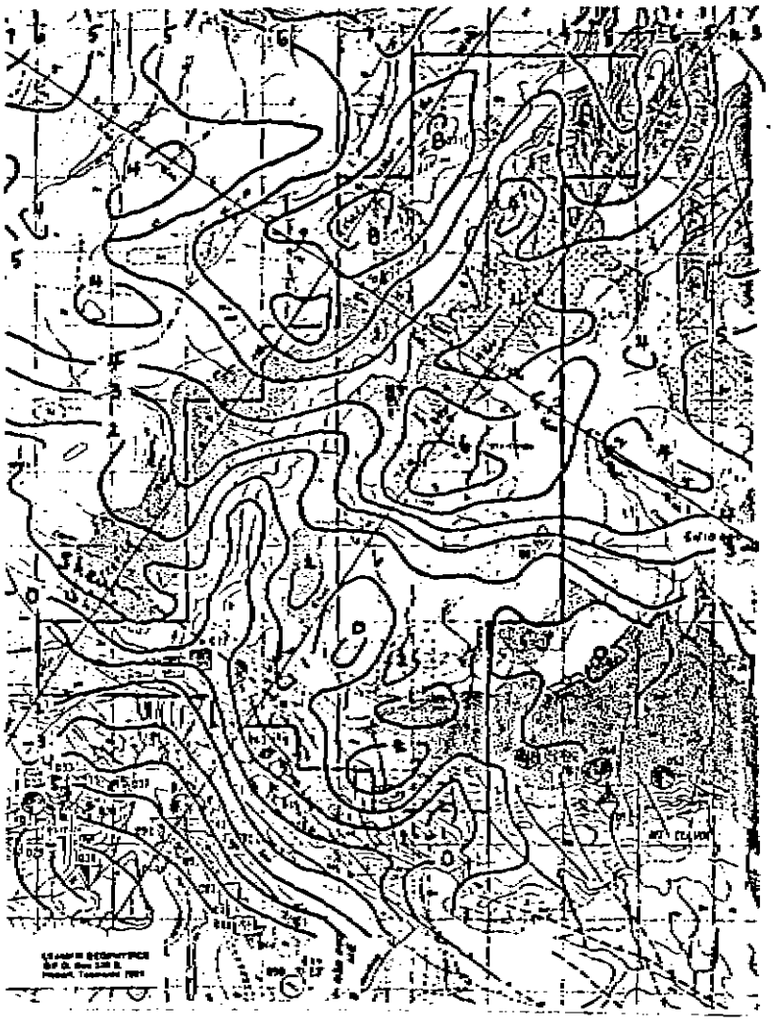
FIGURE 9



1. Lake Barrington
2. Staverton

Locations after
Bamford & Green (1988)

SITES OF KNOWN MINERALISATION LAKE BARRINGTON AREA EL 10/88
(available as an overlay) FIGURE 7

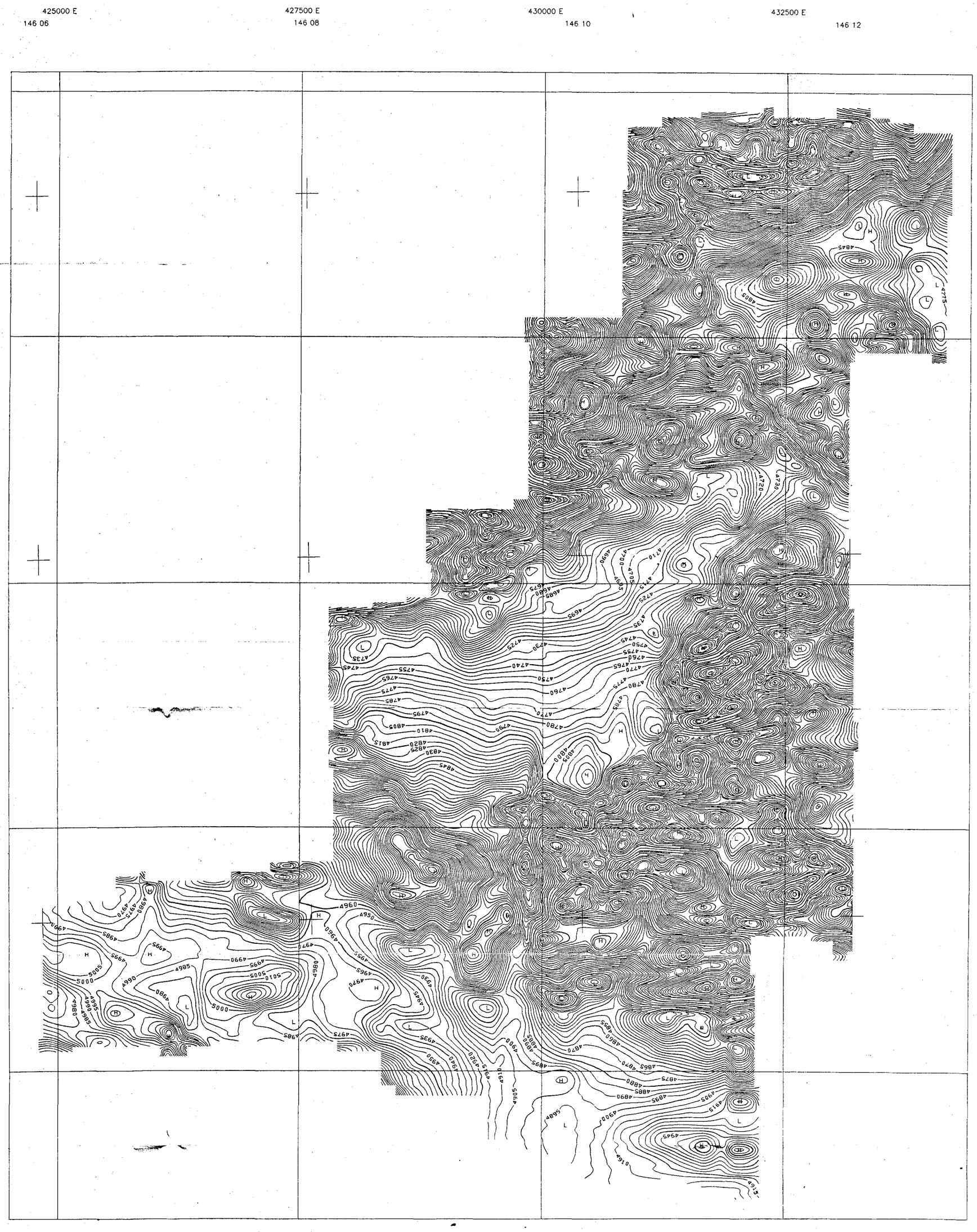


RESIDUAL GRAVITY FIELD LAKE BARRINGTON
(from Leaman, 1990) Available as overlay

FIGURE 9

9989

WILMOT, CETHANA



PROCESSING AND MAPPING:

Data processing and mapping performed by Pitt Research Pty Limited during March 1990.

The IGRF component has been removed from the measured magnetic data..

Map grid size: 50 metres

NORANDA
SHEFFIELD GEOPHYSICAL SURVEY 1990
WILMOT, CETHANA
RESIDUAL MAGNETIC CONTOURS

Contour Interval : 5 nT

500 0 500 1000 1500 2000 2500 Metres

5 cm

SCALE 1:25 000

SURVEY SPECIFICATIONS:

91-3231.

Survey Area: Sheffield.

Flown by Geo Instruments Pty Ltd, February 1990, Job Number 9001.

Nominal Terrain Clearance of Detector in Bird at 80 metres.
Nominal Line Spacing: Traverse Lines 150 metres
Tie Lines 400 metres.

Recording Interval: Magnetics 0.48 seconds
Spectrometer 0.96 seconds

Magnetometer: G-813 Proton Precession Magnetometer in a towed bird.
Sensitivity 0.1 nT.

Spectrometer: GR3001 with detector volume of 16.8 litres.

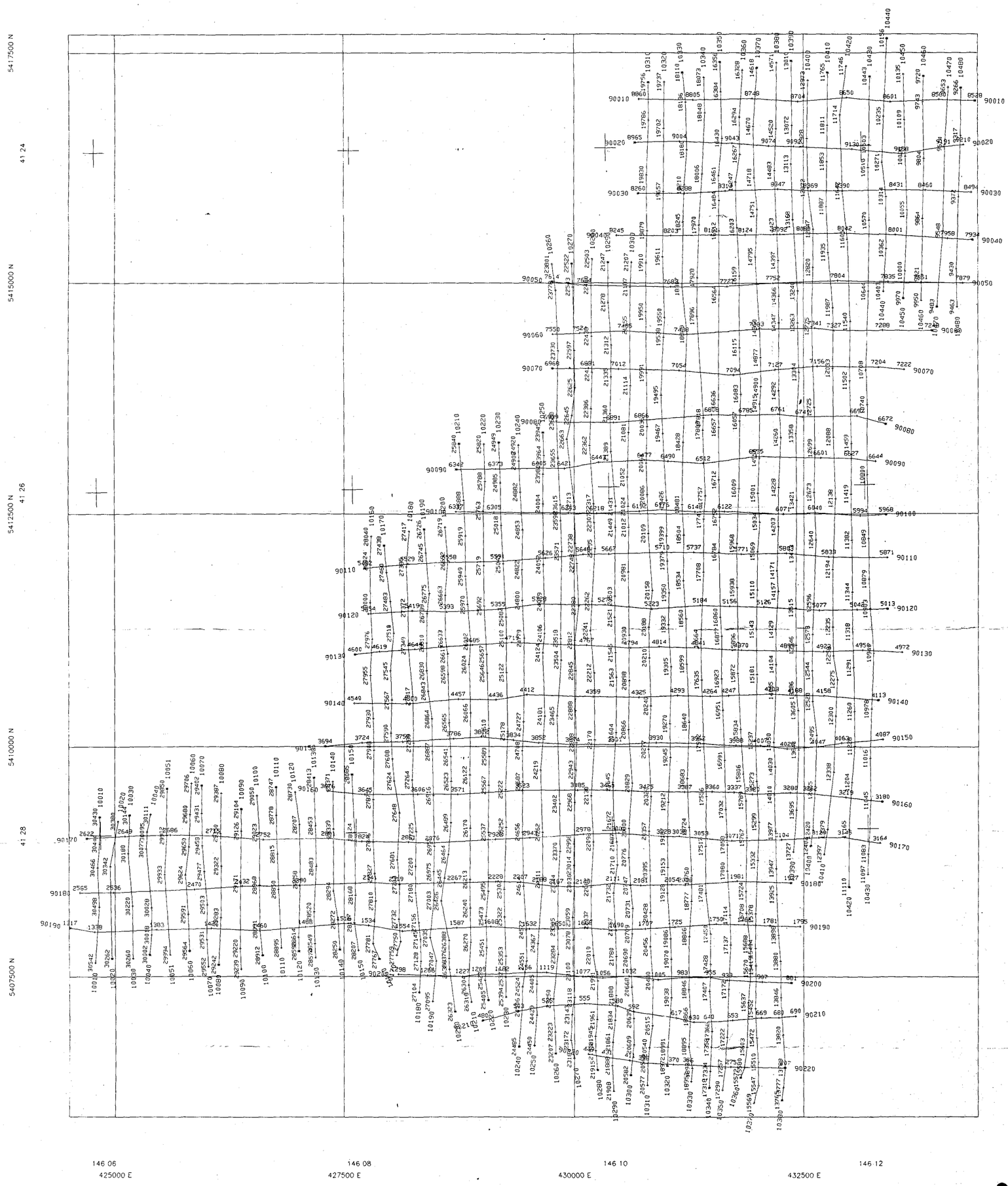
Data Recording: Geo Instruments 2000 Digital to Disk.

Flight path record by colour video VHS PAL.
Flight line recovery by transfer to 1:10 000 scale control maps.

395127

9991

WILMOT, CETHANA



PROCESSING AND MAPPING:

Flight path digitising, data processing and mapping performed by Pitt Research Pty Limited during March 1990.

NORANDA
SHEFFIELD GEOPHYSICAL SURVEY 1990
WILMOT, CETHANA
FLIGHT PATH

5 cm

500 0 500 1000 1500 2000 2500 Metres

SCALE 1:25 000

SURVEY SPECIFICATIONS: 91-3231.

Survey Area: Sheffield.

Flown by Geo Instruments Pty Ltd, February 1990, Job Number 9001.

Nominal Terrain Clearance of Detector in Bird at 80 metres.
Nominal Line Spacing: Traverse Lines 150 metres
Tie Lines 400 metres.

Recording Interval: Magnetics 0.48 seconds
Spectrometer 0.96 seconds

Magnetometer: G-813 Proton Precession Magnetometer in a towed bird.
Sensitivity 0.1 nT.

Spectrometer: GR3001 with detector volume of 16.8 litres.

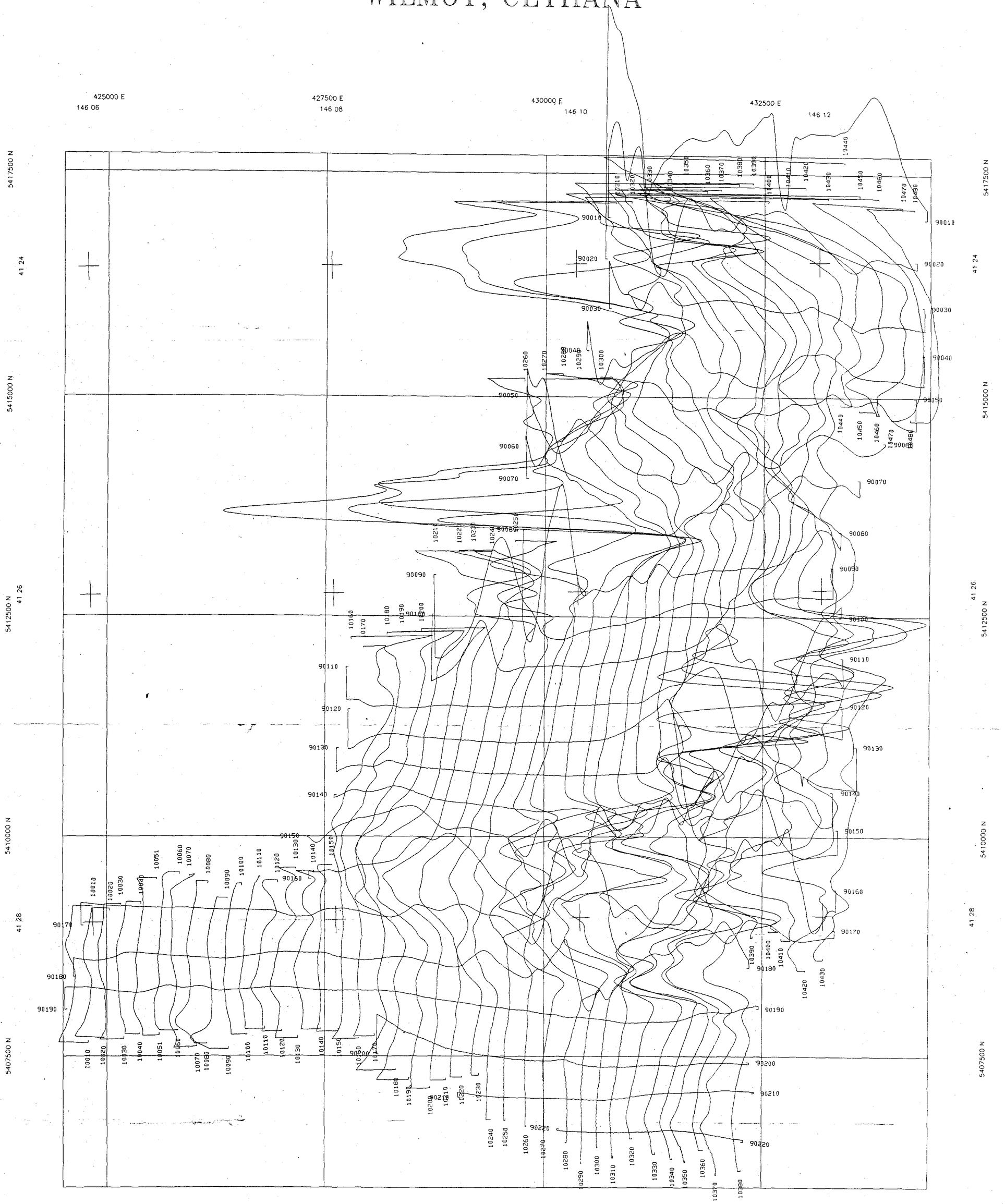
Data Recording: Geo Instruments 2000 Digital to Disk.

Flight path record by colour video VHS PAL.
Flight line recovery by transfer to 1:10 000 scale control maps.

395128

9990

WILMOT, CETHANA



PROCESSING AND MAPPING:

Data processing and mapping performed by Pitt Research Pty Limited during March 1990.

91-3231.1

NORANDA
SHEFFIELD GEOPHYSICAL SURVEY 1990
WILMOT, CETHANA
RESIDUAL MAGNETIC PROFILES

Profile Scale: 100 nT / cm. 5 cm

500 0 500 1000 1500 2000 2500 Metres

SCALE 1:25 000

395129

SURVEY SPECIFICATIONS:

Survey Area: Sheffield.

Flown by Geo Instruments Pty Ltd, February 1990, Job Number 9001.

Nominal Terrain Clearance of Detector in Bird at 80 metres.
Nominal Line Spacing: Traverse Lines 150 metres
Tie Lines 400 metres.

Recording Interval: Magnetics 0.48 seconds
Spectrometer 0.96 seconds

Magnetometer: G-813 Proton Precession Magnetometer in a towed bird. Sensitivity 0.1 nT.

Spectrometer: GR3001 with detector volume of 16.8 litres.

Data Recording: Geo Instruments 2000 Digital to Disk.

Flight path record by colour video VHS PAL.
Flight line recovery by transfer to 1:10 000 scale control maps.

APPENDIX 4

Surveying Reduction Sheets
Fire Tower Prospect

0125

395131

LOOP ONE

		Vet.Dist	Cum Vert.Dist	Corrected Vert Dist.	Corrected Elevations
Datum	- 1	- 7.38	- 7.38	- 7.43	- 7.43
1	2	- 8.33	-15.71	- 8.38	-15.81
2	3	-15.47	-31.18	-15.52	-31.33
3	4	-32.58	-63.76	-32.63	-63.96
4	5	- 4.92	-68.68	- 4.97	-68.93
5	6	- 3.01	-71.69	- 3.06	-71.99
6	7	-11.95	-83.64	-12.00	-83.99
7	8	- 2.19	-85.83	- 2.24	-86.23
8	9	+ 1.42	-84.41	+ 1.37	-84.86
9	10	- 0.82	-85.23	- 0.87	-85.73
10	11	+ 5.06	-80.17	+ 5.01	-80.72
11	12	+ 7.26	-72.91	+ 7.21	-73.51
12	13	+ 4.89	-68.02	+ 4.84	-68.67
13	14	+ 5.66	-62.36	+ 5.61	-63.06
14	15	+12.99	-49.37	+12.94	-50.12
15	16	- 6.75	-56.12	- 6.80	-56.92
16	17	+ 7.85	-48.27	+ 7.80	-49.12
17	18	+ 4.50	-43.77	+ 4.45	-44.67
18	19	+ 3.56	-40.19	+ 3.53	-41.14
19	20	+ 6.81	-33.38	+ 6.76	-34.38
20	21	+ 2.77	-30.61	+ 2.72	-31.66
21	3	+ 0.21	-30.30	+ 0.16	-31.50
22	22	+ 5.48	-24.92	+ 5.43	-26.07
22	23	+ 6.68	-18.24	+ 6.63	-19.44
23	24	+ 4.87	-13.37	+ 4.82	-14.62
24	25	+ 0.73	-12.64	+ 0.68	-13.94
25	26	+ 3.90	- 8.74	+ 3.85	-10.09
26	27	+ 4.66	- 4.08	+ 4.61	- 5.48
27	28	+ 1.15	- 2.93	+ 1.10	- 4.38
28	Datum	+ 4.38	+ 1.45	+ 4.33	00.00

Error of loop 1.45 metre error per Stn .05 metre

0126

395132

LOOP TWO

		Vert Dist	Cum Vert Dist	Corrected Vert Dist	Corrected Elevations
28	29	- 3.27	- 3.27	- 3.26	- 7.64
29	30	- 3.79	- 7.06	- 3.78	-11.42
30	31	- 2.90	- 9.96	- 2.89	-14.31
31	32	- 3.10	-13.06	- 3.09	-17.40
32	33	- 3.36	-16.42	- 3.35	-20.75
33	34	- 3.53	-19.95	- 3.52	-24.27
34	35	- 7.36	-27.31	- 7.35	-31.62
35	36	- 2.15	-29.46	- 2.14	-33.76
36	37	- 1.09	-30.55	- 1.08	-34.84
37	38	+ 5.25	-25.30	- 5.26	-29.58
38	39	- 3.42	-28.72	- 3.41	-32.99
39	40	- 6.09	-34.81	- 6.08	-39.07
38	41	+ 4.67	-20.63	+ 4.68	-24.88
41	42	+ 0.77	-19.86	+ 0.78	-24.10
42	43	+ 5.01	-14.85	+ 5.02	-19.08
43	44	+ 8.07	- 6.78	+ 8.08	-11.00
44	45	- 6.35	-13.13	- 6.34	-17.34
44	46	- 1.09	- 7.87	- 1.08	-12.07
44	47	- 5.32	-12.10	- 5.31	-16.29
44	48	- 0.47	- 7.25	- 0.46	-11.43
48	30	- 0.00	- 7.25	- 0.00	-11.42

Error of look 0.19 metre error per stn 0.01 metre

Station 28 elevation from loop 1 = -4.38 metres

0127 **LOOP THREE** 395133

		Vert.Dist	Cum Vert Dist		Corrected Elevations
28	50	- 3.51	- 3.51		- 7.89
50	51	+ 1.37	- 2.14		- 6.52
51	52	- 3.51	- 5.65		-10.03
52	53	- 6.81	-12.46		-16.84
53	54	- 2.60	-15.06	No correction	-19.44
54	55	0.00	-15.06		-19.44
55	56	- 3.55	-18.61		-22.99
56	57	- 8.15	-26.76		-31.14
57	58	- 9.03	-35.79		-40.17
58	40	+ 1.33	-34.46		-39.07
58	59	- 2.22	- 2.22		-42.39
59	60	- 6.91	- 9.13	No correction	-49.30
60	61	+ 1.29	- 7.84		-48.01
61	15	- 2.35	-10.19		-50.12
61	62	-10.64	-10.84	-10.58	-58.59
62	63	- 9.88	-20.72	- 9.62	-68.21
63	64	- 8.98	-29.70	- 8.82	-76.93
64	65	- 5.73	-35.43	- 5.47	-82.40
65	9	- 2.74	-38.17	- 2.48	-84.86

Error from 61 to 9 of 1.32 metres error per stn 0.26 metres

Station 58 elevation = -40.17

Station 61 elevation = -48.01

0128 LOOP FOUR

395134

		Vert.Dist	Cum Vert Dist	Corrected Vert Dist	Corrected Elevations
6	66	+ 1.87	+ 1.87	+ 1.86	-70.13
66	67	- 1.40	+ 0.47	- 1.41	-71.52
67	68	-10.47	-10.00	-10.48	-81.99
68	69	-13.33	-23.33	-13.34	-95.32
69	70	- 1.53	-24.86	- 1.54	-96.85
69	71	+ 1.74	-23.12	+ 1.73	-93.58
71	72	- 1.89	-25.01	- 1.90	-95.47
72	73	- 5.12	-30.13	- 5.13	-100.59
73	74	- 1.00	-31.13	- 1.01	-101.59
74	75	- 4.19	-35.32	- 4.20	-105.78
75	75	+ 7.85	-27.47	+ 7.84	-97.93
76	77	+ 6.30	-21.17	+ 6.29	-91.63
77	78	+19.79	- 1.38	+19.78	-71.84
78	66	+ 1.57	+ 0.19	+ 1.56	-70.12

Error of loop 0.19 metre error per station 0.015

Station 6 Elevation = -71.99

0129 LOOP FIVE 395135

		Vert. Dist	Cum Vert Dist	Corrected Vert.Dist	Corrected Elevations
3	80	- 5.80	- 5.80	- 5.84	-37.17
80	81	+ 3.59	- 2.21	+ 3.55	-33.62
81	82	- 5.14	- 7.35	- 5.18	-38.80
82	83	- 6.47	-13.82	- 6.51	-45.31
83	84	- 5.00	-18.82	- 5.04	-50.35
84	85	- 2.86	-21.68	- 2.90	-53.25
85	86	+ 1.42	-20.26	+ 1.38	-51.87
86	87	+ 6.12	-14.14	+ 6.08	-45.79
87	80	+ 8.71	- 5.43	+ 8.67	-37.17

Error of loop -0.37 metre error per station -0.04 metre

Station 3 Elevation = -31.33

0130 **LOOP SIX**

395136

		Vert.Dist	Cum Vert Dist	Corrected Vert.Dist	Corrected Elevations
6	88	+ 6.62	+ 6.62	+ 6.59	-65.40
88	89	+ 6.02	+12.64	+ 5.99	-59.41
89	90	+ 5.66			-53.75
89	91	+ 6.79	+19.43	+ 6.76	-52.65
91	92	+ 6.25	+25.68	+ 6.22	-46.43
92	93	+ 5.92	+31.60	+ 5.89	-40.54
93	94	+ 2.09	+33.69	+ 2.06	-38.48
94	95	+ 1.44	Single shot		-37.04
94	96	- 0.49	+33.20	- 0.52	-39.00
96	97	+ 1.57	+31.63	- 1.60	-40.60
97	98	- 0.12	+31.51	- 0.15	-40.75
98	99	- 7.97	+23.54	- 8.00	-48.75
99	100	- 6.71	+16.83	- 6.74	-55.49
100	101	- 5.41	+11.42	- 5.44	-60.93
101	102	- 1.39	+10.03	- 1.43	-62.36
102	103	- 4.44	+ 5.59	- 4.48	-66.84
103	104	+ 1.67	+ 7.26	+ 1.64	-65.20
104	88	- 0.10	+ 7.16	- 0.14	-65.40

Error of loop 0.54 metre error per station 0.03 metre

Station 6 Elevation = -71.99

0131

395137

LOOP SEVEN

		Vert.Dist	Cum Vert Dist		Corrected Elevations
72	73	- 4.74	- 4.74		-100.59
73	79	- 8.78	-13.52		-109.37
79	105	+ 1.67	-11.85		-107.70
105	106	-12.21	-24.06		-119.91
106	107	-14.47	-38.53		-134.38
106	108	- 5.05	-29.11		-124.96
108	109	- 1.71	-30.82		-126.67
109	110	+ 0.24	-30.58		-126.43
110	111	+ 1.67	-28.91	No correction	-124.76
111	112	+ 3.39	-25.52		-121.37
112	113	+ 4.50	-21.02		-116.87
113	114	- 4.18	-25.20		-121.05
114	115	- 1.54	-26.74		-122.59
115	116	+ 2.08	-24.66		-120.51
116	117	+ 5.56	-19.10		-114.95
117	118	+ 7.41	-11.69		-107.54
118	119	- 0.66	-12.35		-108.20
119	120	+ 3.73	- 8.62		-104.47
115	70	+ 9.69	- 1.80		- 97.65(96.85)
70	72	+ 1.72	- 0.08		- 95.93(95.47)

Station 72 Elevation = 95.47
Station 73 Elevation = 100.59
Station 70 Elevation = 96.85

0132 LOOP NINE 395138

		Vert. Dist	Cum Vert Dist	Corrected Vert Dist	Corrected Elevations
					- 6.52
51	153	- 7.01	- 7.01	- 7.31	-13.83
153	154	- 4.96	-11.97	- 5.26	-19.09
154	55	- 0.50	-12.47	- 0.35	-19.44
55	155	- 7.00	-19.47		-26.44
155	156	- 2.14	-21.61		-28.58
156	157	- 0.82	-22.43		-29.40
157	158	+ 0.29	-22.14		-29.11
158	159	+ 4.64	-17.50		-24.47
159	160	+ 5.08	-12.42		-19.44
160	53	+ 2.21	-10.21	} Elevations calculated on	
53	161	- 0.38	-10.59	} another loop	
161	162	- 0.70	-11.29		

Elevation of Station 51 = -6.52

0133 LOOP TEN (Resurvey of LOOP EIGHT)

395139

		Vert. Dist	Cum Vert Dist	Corrected Vert Dist	Corrected Elevations
132	138	- 0.15	- 0.15	- 0.26	-50.73
138	139	- 2.85	- 3.00	- 2.96	-53.69
139	140	-10.96	-13.96	-11.07	-64.76
140	141	- 9.83	-23.34	- 9.49	-74.25
141	142	- 2.31	-25.65	- 2.42	-76.67
142	143	+ 3.88	-21.77	+ 3.77	-72.90
143	144	+ 2.42	-19.35	+ 2.31	-70.59
144	145	- 2.67	-22.02	- 2.78	-73.37
145	146	-20.56	Single shot		
145	147	+ 1.22	-20.82	+ 1.11	-72.26
147	148	+ 5.08	-15.72	+ 4.97	-67.29
148	149	+ 2.27	-13.45	+ 2.16	-65.13
149	150	+ 3.76	- 9.69	+ 3.65	-61.48
150	151	+ 3.86	- 5.83	- 3.75	-57.73
151	152	+ 9.73	- 3.90	+ 9.62	-48.11
152	135	+ 3.30	- 7.20	+ 3.19	-44.92

Error _ 1.67 metre / 15 stn + 0.11 / stn

Station 132 = -50.47

0134

LOOP ELEVEN

395140

		Vert. Dist	Cum Vert Dist	Corrected Vert Dist	Corrected Elevations
9	163	- 5.87	- 5.87	- 6.10	- 90.96
163	164	- 3.18	- 9.05	- 3.41	- 94.37
164	165	+ 2.36	- 6.69	+ 2.13	- 92.24
164	166	- 7.59	-14.25	- 7.82	-100.06
166	167	- 3.76	-18.01	- 3.99	-104.05
167	167	- 0.25	-18.26	- 0.48	-104.53
168	169	- 2.66	-20.94	- 2.91	-107.44
169	170	- 4.59	-25.53	- 4.82	-112.26
170	171	+ 1.62	-23.91	+ 1.39	-110.87
171	172	+ 2.90	-21.01	+ 2.67	-108.20
172	76	+10.43	-10.58	+10.20	- 97.93

Error of 2.49 metres per 11 stations 0.23 metre / station

Station 9 Elevation = -84.86

APPENDIX 5

Analytical data sheets - Analabs

0136

ANALABS

395142

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999
52 Murray Road, Welshpool, W.A. 6106
Telex AA92560
FAX: 004 31 8890

ANALYTICAL REPORT No. 999.59.08.06390

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

ORDER No.	PROJECT
0005	

DATE RECEIVED	RESULTS REQUIRED
01/08/89	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
3	16/08/89	1	55

STATE OF SAMPLES	PRE-TREATMENT								ANALYSIS		
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PUL-VERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	225224/250,225351/373	SO	Prep: 004,009,013,016						Cu,Pb,Zn,Ag/101,As/114,Au/313		
	Various	RO	Prep: 005,010,013,016						Cu,Pb,Zn,Ag/101,As/114,Au/313		

RESULTS TO

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

RESULTS TO

REMARKS

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER

0137

ANALABS

A Division of Macdonald Hamilton & Co. Pty. Ltd.

395143

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06390	16/08/89	0005	1 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	As	Au			
1	225224	15	40	40	1.5	7	[redacted]	27E	5000E	
2	225225	10	25	30	2.0	7	<0.005		4975E	
3	225226	35	35	40	1.5	5	<0.005		4950E	
4	225227	30	55	100	1.5	14	<0.005		4925E	
5	225228	75	85	125	2.0	23	[redacted]		4900E	
6	225229	30	65	100	1.5	21	<0.005		4875E	
7	225230	30	65	165	2.0	13	<0.005		4850E	
8	225231	20	55	125	1.5	9	<0.005		4825E	
9	225232	35	55	150	2.0	13	<0.005		4800E	
10	225233	85	65	125	1.5	21	[redacted]		4775E	
11	225234	50	75	110	1.5	16	<0.005		4750E	
12	225235	90	85	385	1.5	54	[redacted]		4725E	
13	225236	25	45	150	1.5	23	<0.005		4700E	
14	225237	35	30	75	1.5	5	[redacted]	28E	5000N	
15	225238	20	30	45	1.5	4	<0.005		4975N	
16	225239	15	35	50	2.0	6	<0.005		4950N	
17	225240	25	25	40	1.5	9	<0.005		4925N	
18	225241	45	195	135	1.5	97	<0.005		4900N	
19	225242	35	55	100	1.5	7	<0.005		4875N	
20	225243	20	45	125	1.0	8	<0.005		4850N	
21	225244	90	50	150	1.5	17	<0.005		4825N	
22	225245	60	40	95	1.5	10	<0.005		4800N	
23	225246	35	35	70	0.5	190	[redacted]		4775N	
24	225247	25	50	60	1.5	23	<0.005		4750N	
25	225248	45	70	120	1.5	22	<0.005		4725N	

Results in ppm unless otherwise specified
T = element present: but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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ANALABS

A Division of Macdonald Hamilton & Co. Pty. Ltd.

395144

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06390	16/08/89	0005	2 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	As	Au			
1	225249	45	60	105	1.5	33	<0.005	28E	4700 N	
2	225250	25	35	75	1.0	8	<0.005	30E	5000N	
3	225351	25	35	85	1.0	8	<0.005	30 E	4975ON	
4	225352	20	25	40	1.0	6	<0.005		4950 N	
5	225353	30	35	95	1.0	11	<0.005		4925 N	
6	225354	15	35	55	0.5	12	<0.005		4900N	
7	225355	25	70	70	0.5	19	<0.005		4875 N	
8	225356	55	185	125	1.0	56	<0.005		485ON	
9	225357	35	90	70	0.5	71	[redacted]		4825N	
10	225358	80	65	60	0.5	56	[redacted]		4800N	
11	225359	30	30	40	0.5	25	<0.005		4775N	
12	225360	15	15	30	0.5	15	<0.005		475ON	
13	225361	30	15	30	0.5	41	<0.005		4725N	
14	225362	20	15	70	0.5	8	<0.005		4700N	
15	225363	30	70	95	0.5	13	<0.005	29E	5000N	
16	225364	20	25	80	0.5	2	<0.005		4975N	
17	225365	30	30	130	1.0	4	<0.005		495ON	
18	225366	15	30	75	0.5	4	<0.005		4925N	
19	225367	25	30	100	1.0	6	<0.005		4900N	
20	225368	15	30	65	1.0	5	<0.005		4875N	
21	225369	15	50	80	1.0	7	<0.005		485ON	
22	225370	35	45	70	0.5	24	<0.005		4825N	
23	225371	45	50	260	1.0	42	<0.005		4800N	
24	225372	40	45	35	1.5	80	<0.005		4775N	
25	225373	20	40	35	1.0	27	<0.005		475ON	

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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A Division of Macdonald Hamilton & Co. Pty. Ltd.

395145

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06390	16/08/89	0005	3 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	As	Au			
1	225241B	55	235	100	1.0	23	<0.005	28E	4900N	ROCK CHIP.
2	225273B	10	25	20	1.0	35	<0.005	21E	4900N	"
3	225362B	20	25	240	0.5	15	<0.005	30E	4700N	"
4	225373B	5	15	35	<0.5	5	<0.005	29E	4750N	"
5	225374B	20	25	95	0.5	[redacted]	[redacted]	25E	4935N	"
6										
7										
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12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	5	0.5	1	0.005			
24	UNITS	PPM	PPM	PPM	PPM	PPM	PPM			
25	METHOD	101	101	101	101	114	313			

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

395146

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 — 52 Murray Road, Welshpool, W.A. 6106 — Telex AA92560
FAX: 004 31 8890

ANALYTICAL REPORT No. 999.59.08.06445

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

0140

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

ORDER No.	PROJECT
0006	

DATE RECEIVED	RESULTS REQUIRED
23/08/89	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
1	06/09/89	1	8

REFER BELOW	SAMPLE NUMBERS	STATE OF SAMPLES	PRE-TREATMENT: DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	ANALYSIS: REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	225375/82	Ro	Prep: 005,010,011,018							Cu,Pb,Zn,Ag/101,As/114		
	225375/82	Pu								Au,AuChk/313		

RESULTS TO

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

RESULTS TO

REMARKS

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER

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A Division of Macdonald Hamilton & Co. Pty. Ltd.

395147

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06445	06/09/89	0006	1 OF 1

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	As	Au	AuChk		
1	225375	85	465	1335	2.0	800	0.558	0.549	Near Stn 65	
2	225376	25	35	180	<0.5	820	0.533	0.509	Near Stn 9	
3	225377	35	20	200	<0.5	26	0.026	-	Near Stn 12	
4	225378	235	565	4085	13.0	140	11.300	9.920	Near Stn 15	
5	225379	420	55	875	<0.5	370	0.467	-	Near Stn 158	
6	225380	100	15	115	<0.5	140	0.914	-	Near Stn 73	
7	225381	140	20	185	<0.5	17	0.092	-	Near Stn 74	
8	225382	125	55	300	9.5	5300	14.200	12.120	Near Stn 76	
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	5	0.5	1	0.005	0.005		
24	UNITS	PPM	PPM	PPM	PPM	PPM	PPM	PPM		
25	METHOD	101	101	101	101	114	313	313		

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

395148

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 — 52 Murray Road, Welshpool, W.A. 6106 — Telex AA92560
FAX: 004 31 3890

ANALYTICAL REPORT No. 999.89.08.06874

0142

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

ORDER No.	PROJECT
0007	Bowrie Park

DATE RECEIVED	RESULTS REQUIRED
05/10/89	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
6	26/10/89	1	58

STATE OF SAMPLES	PRE-TREATMENT								ANALYSIS			
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE		REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	225301/350,225383/390	RC	Prep: 006,010,016						Cu,Pb,Zn,Ag/101			
	225301/350,225383/390	RC							Au,AuChk/309			
	225301/350,225383/390	RC							As/401			
	225,349,350,353,384	RC							Co/101			
	225301/350,225383/390	RC	Prep: 006,010,016						Pb,Ag/104			

RESULTS TO

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

RESULTS TO

REMARKS

STATE OF SAMPLES		
whole core	WC	
split core	SC	
cutting	CU	
rock	Ro	
soil	SO	
pulp	PU	
water	WA	
tissue	*TI*	
stream sediment	SS	
heavy mineral	HM	

ANALYSIS — PREPARATION			
perchloric acid	A1	cold acid	CA
hydrochloric acid	A2	specific sulphide	SS
nitric acid	A3	other mixed acids	Mo
aqua regia	A4	alkaline attack	AA
nitric-perchloric	A5	volatilization	VO
HF mixture	A6	ignition	IG
HF under pressure	A7	pressed powder (XRF)	PP
fusion	A8	*glass fusion (XRF)*	GF

ANALYSIS — METHOD	
atomic absorbtion	AAS
x-ray fluorescence	XRF
spectrophotometry	SPEC
colorimetry	COL
chromatography	CHR
titration	TTN
other chemicals means	CHEM
miscellaneous	MISC
fluorescence	FLUOR
inductively coupled plasma	ICP

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

0143

395149

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
CHANNEL SAMPLING.	999.89.08.06574	26/10/89	0007	1 OF 6

TUBE No.	SAMPLE No.	Cu	Pb	Pb	Zn	Ag	Ag	Au	AuChk	As
1	225301	130	10	–	70	1.0	–	0.049	0.057	130
2	225302	175	–	2150	510	–	2	1.191	–	510
3	225303	270	35	–	130	3.0	–	1.229	–	620
4	225304	230	130	–	185	2.0	–	0.825	–	70
5	225305	140	400	–	400	2.0	–	0.294	–	350
6	225306	150	160	–	415	4.0	–	1.244	–	590
7	225307	65	95	–	430	4.0	–	2.030	–	120
8	225308	120	210	–	265	2.0	–	0.960	–	400
9	225309	330	90	–	205	2.5	–	1.328	–	130
10	225310	280	55	–	220	1.5	–	0.332	–	15
11	225311	195	50	–	170	2.5	–	2.306	–	25
12	225312	530	15	–	110	3.5	–	1.028	1.082	470
13	225313	430	–	6200	850	–	9	2.446	–	>2500
14	225314	600	–	3675	1200	–	10	5.116	5.690	360
15	225315	600	610	–	610	5.0	–	0.989	–	330
16	225316	360	420	–	825	9.0	–	3.416	–	170
17	225317	430	265	–	730	3.0	–	1.550	1.440	310
18	225318	1150	295	–	585	4.0	–	2.006	3.740	240
19	225319	535	1100	–	750	3.5	–	1.069	–	360
20	225320	225	450	–	590	4.5	–	1.635	–	100
21	225321	65	35	–	280	0.5	–	0.049	–	50
22	225322	265	90	–	520	2.5	–	0.411	–	820
23	225323	540	30	–	350	2.0	–	0.221	–	40
24	225324	330	160	–	400	1.0	–	0.532	–	70
25	225325	50	65	–	710	1.0	–	<0.005	–	30

Results in ppm unless otherwise specified
T = element present but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

0144

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

395150

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	997.89.08.06674	26/10/89	0007	2 OF 6

TUBE No.	SAMPLE No.	Cu	Pb	Pb	Zn	Ag	Ag	Au	AuChk	As
1	225326	100	95	–	750	6.0	–	<0.005	–	85
2	225327	45	20	–	130	1.0	–	3.906	–	8
3	225328	105	–	700	965	–	6	4.936	–	200
4	225329	60	125	–	625	3.0	–	1.012	–	240
5	225330	75	85	–	1100	1.5	–	0.066	<0.005	240
6	225331	160	60	–	1300	1.5	–	0.140	–	380
7	225332	190	105	–	595	1.5	–	0.232	–	30
8	225333	1700	30	–	140	7.5	–	0.738	0.723	25
9	225334	730	30	–	800	2.5	–	<0.005	–	15
10	225335	200	50	–	505	2.5	–	<0.005	–	20
11	225336	375	30	–	105	1.0	–	0.011	–	180
12	225337	150	25	–	115	1.5	–	0.060	–	15
13	225338	320	25	–	250	2.0	–	0.473	–	20
14	225339	130	25	–	200	1.5	–	0.160	–	120
15	225340	40	15	–	100	1.0	–	0.072	–	150
16	225341	65	30	–	170	1.5	–	0.439	–	120
17	225342	65	25	–	130	3.0	–	0.816	–	120
18	225343	55	15	–	130	1.5	–	0.920	–	310
19	225344	50	25	–	115	2.0	–	<0.005	–	130
20	225345	30	20	–	135	1.0	–	<0.005	0.090	8
21	225346	25	15	–	90	1.0	–	<0.005	–	7
22	225347	40	20	–	120	<0.5	–	0.015	0.081	5
23	225348	65	5	–	98	<0.5	–	1.643	–	25
24	225349	235	125	–	480	1.5	–	0.394	–	1520
25	225350	700	100	–	570	3.0	–	1.247	1.010	>2500

Results in ppm unless otherwise specified
T = element present: but concentration too low to measure
x = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

0145

ANALABS

395151

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.06.06574	26/10/89	0007	3 OF 6

TUBE No.	SAMPLE No.	Cu	Pb	Pb	Zn	Ag	Ag	Au	AuChk	As
1	225383	30	25	–	160	1.0	–	1.455	–	250
2	225384	35	115	–	490	2.5	–	<0.005	–	630
3	225385	90	100	–	60	0.5	–	<0.005	–	10
4	225386	70	130	–	90	<0.5	–	<0.005	–	7
5	225387	30	30	–	35	<0.5	–	<0.005	–	3
6	225388	40	290	–	270	<0.5	–	<0.005	–	4
7	225389	25	35	–	100	<0.5	–	<0.005	–	<2
8	225390	30	10	–	65	<0.5	–	<0.005	–	6
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	25	5	0.5	2	0.005	0.005	2
24	UNITS	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
25	METHOD	101	101	104	101	101	104	309	309	401

Results in ppm unless otherwise specified
T = element present, but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

0146

395152

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06574	26/10/89	0007	4 OF 6

TUBE No.	SAMPLE No.	As	Co							
1	225301	--	--							
2	225302	--	--							
3	225303	--	--							
4	225304	--	--							
5	225305	--	--							
6	225306	--	--							
7	225307	--	--							
8	225308	--	--							
9	225309	--	--							
10	225310	--	--							
11	225311	--	--							
12	225312	--	--							
13	225313	0.32	--							
14	225314	--	--							
15	225315	--	--							
16	225316	--	--							
17	225317	--	--							
18	225318	--	--							
19	225319	--	--							
20	225320	--	--							
21	225321	--	--							
22	225322	--	--							
23	225323	--	--							
24	225324	--	--							
25	225325	--	--							

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
-- = element not determined

AUTHORISED OFFICER

0147

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

395153

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06574	26/10/89	0007	3 OF 6

TUBE No.	SAMPLE No.	As	Co							
1	225326	—	—							
2	225327	—	—							
3	225328	—	—							
4	225329	—	—							
5	225330	—	—							
6	225331	—	—							
7	225332	—	—							
8	225333	—	—							
9	225334	—	—							
10	225335	—	—							
11	225336	—	—							
12	225337	—	—							
13	225338	—	—							
14	225339	—	—							
15	225340	—	—							
16	225341	—	—							
17	225342	—	—							
18	225343	—	—							
19	225344	—	—							
20	225345	—	—							
21	225346	—	—							
22	225347	—	—							
23	225348	—	—							
24	225349	—	770							
25	225350	0.27	2150							

Results in ppm unless otherwise specified
T = element present: but concentration too low to measure
X = element: concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

0148

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

395154

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06574	26/10/89	0007	6 OF 6

TUBE No.	SAMPLE No.	As	Co							
1	225383	--	130							
2	225384	--	560							
3	225385	--	--							
4	225386	--	--							
5	225387	--	--							
6	225388	--	--							
7	225389	--	--							
8	225390	--	--							
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	0.01	5							
24	UNITS	%	PPM							
25	METHOD	404	101							

Results in ppm unless otherwise specified
T = element present: but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

395155

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 — 52 Murray Road, Welshpool, W.A. 6106 — Telex AA92560
FAX: 004 31 8890

ANALYTICAL REPORT No. 999.59.08.06768

0149

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

ORDER No.	PROJECT
P Jones	

DATE RECEIVED	RESULTS REQUIRED
04/01/89	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
3	04/01/89	1	66

STATE OF SAMPLES		PRE-TREATMENT							ANALYSIS		
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	<2253,301/350,383/398	pu							Sn,W/401,W/403		

RESULTS TO

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

RESULTS TO

REMARKS

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER

0150

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

395156

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06768	04/01/89	P Jones	1 OF 3

TUBE No.	SAMPLE No.	Sn	W	W						
1	2253301	<3	65	–						
2	2253302	<3	150	–						
3	2253303	<3	>500	0.104						
4	2253304	5	120	–						
5	2253305	<3	75	–						
6	2253306	3	210	–						
7	2253307	<3	55	–						
8	2253308	<3	50	–						
9	2253309	<3	85	–						
10	2253310	6	80	–						
11	2253311	<3	25	–						
12	2253312	<3	>500	0.085						
13	2253313	4	>500	0.133						
14	2253314	<3	>500	0.111						
15	2253315	4	150	–						
16	2253316	<3	>500	0.119						
17	2253317	4	>500	0.160						
18	2253318	3	>500	0.156						
19	2253319	10	340	–						
20	2253320	5	260	–						
21	2253321	<3	70	–						
22	2253322	5	190	–						
23	2253323	<3	140	–						
24	2253324	4	50	–						
25	2253325	<3	60	–						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

0151

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

395157

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06768	04/01/89	P Jones	2 OF 3

TUBE No.	SAMPLE No.	Sn	W	W						
1	2253326	<3	70	–						
2	2253327	4	35	–						
3	2253328	<3	>500	0.101						
4	2253329	<3	340	–						
5	2253330	<3	130	–						
6	2253331	<3	110	–						
7	2253332	<3	85	–						
8	2253333	15	>500	0.226						
9	2253334	6	25	–						
10	2253335	4	20	–						
11	2253336	10	55	–						
12	2253337	<3	45	–						
13	2253338	5	65	–						
14	2253339	5	80	–						
15	2253340	<3	90	–						
16	2253341	<3	100	–						
17	2253342	4	110	–						
18	2253343	5	50	–						
19	2253344	6	100	–						
20	2253345	5	55	–						
21	2253346	<3	30	–						
22	2253347	6	<20	–						
23	2253348	<3	30	–						
24	2253349	<3	>500	0.076						
25	2253350	<3	>500	0.142						

Results in ppm unless otherwise specified
T = element present: but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

395158

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06768	04/01/89	P Jones	3 OF 3

TUBE No.	SAMPLE No.	Sn	W	W						
1	2253383	4	240	–						
2	2253384	<3	>500	0.057						
3	2253385	<3	20	–						
4	2253386	<3	<20	–						
5	2253387	<3	<20	–						
6	2253388	<3	<20	–						
7	2253389	<3	<20	–						
8	2253390	<3	<20	–						
9	2253391	4	<20	–						
10	2253392	7	<20	–						
11	2253393	<3	<20	–						
12	2253394	<3	85	–						
13	2253395	<3	20	–						
14	2253396	20	<20	–						
15	2253397	3	>500	0.060						
16	2253398	<3	100	–						
17										
18										
19										
20										
21										
22										
23	DETECTION	3	20	0.005						
24	UNITS	ppm	ppm	%						
25	METHOD	401	401	403						

Results in ppm unless otherwise specified
T = element present: but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

395159

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 — 52 Murray Road, Welshpool, W.A. 6106 — Telex AA92560
FAX: 004 31 8890

ANALYTICAL REPORT No. 999.59.08.06664

0153

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

ORDER No.	PROJECT
Phil Jones	Gowrie Park

DATE RECEIVED	RESULTS REQUIRED
15/11/89	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
1	29/11/89	1	8

STATE OF SAMPLES	PRE-TREATMENT								ANALYSIS			
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	225391/98	RC	Prep: 006	010,011	012,013,016				Cu,Pb,Zn,Ag/101		
	225391/98	RC							As/114		
	225391/98	RC							Au,AuChk/309		
	225391/98	RC							As/101		

RESULTS TO

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

RESULTS TO

REMARKS

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

0154

395160

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
RECONNAISSANCE WEST OF FIRE TOWER PROSPECT.	999.59.08.06664	29/11/89	Phil Jones	1 OF 1

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	As	As	
1	225391	185	590	150	2.5	<0.008	-	190	>100	
2	225392	125	1350	690	1.0	<0.008	-	-	49	
3	225393	25	720	240	0.5	0.026	-	-	23	
4	FIRE TOWER. 225394	250	170	250	<0.5	0.093	-	800	>100	
5	225395	110	800	830	0.5	0.009	-	-	17	
6	225396	30	<5	145	<0.5	<0.008	-	-	7	
7	225397	300	430	580	1.0	1.785	1.955	230	>100	
8	225398	95	350	680	0.5	0.554	0.529	1500	>100	
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	5	0.5	0.008	0.008	100	1	
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
25	METHOD	101	101	101	101	309	309	101	114	

Results in ppm unless otherwise specified
T = element present, but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

395161

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 52 Murray Road, Welshpool, W.A. 6106 Telex AA92560

FRI: 004 31 3990

0155

ANALYTICAL REPORT No. 999.59.08.06897

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

ORDER No.	PROJECT
0008	Gowrie Park
DATE RECEIVED	**RESULTS REQUIRED**
28/02/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
1	16/03/90	1	10

STATE OF SAMPLES	PRE-TREATMENT							ANALYSIS		
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	<225,399/408	RC	Prep: 006,010,011,012,013,016						Cu,Pb,Zn,Ag/101		
	<225,399/408	RC							Au,AuChk/309		
	<225,399/408	RC							As/401		

RESULTS TO

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

RESULTS TO

REMARKS

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER Jenkins

0156

ANALABS

395162

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.06897	16/03/90	0003	1 OF 1

TUBE No.	SAMPLE No.	Au	AuChk	Cu	Pb	Zn	Ag	As	
1	225399	1.782	--	225	900	535	3.0	95	STN 51 - 153 0 - 11m
2	225400	3.363	3.423	115	605	600	4.5	150	11. 22 m
3	225401	1.524	--	100	680	685	3.5	100	STN 153 - 154 0 - 10m
4	225402	0.212	--	200	55	190	0.5	500	STN 155 - 55 0 - 9m
5	225403	0.874	--	140	365	1300	1.5	390	STN 56 0 - 8.5m
6	225404	1.566	--	80	140	1200	2.0	450	STN 156 - 157
7	225405	0.783	--	20	50	475	0.5	70	STN 157 - 158
8	225406	0.452	--	55	85	710	0.5	55	STN 157 - 159
9	225407	0.631	--	260	155	460	1.0	190	STN 159 - 160
10	225408	0.243	--	275	980	550	4.0	540	Near STN 53
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23	DETECTION	0.003	0.005	5	5	5	0.5	2	
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
25	METHOD	309	309	101	101	101	101	401	

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER Jenkins

ANALABS

395163

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 — 52 Murray Road, Welshpool, W.A. 6106 — Telex AA92560
FAX: 004 31 3890

ANALYTICAL REPORT No. 999.39.08.07060

0157

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

ORDER No.	PROJECT
Dispatch No 0009	

DATE RECEIVED	RESULTS REQUIRED
30/04/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
4	02/05/90	1	81

STATE OF SAMPLES	PRE-TREATMENT								ANALYSIS		
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	K2254,09/33,35/90	DC	Prep: 006,010,011,012,013,016						Au,AuChk/309		
	K2254,09/33,35/90	DC							Cu,Pb,Zn,Ag,As/101		
	K2254,09/33,35/90	DC							Pb:1/101		

RESULTS TO

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

RESULTS TO

REMARKS

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER Jenkins

0158

395164

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.07060	02/08/90		1 OF 4

TUBE No.	SAMPLE No.	Cu	Pb	Pb:1	Zn	Ag	As	Au	AuChk	GP-90-1
1	225409	405	7350	–	1500	5.5	600	1.936	2.060	0-1
2	225410	640	3650	–	1550	5.5	200	2.408	–	1-2
3	225411	370	4950	–	3700	7.5	200	2.316	–	2-3
4	225412	555	>10000	1.01	3650	10.0	300	3.590	–	3-4
5	225413	555	4000	–	710	5.5	400	2.454	–	4-5
6	225414	510	2950	–	780	4.0	100	1.174	–	5-6
7	225415	1050	>10,000	1.04	6800	16.5	1500	4.510	4.160	6-7
8	225416	285	3050	–	1150	4.0	200	3.108	–	7-8
9	225417	270	2450	–	1330	4.0	300	0.572	–	8-9
10	225418	575	2400	–	1150	3.0	300	0.736	0.612	9-10
11	225419	515	1750	–	1000	3.5	300	0.764	–	10-11
12	225420	725	1350	–	1225	7.5	100	3.260	–	11-12
13	225421	525	1300	–	770	4.0	100	1.122	–	12-13
14	225422	910	1550	–	850	4.0	<100	1.320	–	13-14
15	225423	1100	1500	–	1700	4.0	<100	0.774	–	14-15
16	225424	850	720	–	1350	4.0	<100	1.434	–	15-16
17	225425	1700	1000	–	2250	10.0	<100	5.610	4.400	16-17
18	225426	430	220	–	1100	4.0	<100	1.746	–	17-18
19	225427	300	215	–	940	2.5	100	0.720	–	18-19
20	225428	1325	330	–	1025	4.5	<100	1.552	–	19-20
21	225429	395	305	–	1650	3.5	<100	0.742	–	20-21
22	225430	375	240	–	1050	2.5	<100	3.836	–	21-22
23	225431	195	605	–	1450	2.5	<100	0.730	–	22-23
24	225432	125	220	–	360	4.5	<100	1.716	–	23-24
25	225433	140	120	–	285	1.5	<100	0.400	–	24-25

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

0159

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

395165

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No	PAGE
	999.59.08.07060	02/05/90		2 OF 4

TUBE No.	SAMPLE No.	Cu	Pb	Pb:1	Zn	Ag	As	Au	AuChk	GP-90-3
1	225435	80	15	–	110	1.0	300	0.650	–	24-24.6
2	225436	55	40	–	130	1.0	900	0.858	0.640	23-24
3	225437	15	100	–	305	0.5	200	0.034	–	22-23
4	225438	10	45	–	120	0.5	400	0.532	–	21-22
5	225439	35	15	–	135	2.0	300	1.424	–	20-21
6	225440	225	55	–	290	7.0	600	4.654	4.480	19-20
7	225441	125	25	–	610	1.0	800	0.282	–	18-19
8	225442	80	20	–	220	1.0	400	1.562	–	17-18
9	225443	60	60	–	570	3.0	200	1.918	–	16-17
10	225444	60	50	–	445	3.5	300	2.968	–	15-16
11	225445	65	215	–	1050	4.0	600	2.444	2.484	14-15
12	225446	55	480	–	750	4.5	800	4.294	4.140	13-14
13	225447	30	450	–	710	7.5	2300	8.134	7.500	12-13
14	225448	55	105	–	195	0.5	300	0.282	–	11-12
15	225449	30	95	–	200	1.0	2700	0.334	–	10-11
16	225450	65	125	–	205	1.0	700	0.522	–	9-10
17	225451	10	45	–	170	0.5	100	0.170	–	8-9
18	225452	15	65	–	535	2.5	100	1.348	–	7-8
19	225453	40	80	–	745	4.0	200	2.244	–	6-7
20	225454	50	130	–	335	16.0	100	8.534	8.480	5-6
21	225455	375	270	–	3300	5.5	900	0.456	–	4-5
22	225456	135	180	–	950	7.5	1000	1.560	–	3-4
23	225457	115	40	–	450	3.0	400	0.536	–	2-3
24	225458	190	65	–	330	3.0	600	0.382	–	1-2
25	225459	115	50	–	350	2.0	800	0.104	–	0-1

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

0160

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

395166

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.07060	02/05/90		3 OF 4

TUBE No.	SAMPLE No.	Cu	Pb	Pb:1	Zn	Ag	As	Au	AuChk	GP-90-2
1	225460	405	20	–	190	1.0	200	0.246	–	26-25
2	225461	1250	20	–	340	3.0	700	1.072	–	24-25
3	225462	115	25	–	145	3.0	1300	0.132	0.110	23-24
4	225463	135	30	–	150	2.5	1000	0.266	–	22-23
5	225464	335	55	–	250	2.0	500	0.186	–	21-22
6	225465	135	100	–	150	3.0	300	1.520	–	20-21
7	225466	50	30	–	245	1.0	200	1.376	–	19-20
8	225467	65	75	–	165	1.0	900	0.248	–	18-19
9	225468	130	45	–	155	1.5	300	0.592	–	17-18
10	225469	590	235	–	210	5.0	500	0.574	–	16-17
11	225470	165	155	–	350	3.5	500	0.060	–	15-16
12	225471	180	935	–	1775	2.5	700	0.040	0.050	14-15
13	225472	355	2925	–	1100	4.0	900	0.496	–	13-14
14	225473	235	690	–	760	1.0	700	0.144	–	12-13
15	225474	250	50	–	145	1.0	500	0.664	–	11-12
16	225475	100	75	–	155	5.5	100	4.532	4.280	10-11
17	225476	150	120	–	170	2.5	700	0.780	–	9-10
18	225477	165	150	–	145	5.0	400	0.430	–	8-9
19	225478	365	70	–	205	1.5	200	0.178	–	7-8
20	225479	205	475	–	460	2.5	900	0.790	–	6-7
21	225480	155	3000	–	1050	3.0	700	0.358	–	5-6
22	225481	180	530	–	585	25.0	1500	0.523	–	4-5
23	225482	125	1000	–	1100	27.0	1700	0.778	–	3-4
24	225483	130	1250	–	3075	10.5	600	0.284	–	2-3
25	225484	180	3075	–	1500	3.5	1200	0.252	–	1-2

Results in ppm unless otherwise specified
T = element present but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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395167

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.03.07060	02/05/90		4 OF 4

TUBE No.	SAMPLE No.	Cu	Pb	Pb:1	Zn	Ag	As	Au	AuChk	GP-90-2
1	225485	300	8150	–	985	6.5	700	0.070	–	0 – 1
2	225486	65	165	–	760	<0.5	200	0.062	–	Above STN 15
3	225487	330	975	–	1100	11.0	7000	2.036	–	As for 225405
4	225488	310	2250	–	1675	6.5	800	3.176	–	4mW of STN 153
5	225489	1500	75	–	240	3.0	3700	0.314	–	As for 225402
6										
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13										
14										
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19										
20										
21										
22										
23	DETECTION	5	5	0.01	5	0.5	100	0.008	0.008	
24	UNITS	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	
25	METHOD	101	101	101	101	101	101	309	309	

Results in ppm unless otherwise specified
T = element present, but concentration too low to measure
x = element concentration is below detection limit
– = element not determined

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A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 52 Murray Road, Welshpool, W.A. 6106 Telex AA92560
FAX: 004 31 8890

ANALYTICAL REPORT No. 999.59.08.07143

0162

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

ORDER No.	PROJECT
0010	

DATE RECEIVED	RESULTS REQUIRED
05/06/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
4	27/06/90	1	34

STATE OF SAMPLES		PRE-TREATMENT							ANALYSIS		
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	Various	PU							Mn,Ni,Co,Mo,Ba,Cr,Fe,Ta,V,Li/201		
	Various	PU							Sb/401		
	Various	PU							W/401		
	Various	PU							W/403		

RESULTS TO

Mr.P.Jones
Noranda Pty.Ltd.,
Saddle Road,
Kettering
Tasmania 7155

RESULTS TO

REMARKS

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Mo	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

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0163

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

395169

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.07143	27/06/90	0010	1 OF 4

TUBE No.	SAMPLE No.	Mn	Ni	Co	Mo	Ba	Cr	Fe	Ta	V
1	225225	353	<10	7	<10	5290	31	6.89	<10	121
2	225414	11300	18	131	<10	5177	54	6.19	<10	124
3	225415	8960	50	213	<10	4959	42	6.64	<10	94
4	225417	17700	37	479	<10	5118	43	8.58	<10	88
5	225422	6637	16	73	<10	3831	90	6.94	<10	188
6	225425	14200	18	36	<10	2401	69	9.12	<10	215
7	225426	12200	12	36	<10	1593	72	8.52	<10	202
8	225427	10500	12	48	<10	3502	77	8.10	<10	206
9	225432	12700	11	18	<10	2790	86	8.64	<10	240
10	225433	12900	10	17	<10	3332	70	9.36	<10	183
11	225437	6598	16	144	<10	5041	64	6.74	<10	218
12	225439	2895	16	170	<10	4799	54	5.80	<10	258
13	225440	3785	58	356	<10	3202	75	10.68	<10	208
14	225446	9095	32	489	<10	3223	57	10.70	<10	204
15	225447	9817	44	1278	<10	2515	70	10.13	<10	236
16	225448	9394	16	145	<10	2766	53	11.41	<10	214
17	225452	8390	11	38	<10	1826	67	10.45	<10	268
18	225454	7140	12	46	<10	3946	71	9.08	<10	246
19	225455	3624	27	267	<10	2188	71	6.30	<10	134
20	225456	6473	32	548	<10	2224	63	6.06	<10	155
21	225466	3253	19	115	<10	4140	70	9.57	<10	223
22	225467	3146	17	337	<10	4791	71	7.77	<10	205
23	225473	5992	26	390	<10	2896	56	10.95	<10	217
24	225475	3129	16	96	<10	4105	60	8.98	<10	238
25	225480	6639	26	400	<10	4242	59	7.46	<10	181

Results in ppm unless otherwise specified
T = element present but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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0164

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395170

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.07143	27/06/90	0010	2 OF 4

TUBE No.	SAMPLE No.	Mn	Ni	Co	Mo	Ba	Cr	Fe	Ta	V
1	225412	—	—	—	—	—	—	—	—	—
2	225416	—	—	—	—	—	—	—	—	—
3	225420	—	—	—	—	—	—	—	—	—
4	225430	—	—	—	—	—	—	—	—	—
5	225444	—	—	—	—	—	—	—	—	—
6	225445	—	—	—	—	—	—	—	—	—
7	225453	—	—	—	—	—	—	—	—	—
8	225488	—	—	—	—	—	—	—	—	—
9	225443	—	—	—	—	—	—	—	—	—
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11										
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16										
17										
18										
19										
20										
21										
22										
23	DETECTION	15	10	5	10	5	10	0.01	10	2
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm
25	METHOD	201	201	201	201	201	201	201	201	201

Results in ppm unless otherwise specified
T = element present: but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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0165

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395171

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.07143	27/06/90	0010	3 OF 4

TUBE No.	SAMPLE No.	Li	Sb	W	W					
1	225225	8	–	–	–					
2	225414	4	5	–	–					
3	225415	4	30	85	–					
4	225417	3	–	–	–					
5	225422	5	5	–	–					
6	225425	5	10	>300	0.261					
7	225426	6	5	–	–					
8	225427	5	–	–	–					
9	225432	5	6	–	–					
10	225433	4	–	–	–					
11	225437	4	–	–	–					
12	225439	5	6	–	–					
13	225440	5	<3	>300	0.601					
14	225446	5	<3	90	–					
15	225447	6	<3	55	–					
16	225448	6	–	–	–					
17	225452	7	<3	75	–					
18	225454	5	9	95	–					
19	225455	5	–	–	–					
20	225456	6	7	55	–					
21	225466	5	4	–	–					
22	225467	4	–	–	–					
23	225473	6	–	–	–					
24	225475	5	3	230	–					
25	225480	4	–	–	–					

Results in ppm unless otherwise specified
T = element present, but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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395172

0166

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.59.08.07143	27/06/90	0010	4 OF 4

TUBE No.	SAMPLE No.	Li	Sb	W	W					
1	225412	–	7	>300	0.091					
2	225416	–	10	>300	0.153					
3	225420	–	6	180	–					
4	225430	–	6	45	–					
5	225444	–	5	100	–					
6	225445	–	<3	130	–					
7	225453	–	5	110	–					
8	225488	–	55	70	–					
9	225443	–	–	190	–					
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	2	3	20	0.005					
24	UNITS	ppm	ppm	ppm	%					
25	METHOD	201	401	401	403					

Results in ppm unless otherwise specified
T = element present: but concentration too low to measure
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— = element not determined

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APPENDIX 6

Diamond Drill Hole Logs
Fire Tower Prospect

DRILLHOLE : GP - 90- 1 DEPTH : 24.7 metres

COORDINATES : DECLINATION : Vertical

0168

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
0	1	0.7	100	Coring Starts @ 0.3 m. Highly weathered, oxidised, ferruginous manganiferous, very quartz rich EPICLASTIC. Medium to coarse grained, most quartz grains are subangular, moderately veined, strong silica/sericite/carbonate altered.	Fine grained gn to 0.5% as disseminations and stringers. Minor cpy also and minor py as blebbs or coarser disseminated aggregates. to 1-1.5%	Mod. to strong quartz carb. hem. veining varying from 45° to 60° to ca. Some Shearing at 30° to ca. Some veining Mn coated.	Core poorly fractured.	Mod.	405	7350	1500	5.5	600	1.94
1	2	1.0	100	Ditto: More fine to coarse grained, some small shale fragments, strongly altered, occaissionally brecciated along major veined areas.	Py as vein fillings or as large aggregates, minor fine disseminations totalling ≈ 2-3%. Tr to minor gn filling fine veinlets (late stage)	Strong veining qtz/carb/hem minor mn some relict py filling veinlets @ 20° to ca. Hem Mn veins generally @ 50-60°	late stage fine fillagree veinlets gn/ sericite? filled @ 75° to ca.	Wk.	640	3650	1550	5.5	200	2.41
2	3	1.0	100	Ditto: Possible ghosted fiamme? quite coarse grained qtz EPICLASTIC.	Strongly pyritic 3-5% as diss's, aggreg's, and 1cm wide veins. Py boundaries oxidised to hem. Minor gn as fine diss's.	Strong quartz pyrite (hem) also quartz carbonate veining, varying from 1 vein/ 5cm's.	Massive unit poorly fractured Micro fractured gn/sericite filled, @ 75° to c.a.	Mod.	370	4950	3700	7.5	200	2.32
3	4	1.0	100	Ditto: Finer grained, moderate to strongly sulphidic, massive unit, strongly silica/sericite altered, Major brecciated manganiferous/hematite vein from 3.70 - 4.00 metres. Unit contains ghosted fiamme.	strongly pyritic ≈ 5% as above. Also minor to mod. gn as fine diss's to 0.5 to 1.0%. Gn predominantly as late stage veinlets at high angle to core.	Strongly qtz/ carb. veined generally @ 60° to ca. and usually 1-3mm in width. Minor blebby py as vein fillings (partly oxid. to hem.) Major vein 3.70-4.00 hem/mn filled	Fine late stage veinlets as above.	Mod.	555	1.01%	3650	10.0	300	3.59

395174

DRILLHOLE : GP-90-1 DEPTH : 24.7 metres

COORDINATES : DECLINATION : Vertical.

0105

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
4	5	1.0	95	EPICLASTIC : Coarser grained than previous intervals, also stronger carb. veined (siderite), minor shale fragments or thin bed @ 25° to c.a.	Weak to mod. py as disseminations and aggregates to 1-3%. Minor gn in qtz veins @45° to ca. 1-2 mm width.	Strong qtz/carb (siderite) veining up to 0.8 cm @ 85° to ca. Major vein breccia from 4.0 to 4.25m. Hem/Mn filled (see interval 3-4)	Major low and shear orientation Qtz/carb. veined occasionally.	Wk.	555	4000	710	5.5	400	2.45
5	6	1.0	100	Ditto: Variable fine to coarse grained quartz rich epiclastic, strong carb. alteration also strong silica/sericite.	Weakly sulphidic, strongly qtz/carb. veined. Tr Gn and weak py <1%	In places intense qtz/carb. veining 3-7 veins/cm, some hematitic filled (after py or carb?) varying from 60° to 30° to ca some conjugate sets.	As above.	Nil	510	2950	780	4.0	100	1.17
6	7	1.0	100	Fine grained Siliceous Volcanic or Epiclastic unit, strongly altered and sulphidic, strongly veined and contains minor laminated cherty? fragments. Minor manganese coatings on fracture surfaces. Minor shale fragments.	Strong py to 3-4 % as dissemin's and aggregates and minor gn as very fine grained disseminations up to 0.5% - 1.0%	Strong veining up to 4-6 veins per cm @ 45-50° to ca. Py oxidising to Hem at edges. Strong clay? alteration in microfractures.	Minor fracturing @ 60° to c.a.	Nil	1050	1.04%	6800	16.5	1500	4.51
7	8	1.0	100	Mixed sequence of fine VOLCANICS and med. grained qtz rich EPICLASTIC. Strong qtz/carb. altered - pervasive throughout matrix, strongly veined, minor large rock fragments to 1cm diameter.	Minor py locally up to 1-2% over 5cm as vein filling however, rest of interval as diss's. Tr gn in qtz veinlets.	Strong to intense qtz/carb veining with only minor py veining. Py vein @ 45° to ca and qtz/carb conjugate to that. Other Hem veinlets @ 45° to ca.	One major Hem. veinlet along shear orientation @ 20° to c.a.	Mod.	285	3050	1150	4.0	200	3.11

395175

DRILLHOLE : GP-90-1 DEPTH : 24.7 metres.
COORDINATES : DECLINATION : Vertical.

01720

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
8	9	1.0	100	Predominantly fine grained VOLCANIC with minor coarse grained qtz rich EPICLASTIC sections. Matrix extensively carbonated and silicified. Major hematite cemented angular breccia zone @ 8.60 to 8.80 metres. Weakly mineralized, moderately veined, minor chloritic fragments	Minor py (<1%) as fine disseminations and minor blebbs. Tr gn as fine grained infilling to thin quartz veins (late stage)	Mod. qtz/carb and carb/hem veinlets generally < 1-2mm @ 60-65° to ca. Major breccia zone 8.60-8.80 with angular frags in hem matrix plus manganese.	Core massive, little fracturing	Tr.	270	2450	1330	4.0	800	0.57
9	10	1.0	100	Intermixed fine volcanics and coarse qtz rich epiclastic, strongly carb/silica altered, strongly veined, moderately fractured sequence. Sections show large angular fragments in finer matrix.	Mod py from 1-3% with minor to strong gn reaching up to 0.5% over narrow intervals. But is generally pervasive throughout.	Major qtz/carb vein (20cm width) from 9.0 m. Brecciated ferruginous zone from 9.2-9.3m. Hem vein @ 45° to ca. Late stage qtz veins @ 60° to ca and ≃ 90° to Hem veins.	Mod fracturing around breccia zone. Most fracture surfaces are Hem coated indicating high fluid flows.	Nil.	575	2400	1150	3.0	300	0.74
10	11	1.0	100	Ditto: with black shale cast.	Weak to mod. py 1-2% as aggregates and disseminations with Tr to minor gn. Large Hematite zones after carbonate. (siderite) Tr Cpy.	Strong carb/hem and qtz/carb veining. Qtz carb veins cross cut foliation at ≃ 90°. Veins oriented 50° to c.a.	Core Mod broken along microfractures.	Nil	515	1750	1000	3.5	300	0.76
11	12	1.0	100	Ditto:	As above for py, gn and cpy.	Pyrite vein @ 40° to ca cut by Qtz/carb vein trending 50° to c.a. (conjugate to py).		Tr	725	1850	1225	7.5	100	3.26

395176.

DRILLHOLE : GP-90-1 DEPTH : 24.7 metres.
COORDINATES : DECLINATION : Vertical.

017

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
12	13	1.0	100	Ditto: Fractured, ferruginous veined zone from 12.15 to 12.50 metres, no observable clasts.	Weakly diss. py <1%. Tr to minor gn. as fine disseminations in late stage cross-cutting qtz veinlets.	Mod quartz/carb. and carb hem. veining. Tr py in vein filling. Major gossanous layered and fractured vein trending ≃ 40° to ca @ 12.15 to 15.50 m.	Core mod. fractured & broken near ferruginous zone. Fracture faces show evidence of leaching.	Nil.	525	1300	770	4.0	100	1.12
13	14	1.0	100	Ditto: Showing no large clasts, core strongly veined and fractured from 13.6 to 14.0 metres.	Weak py ≃ 1% as fine veinlets or small aggregates. Tr cpy. in large Qtz/carb veins. Tr gn. in cross-cutting qtz veinlets.	Moderate veining ≃ 1 per cm. Generally qtz/carb. or carb/clay? Some py and cpy aggreg in some qtz carb veins, generally @ 60° to ca. Major ferrug. zone @ 45° to c.a.	Core mod to strongly fractured. Many fracture faces Mn. coated or hem. coated.	Nil.	910	1550	850	4.0	<100	1.32
14	15	1.0	95	Ditto: Veined and fractured zone from 14.0 to 14.10 and also strongly fractured at 14.40 to 14.80 metres.	Weak to mod. py 1-3% as diss's and vein fillings plus aggregates. Tr to minor gn. Tr to minor cpy	Intense qtz clay? veining with minor sulphidic component (py) @ 50° to ca. Qtz carb vein (0.6 cm width) vertical to ca. Hem vein sub parallel to ca. Weak to mod. veining, predominately carb. some qtz/carb. and rare py veins. - varying from near vert. to 45° to ca. One vein subpll to ca. containing py/carb/qtz tr gn.	strong fracturing from 14.40 to 14.80 metres.	Tr	1100	1500	1700	4.0	<100	0.77
15	16	1.0	100	Predominantly siliceous altered, weakly sulphidic, carbonated, quartz rich EPICLASTIC. Core moderately fractured. Matrix strongly microfractured and carbonate/clay stockworked.	Minor py to 2% as fine wispy aggregates and disseminations with minor cpy, Tr gn. Some py with carbonate veining.		Core moderately fractured with surfaces hematite coated. Core matrix strongly microfractured and clay/carbonate filled.	Wk	850	720	1350	4.0	<100	1.43

395177

DRILLHOLE : GP-90-1 DEPTH : 24.7 metres.
COORDINATES : DECLINATION : Vertical.

0172

INTERVAL From	To	Metre	% Rec-overy	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
16	17	1.0	100	Coarse grained, strongly silicified and carbonate altered quartz rich, mod. sulphidic EPICLASTIC. Brecciated, clay/carbonate stockworked, veined. Major veins @ 16.60-16.65 and 16.95-17.00.	Mod to strongly pyritized (3-4%) with minor cpy and Tr gn. Large py vein @ 16.15m. Some large aggreg's of py to 1.5 cm diam. otherwise as fine aggreg's throughout matrix. (as is fine cpy)	Intense carb/clay veining (stockworking) with some brecciation. Some qtz/carb. veining (Tr gn) Major hem. veins trending 45-50° to ca.	Core mod fractured around hem. veins due to movement along veins.	Wk	1700	1000	2250	10.0	<100	5.61
17	18	1.0	95	Ditto: Major vein from 17.00 to 17.10m also @ 17.90-18.00. Core very siliceous and carbonated, mod to strongly veined and fractured, minor black shale siltstone clasts. Unit brecciated. Clast of fine grained sphalerite.	1-3% pyrite Tr cpy and gn Py as fine aggreg's and wispy lamellae parallel to shearing orientation. Frag. of sphalerite.	Intense clay/carb. stockworking and mod qtz/carb veining to 2-3 mm width, @ 40° to ca and a second set 90° to this. Shearing Sub// to ca. Major vein @ 45° to ca (Hem filled). Major vein sub// to ca.	Moderate to strong fracturing around vein areas.	Nil	430	220	1100	4.0	<100	1.75
18	19	1.0	95	Ditto: No fragments, little sulphide, moderately fractured.	Weak py <1%, Tr gn in qtz veinlets.	Intense clay/carbonate veining - to brecciation, and weak qtz/carbonate veinleting @ 45° to 50° to ca	Weak to mod fracturing with hematite on fracture planes.	Tr.	300	215	940	2.5	100	0.72
19	20	1.0	100	Ditto: Plus black shale clasts and chloritic fiamme, strongly fractured, strongly quartz/hematite veined.	Mod pyritic 2-3% as large aggregates and/or fine disseminations. Tr cpy and gn.	Weak to mod veining, predominantly qtz/carb. some hematite @ 75° to ca and thinner veinlets 90° to the former.	Core badly broken and highly fractured giving rise to rubbly interval, many fractures hem. coated.	Nil	1325	330	1025	4.5	<100	1.55

3951178

DRILLHOLE : GP-90-1 DEPTH : 24.7 metres
COORDINATES : DECLINATION : Vertical

017

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
20	21	1.0	100	Ditto:	Ditto except py < 1.5%.	Mod to strong hem. veining generally < 2mm width varying from 40-50° to ca. Qtz/Carb. veining to 65° to ca (contain py, cpy) Qtz veinlets (tr gn) @ 50° to ca.	Leaching by water down through open veinlets. Core badly broken.	Tr.	395	305	1650	3.5	<100	0.74
21	22	1.0	95	Ditto:	Ditto: < 1% py Tr gn.	Mod to strong clay/carb. veining (stock working) Some times brecciated Some carb (sid) veining @ 30-35° to ca. qtz carb @ 70° to ca.	Core weakly broken, relatively massive unit.	Nil	375	240	1050	2.5	< 100	3.84
22	23	1.0	100	Ditto: Except larger proportion of clastic fragments (grit size) mainly siltstone and black shale. Core still strongly siliceous and carbonate altered, matrix of core extensively stockworked and in part brecciated.	Py to 1-3% variable as aggreg's, lamellae, dissem's Tr coarse dissem. cpy and tr gn	Major py vein @ 10-15° to ca. (large black sh. frag. @ same orientation). large carb veins to 1-2cm width @ 45° to ca and second vein @ 50° to ca (conjugate to first) Matrix brecciated	Core weakly fractured. Surfaces generally hem stained.	Nil.	195	605	1450	2.5	< 100	0.73
23	24	1.0	100	Ditto: Lithic quartz rich EPICLASTIC. Many different types of fragments. Extensive silica/carbonation alteration. Some chloritic fiamme.	Py < 1.5% Tr gn in thin qtz veinlets. or in qtz/carbonate veinlets.	Mod veining mainly qtz/carb and carb. veins < 2mm width. Leached and open. Matrix extensively clay/carb. veinleted and stockworked. In part brecciated.	Ditto.	Nil.	125	220	360	4.5	< 100	1.72

395179

DRILLHOLE : GP-90-1 DEPTH : 24.7 metres

COORDINATES : DECLINATION : Vertical

0174

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
24	24.7	0.7	100	Sheared fiamme (chloritic) rich quartz EPICLASTIC. Extensively carbonate / clay stockworked. Strongly siliceous and carbonate altered.	Py < 1.5% Tr gn.	Extensive clay carb. stock-working in part brecciated Only minor to weak qtz carb and carb veining Veins < 2mm in width.	Core weakly fractured. Surfaces hematite stained.	Tr	140	120	285	1.5	<100	0.40
	EOH.			END OF HOLE.										

395180

017

DRILLHOLE : GP - 90 - 2 DEPTH : 25.8 metres

COORDINATES : DECLINATION : Vertical

INTERVAL From	INTERVAL To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
0	1	0.7	100	Coring starts 0.3m. Highly weathered, oxidised, ferruginous, manganiferous, fine/coarse EPICLASTIC. Quartz grains rounded, Minor sheared out shale fragments.	Relict pyrite as lge clasts? lot of He/Mn in vein and fracture fillings.	Major Hematite sheared vein 010° to ca, mod to strong veining	Lot of fillagree Manganese on fractures and cleavage faces.	Nil	300	8150	985	6.5	700	0.070
1	2	1.0	100	1.00 - 1.70 Ditto : with more abundant shale frag's, pyritic, extensively veined, finer grained. 1.70 - 2.0 Sheared SHALE : Contact ≈ 40° to ca. Shale cut by pyrite veinlets Shale partly silicified and bedded.	Py as thin veinlets vein fillings and lge clasts or aggregates. Tr gn in shale section. Py generally in close association with hematite.	Strong veining @ 1.5m with 1 vein/cm. Thin veinlets @ 30-45° to ca, conjugate to these (hem. filled) are py/hem veins @ 40° to ca. Also major Mn/Hem shear @ 20° to ca.	Fracturing bedding parallel (Shale)	Nil	180	3075	1500	3.5	1200	0.252
2	3	1.0	100	2.0 - 2.5 Sheared SHALE/SILTSTONE BRECCIA, silicified, matrix of quartz and feldspar as subrounded grains OR felsic INTRUSIVE. 2.5 - 3.0 QUARTZ FELDSPAR INTRUSIVE, equigranular coarse grained/medium grained. Unit pyrite with Minor to mod. galena. Massive unbedded unit.	Majority of py as lge aggregates, abundant Gn as fine veinlets Py ≈ 2-3% Gn 1-2% Hem. as oxidation product of pyrite.	Weak quartz/carbonate veining Minor Hem/Py vein @ 60° to ca (1cm width) Thinner qtz/car (<2mm) @ 80°-60° to ca.	Fracture @ 10-15° to ca. Massive core, good recoveries with little fracturing.	Nil	130	1250	3075	10.5	600	0.284
3	4	1.0	100	Ditto : mod. to strongly py/gn rich albitized ? (pinkish) equigranular felsic intrusive. Core cut by siderite veinlets and thick py veins 1-2.5cm, thin gn veinlets.	Mod to strong py av (5-7%) as large thick veins with hem. coatings. Gn as finely disseminated aggregates to 2-3% over 20cm from 3 metres.	Lge py veins 50° to ca, conjugate to these is another vein @ 10° to ca and another @ 40° Siderite 57° to ca. Siderite + Py @ 40° to ca Py veins 1 every 7cm's.	Minor open space fracturing @ 70° to ca.	Nil	125	1000	1100	27.0	1700	0.778
4	5	1.0	100	Ditto : looks more well sorted Epiclastic than intrusive, grains sub-rounded, unit quite massive.	Lge up to 3cm wide Py/hem veins, tr gn. Py ≈ 5-6%.	Mod veining, Py veins up to .5 cm wide. rimmed by Hem. Minor qtz/siderite veining Py veins 10-40° to ca Py vein every 7cm's	Hematite/Manganiferous Shear zone ≈ 1-2cm wide @ 4.95m @ 20° to ca.	Nil	180	530	585	25.0	1500	0.523

395181

DRILLHOLE : GP-90-2 DEPTH : 25.8 metres

COORDINATES: DECLINATION : Vertical.

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
5	6	1.0	100	5.0 - 5.3 Ditto : except extensive Hem/ Mn alteration at contact. 5.3 - 6.0 Extensively sheared, fractured, mod/strongly Hem/ py veined FINE VOLC/ minor quartz rich EPICLASTIC. Core badly broken.	Py to 2% Hem. quite strong as well as manganiferous component.	Strong veining, mainly Hem. Minor py as well as Mn, sections well stockworked up to 1 vein/cm. widths generally 1-2mm.	Open space fracturing, leaching of Hem/ py fillings to veins. Mn shear zone @ 40° to ca @ 5.4 metres.	Tr	155	3000	1050	3.0	700	0.358
6	7	1.0	100	Ditto : from 53m, slightly more massive, less broken, strongly veined, minor quartz carbonate veinlets.	Py 1-2% rimmed by Hem, up to 0.5cm wide. Strong Hem minor Manganese.	Mod /Strg Hem/ py minor Mn veining. Main veining 40-70° to ca. Hem being pervasive around veins.	Minor to mod open space fracturing indicative of leaching. generally 55° to ca.	Wk	205	475	460	2.5	900	0.790
7	8	1.0	100	Ditto : more filagree cream coloured quartz/carbonate or siderite veinlets. Sections show intense stockworking. Core mod. py/ hem veined. Breccia textures in heavily dolomitized areas.	Py 1-2%, Hem mod to strong. Minor manganese.	Qtz/carb and Siderite up to 10 veinlets/cm. Py/hem vary from 1 vein every 10-15 cm. Major veins @ 50-60° to ca. others @ 40° to ca.	Open space fracturing @ 40° to ca and as low as 5° to ca.	Wk	365	70	205	1.5	200	0.178
8	9	1.0	100	Ditto : except core becoming increasingly sericitic altered. Core shows significant shear texture. Mod py/hem veining. Minor dolomite veining. Minor lithic frags. to 0.6cm length.	Py 5% (less hem - oxidation) Hem moderate.	Mod py/hem veins up to 0.5cm width av 1 vein/6cm's Veins vary from 50° to 70° to ca some leaching. Qtz/Carb. veins 90° to main shear orientation (cleavage ?)	Minor open space fracturing leached hem? 50° to ca. Mn shear @ 45° to ca 3mm width. Further slickensided shear @ 20° to c.a.	Tr	165	150	145	5.0	400	0.430
9	10	1.0	100	Ditto : core also becoming increasingly sideritic (veinlets) Zone weakly to moderately veined.	Py 1-3% variable Minor Hem/ Mn.	At 9.3m have 10 cm wide zone of Hem/py/siderite minor Mn @ 40-50° to ca. Some py as fine grained wispy veinlets/ follow foliation. Veining density @ 1/cm.	Minor leached zones after carbonate @ 60° to ca.	Wk	150	120	170	2.5	700	0.780

DRILLHOLE : GP - 90 - 2 DEPTH : 25.8 metres

COORDINATES : DECLINATION : Vertical

017

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
10	11	1.0	100	Ditto : except extensively sericitized and siderilized Lithic TUFF or medium to coarse grained EPICLASTIC with Subrounded qtz grains prominent. Weakly hematite veined, weakly broken, massive.	Weak hematite veined section <1% py as fine disseminations.	Very strong to extreme siderite veining, well stockworked, also clay veining after sericite? veining <1mm and generally < 0.2mm. Hem veins vary from 30-60° to ca day and siderite veins 60-70° to ca.	weakly fractured. Slickensided surface @ 30° to ca. sub parallel to hematite veins	Tr	100	75	155	5.5	100	4.532
11	12	1.0	100	Ditto : more broken and more quartz/ carbonate veined. Weak hem/ py veined. Abundant lithic frags. Shale frags to 4cm in length Sometimes sphaleritic.	Weak hem/ py mineralization. Py ≃ 1%. Minor sphalerite in shale fragments.	Qtz/carb veins 60-70° to ca. 1-3mm width. 1.6 veins/cm. Hem veins up to 4cm wide @ 60° to ca in general.	Major fracturing from 11.10 to 11.40 - broken core.	Nil	250	50	145	1.0	500	0.664
12	13	1.0	100	Ditto: less broken, extensively dolomite/ sericite altered. Mod to strong veined minor sphaleritic EPICLASTIC. Major ferruginous shear zone @ 12.60m ≃ 5-7 cm wide.	Py < 2% as fine disseminations and weak veins rimmed by hematite. sphalerite to 2-3% over ≃ 10 cm's adjacent to ferrug. shear zone @ 12.60m. Minor to tr cpy as disseminations and fine stringers.	Major ferrug/ manganiferous shear 25° to ca. Major qtz/hem veins @ 70° to Ca. cut shear zone @ 90° Upwards of 1 vein/cm.	Core moderately fractured.	Nil	235	690	760	1.0	700	0.144
13	14	1.0	100	Ditto: 13-13.60 heavily veined goerthite pyrite and qtz/siderite, extensively altered, lithic, qtz rich beige green EPICLASTIC. 13.60 - 14.00 Extensively broken ground of above,	Veined py + hem quite strong with veins up to 0.5 cm width every 5 cm of core. Py 2-3%. Significant qn as fine veinlets sub parallel to qtz/carb veins.	Major py veins @ 40-60° to ca. One at 20° to ca Majority of qtz/ carb veinlets (<2mm width) cross cut at high angle the py veins. Most qtz/carb @ 50-65° to ca. Some Conjugate fractures show pervasive ferrug alter	Core extensively broken. from 13.60 - 14.00 metres.	Tr	355	2925	1100	4.0	900	0.496

305183

DRILLHOLE : GP-90-2 DEPTH : 25.8 metres

COORDINATES : DECLINATION : Vertical

0178

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
14	15	1.0	100	Very chloritic, minor sericitic, dark green, qtz rich, carbonate veined, strongly hematite veined EPICLASTIC. Core moderately broken.	Py to 2%, tr spl and possibly cpy, strong and extensive hematite veining and pervasive hem alth. as stockworking.	Two prominent hem|py veins sets 1) 25° to ca and 2) 50° to ca. (low angle to each other) Dolomite veining at 10° to ca. Py|Hem veins vary from 2mm to 0.5 cm. Dol av 1-2mm. Extensive clay veinlets after Seric.	Core mod. fractured, some open spaces due to leaching. Slickensided surface @ 40° to ca Sub parallel to veining.	Nil	180	835	1975	2.5	700	0.040
15	16	1.0	100	Ditto: Very strong quartz carbonate (siderite?) veinleting with ancillary qtz/chlorite tension gash infillings. Weak py|hem veining. Minor py/spl as disseminations or aggregates.	Py <1.5% as diss and aggregates. Some associated with thin veins. Minor spl assoc with py. Core less strongly economic veined.	Core extensively and v. strongly qtz/carb. veined and qtz/chl veinleted ± 50° to ca. Minor hem|py veins @ 40-45° to ca and ± 90° to qtz/carb. veins.	Not significant as core weakly broken. Some open space due to leaching	Tr	165	155	350	3.5	500	0.060
16	17	1.0	100	Sericite silica altered, extensive clay, qtz/carb, and pyrite veined beige green quartz rich EPICLASTIC. Moderate to strong py|hem veining. Large darker green pumiceous fragments not flattened greatly.	Mod to strong py|hem veining with py 3-4%. as fine veinlets, in veins with siderite and as clusters or aggregates. Mod to Strong hem component. Tr gn.	Major py|hem vein @ 20° to ca and 90° to other vein set @ 40° to ca. Other veins @ 40-50 and also 70° to ca. Approx 25 major veins to the metre. less but stg. qtz|carb veining present as are the myriad textured clay veinlets.	Core broken and fractured with hematitic fracture surfaces from 16.7m to 17.0 metres.	Nil	590	235	210	5.0	500	0.574
17	18	1.0	100	Ditto: moderately to strongly hematite pyrite veined. Minor rounded lithic fragments to 1cm length.	Ditto with gn.	Ditto without the shear zone for 18-19.	Fractures dolomite/py healed @ 20° to ca.	Wk.	130	45	155	1.5	300	0.592

395184

DRILLHOLE : GP-90-2 DEPTH : 25.8 metres
COORDINATES : DECLINATION : vertical.

INTERVAL From	To	Metre	% Rec-overy	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
18	19	1.0	100	Ditto: prominent siltstone fragments, rounded silic fragments, ferruginous shear zone @ 18.6 metre.	Strongly pyritic and hematitic. Py 4-5%. as veins, dissemination and aggreg's tr to minor spl.	Large ferrug. shear zone 15 cm wide @ 18.6. 40° to ca. Other 1-3mm wide py/carb veins @ 40° to ca, 50° and 70° to ca veins are less hematitic but more py/carb carb. iron rich?	Core weakly fractured, relatively unbroken, again 20° to ca vein/fracture cuts 40° veins at high angle (90°±).	Wk	65	75	165	1.0	900	0.248
19	20	1.0	100	Ditto: prominent ferrug/py shear zone @ 19.40 metres.	Py 4-5% as prominent py/carb veins, veinlets, sometimes assoc with hematitic shear zones.	One major vein sub parallel to ca approx 3-5mm width. Shear Zone @ 19.40m ≃ 40° to ca, Some of hem shears cut 90° to qtz/carb veins.	Ditto.	Tr.	50	30	245	1.0	200	1.376
20	21	1.0	100	Ditto: relatively unbroken core, heavily qtz/carb veined, weakly pyritic, + clast of rounded sphalerite.	Very weak py <1%. clast of spl 2-3mm diameter, rounded, fine grained.	Very strong qtz/carb veining @ 60° to ca. Siderik veining (tr py) @ 40° to ca and ≃ 90° to qtz/carb veining. Chlorik gash veining similar to qtz/carbonate.	Ditto.	Nil	135	100	150	3.0	300	1.520
21	22	1.0	100	Ditto: with large ferruginous shear zone @ 21.50 metres, width 15cm's.	Py 2% Trace to minor cpy assoc with py in veinlets tr spl.	Major shear zone 40° to ca, prominent py/carb vein sub parallel to ca. Other hem/py/carb veins at 50 and 70° to ca. Chlorik filled tension gashes @ 20-30° to ca.	Core mod fractured and core slightly broken	Nil	335	55	250	2.0	500	0.186

395185

J180

DRILLHOLE : GP-90-2 DEPTH : 25.8 metres

COORDINATES : DECLINATION : Vertical.

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
22 -	23	1.0	100	Ditto : extensively sericitic and clay veinleted lithic (large siltstone frags) EPICLASTIC. Major pyrite vein @ 22.5m.	Py 2-3% overall, large 1cm with py vein @ 22.5m. Minor gn/spl assoc with py @ 22.2 - 22.35m	Py vein 35° to ca. Py/gn/spl vein 20° to ca and 90° to above. Carb. minor py veins @ 40° to ca. Overall veining Mod. Weak sulphidic veining. Prominent clay filled cleavage @ 30° to ca.	Core weakly fractured. Very good recoveries in weakly broken ground.	Nil	135	30	150	2.5	1000	0.266
23 -	24	1.0	100	Ditto : large pumiceous frags, chloritic, sub rounded with smaller siltstone fragments in qtz rich seri inteuse clay altered EPICLASTIC. Unit auto-brecciated.	Minor py 1-3% Minor gn/spl assoc with aggreg's of pyrite.	Sulphidic vein cut by later qtz/carb vein. large hematitic (py) vein @ 20° to ca. Clay veinleting giving intense stockworking /myriad of fine veinlets. Brecciated texture common.	Core fractured sub parallel to ca, same orientation as large vein. Brecciation texture with some movement of fragments.	Nil	115	25	145	3.0	1300	0.132
24 -	25	1.0	100	Ditto : large frag of quenched volcanic (snowflake texture) incorporated into epiclastic. Unit moderate pyritic, mod to strongly veined.	Pyrite 3-4% as thin <1mm in general veinlets or as minor disseminations and aggregates. Minor cpy and gn/spl	Lot of sulphidic material in fract and veins @ 20° to ca. Major qtz/carb late stage veins. @ 40-50° to ca and 90° to above. Minor zone of intense hem @ 24.25 metre.	Moderate fracturing from 24.0 - 24.35 rest of core relatively unbroken. Some open space fracturing @ 30° to ca, parallel to cleavage	Wk.	1250	20	340	3.0	700	1.072
25 - 25.8	EOH.	0.8	100	Ditto. EPICLASTIC containing large fragments of pumice and clasts of siltstone. Core extensively qtz/carb. veined and extremely sericite/clay altered.	Pyrite 1-2% as thin <1mm in general veinlets or as minor disseminations or aggregates.	Pyritic vein @ 30° to ca, Qtz/Carb gash veins and veinlets @ 50° to ca.	Major slickensided fracture @ 40° to ca parallel to Hem vein but 90° or high angle to pyrite vein.	Tr.	405	20	190	1.0	200	0.246
				END OF HOLE.										

395180

DRILLHOLE : GP-90-3 DEPTH : 24.6 metres

COORDINATES : DECLINATION : -65° GE.

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
0	1	0.5	100	Coring starts @ 0.5m: Highly weathered, oxidised, ferruginous manganiferous, coarse grained, qtz rich EPICLASTIC. Strongly veined and altered.	qtz/hem/mn coated veins and manganiferous filled fractures.	Strong veining overall, some brecciation, general trend being 30° to ca and a conjugate set at ± 30° also.		Nil	115	50	350	2.0	800	0.104
1	2	1.0	100	Ditto: Fine EPICLASTIC component higher than for 0-1m, signs of shearing or flow banding! difficult to distinguish. Minor to moderate brecciation.	Strong hem/mn vein filling and fracture coating.	Very strong veining 1 vein/cm. predominantly @ 30° to ca and conjugate 30° (120° dip) with another sig. trend at 50-55° to ca. A weak low angle trend also occurs @ 15° to ca.	Some of fractures are leached and open. Sections of veined core show rotation and brecciation features.	Nil	190	65	330	3.0	600	0.382
2	3	1.0	100	Ditto: Moderately weathered, with strong veining and quartz sericite hematite alteration.	Ditto.	Strong veining overall, low angle veining more common. (1 vein/cm) ie @ 15° to ca Also high angle 50-55 veining also more common. Most veins < 2mm.	Less altered rocks show clay veining prominently. veinlets < 0.5 mm.	Nil	115	40	450	3.0	400	0.556
3	4	1.0	100	Weak to moderately weathered EPICLASTIC, shale clasts prominent, distinct foliation or primary layering. Core showing strong veining.	Tr to 1% Py Trgn Rest oxidised material, mainly hematite and manganese, also minor qtz component to veins.	Very strong qtz/hem/Mn/(py) veinlets and veins. Generally 50-60° to ca with further set @ 30° to ca. Clay filled veinlets occur throughout.	Major fracture/breccia zone @ 3.40-3.70 m.	Nil	135	180	950	7.5	1000	1.560

DRILLHOLE : GP-90-3 DEPTH : 24.6 metres

COORDINATES : DECLINATION : -65° GE.

0182

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
4	5	1.0	100	Ditto: Pyritic (blebby or fine disseminations) lithic rich (fiamme and chert clasts) EPICLASTICS. Foliation ever present at 25° to ca.	Py 1-2% as blebbs and fine disseminations. Tr fine gn remainder being oxidised material (hem plus mn) Py rimmed by Hem. 10% py tr gn over 10 cm @ 4.30 metres.	Strong veining. significantly more sulphide than oxide, more carbonate than qtz veining. Significant clay veining. Gossauous patches. veining varies from 30 to 55° to ca some low angle veins @ 10-15° to ca.	Minor open space fracturing	Nil	375	270	330	5.5	900	0.456
5	6	1.0	100	Fine grained, strongly altered and moderately veined qtz rich EPICLASTIC. Extensive K-spar ? and sericite/dolomite alteration as pervasive throughout matrix.	Tr - 1% Py as fine disseminations. Tr gn in dark vok fragment as fine disseminations. Also qtz/hem vein fillings	Moderate qtz-hem veined but extensively clay sericite veinleted. oxidised veins vary from 10-70° to ca.	Again leaching causing open fractures.	Nil	50	130	335	16.0	100	8.534
6	7	1.0	95	Ditto: Extensive clay/sericite altered minor quartz/dolomite/veined EPICLASTIC	Tr Py, significant Hem/qtz shear vein @ 6.35 m over 40cm width.	Major hem/qtz vein/shear @ 40° to ca. Other veins @ 40-55° to ca some brecciation evident. Mod. veining overall with thin solitary qtz/hem veins @ 60° to ca	Major ferrug fracture zone @ 6.35m - 6.75 m. Core quite broken either side of zone.	Nil	40	80	745	4.0	200	2.244
7	8	1.0	90	Ditto: Except coarse grained, very qtz rich. Extensively clay sericite altered.	Tr py < 1%.	Weak qtz/hem veining but intensely clay sericite Minor carbonate veinleting.	Core extensively broken	Nil	15	65	535	2.5	100	1.348
8	9	1.0	85	Ditto: With numerous chert and black shale clasts prominent. Rock very foliated.	Tr py and gn as very fine disseminations.	Very weak qtz/hem but intense clay/sericite as pervasive fine veinlets.	Core moderately broken.	Nil	10	45	170	0.5	100	0.170

395188

DRILLHOLE : GP-90-3 DEPTH : 24.6 metres.
COORDINATES : DECLINATION : -65° GE.

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
9	10	1.0	100	EPICLASTIC, strongly altered, contains large chloritic fiamme and other rock fragments.	Py as minor fine grained aggregates <1%.	Intense micro veinleting/clay carbonate) of sheared matrix. Wk qtz, minor carb. veining tr py. Some @ 45° to ca other @ 75° to ca (45° to first) Micro fractures 50° to ca and ⊥ to shear foliation.	Moderate to strongly broken Some fracture surfaces, hematite stained.	Nil	65	125	205	1.0	700	0.522
10	11	1.0	100	Ditto: unit with minor pyrite, some fractures show slickensiding. Ferrug breccia present @ 10-10.15.	Weak to moderate py 1-3% but quite variable as fine grained dissem's and aggregates or as lge bleblos. Occaisstionally as veinlet fillings. Tr gn.	Ferrug. breccia @ 10-10.15m. Intense micro fracturing of matrix, clay carb. filled. V. weak veining otherwise. Fine qtz veinlets ⊥ to shearing ie @ ± 65° to ca	Core moderately broken. Slickensided fracture sub parallel to ca with movement 45° to ca.	Nil	30	95	200	1.0	2700	0.334
11	12	1.0	100	Ditto: Coarse grained, quartz rich EPICLASTIC containing substantial grit sized black shale fragments. Unit intensely clay/seriate/carb altered, less sheared than above.	Weak pyrite <1% Tr Gn, Tr Cpy,	0.5cm wide hem vein @ 11.10m @ 90° to ca.	Core weakly broken.	Nil	55	105	195	0.5	300	0.282
12	13	1.0	100	Ditto: except sequence from 12.80 to 13.00 showing increased black shale clasts. Core extensively silica/ seriate/ carbonate altered.	Minor pyrite 1-1.5% as aggregs blebbos or as lamellae. Tr gn as coarse disseminat-ious generally with carbonate. Tr Cpy Also possible sphalerite as fine grained disseminated material in blk shale and epiclastic matrix. (Tr to Minor)	Intense micro veining of matrix infilled by Seriate/carb Core otherwise Mod. veined, predominantly qtz/carb @ 45° to ca and some 90° to former. Some hematite infilling. Some py infilling from 12.70-13m	Core weakly broken	Nil	30	450	710	7.5	2300	8.154

335189

DRILLHOLE : GP-90-3 DEPTH : 24.6 metres
COORDINATES : DECLINATION : -65° GE

351190

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
13	14	1.0	100	EPICLASTIC, sheared, intensely sericitic/silicic/carbonate altered, qtz rich, lithic (chloritic fiamme) rich and weakly sulphidic.	Py ≃ 1% aggregs, clusters, weak vein filling. Tr to minor Cpy as lge coarse grained aggregates. Tr gn as fine dissems and occasionally infilling carb. veins.	Qtz/carb veining up to 3mm width with some sulphide veining at 45° to ca (90° to foliation). Other veining @ 60° to ca and 90° to other major attitude. Carb. alteration sub// to shearing.	Core weakly broken.	Nil	55	480	750	4.5	800	4.294
14	15	1.0	100	Ditto:	Weak pyrite ≃ 1% Tr gn Tr Sph (in qtz/carb veins)	Intense stockworking of epiclastic matrix by carb/sericite infusion. Minor qtz/carb veining @ 75-90° to ca. A low angle hem filled (< 2mm) vein @ 20° to ca.	Weak fracturing and core weakly broken. Some fracture surfaces hem. coated.	Tr.	65	215	1050	4.0	600	2.444
15	16	1.00	85	Ditto to 15.60. 15.60 - 16.00 Major gossanous, qtz/carbonate/hematite vein system @ 45° to ca.	Py < 1% Tr Sph, Tr gn.	Qtz/carb. vein @ 30° to ca. Core only weakly veided in zone to 15.60 m. 15.60 to 16.00 is layered, gossanous vein @ 45° to c.a.	Core extensively broken in veined area and weakly fractured otherwise.	Nil	60	50	445	3.5	300	2.968
16	17	1.0	100	16.- 16.10 contact for major, ferruginous vein. 16.10 - 17.00 EPICLASTIC, sheared, intensely sericite/carbonate/silica altered, chloritic fiamme rich and quartz rich. Quenched texture - snowflake texture in part!	Weak py ≃ 1% Tr to minor sph as finely disseminated accumulations.	Mod veining pred/qtz carb. in quenched area. Veins open & leached (hem coated) @ 55° to ca. & 90° to the former. Other carb veins @ 30° to ca and major carb veining @ 16.8-17m sub// to ca as gash infillings?	Weakly broken overall. Moderately broken in quenched area.	Nil	60	60	570	3.0	200	1.918

DRILLHOLE : GP-90-3 DEPTH : 24.6 metres
COORDINATES : DECLINATION : -65° GE

0195

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
17	18	1.0	100	Ditto: Slightly more chloritic matrix. No quenched lithologies. Minor chert fragments.	Py quite variable 1-2% as fine wispy veinlets & some aggregates or clusters	Mod to strong quartz/carb. veining minor pyrite-infilling Major direction @ 70-80° to ca with up to 1 vein/cm. Some at 45° to ca and minor veins @ 10-15° to ca.	V. Weak fracturing	Wk.	80	20	220	1.0	400	1.562
18	19	1.0	100	Ditto: less chloritic, but very intensely siliceous and sulphidic. Minor chert and black siltstone fragments.	Pyrite 3-5% as fine veinlets, dissem's, and aggreg's. Some with associated gn and sph. Major 1cm width chert and py filled vein @ 18.05 m.	Significant qtz/carb veining @ 70-80 to ca. Sulphide vein @ 25° to ca. Some @ 50° to ca Veining mod to strong overall.	Ditto.	Tr.	125	25	610	1.0	800	0.282
19	20	1.0	100	Ditto:	Ditto. Major vein 5cm width from 19. to 19.05 comprised of py, tr cpy in matrix of chert and blk shale fragments.	Major gash infillings of carb. @ 25° to ca. Other vein orientations @ 40° to ca. Some finer veinlets @ 70° to ca.	Ditto	Wk.	225	55	290	7.0	600	4.654
20	21	1.0	100	Ditto: some large chloritic fiamme present in otherwise very siliceous matrix.	Pyrite 2-3% Tr gn.	Ditto.	Ditto	Tr	35	15	135	2.0	300	1.424
21	22	1.0	100	Ditto: with some minor black shale siltstone fragments to 1cm width.	Pyrite 1-3% variable as fine aggregates and thin veinlet infilling.	Weak to mod qtz/carb veining ≃ 20 veins to the metre. Matrix cut by intense micro fracturing, infilled by sericite/carb.	Very Weak fracturing.	Nil	10	45	120	0.5	400	0.532

395191

DRILLHOLE : GP-90-3 DEPTH : 24.6 metres
COORDINATES : DECLINATION : -65° to GE

0180

INTERVAL From	To	Metre	% Recovery	GEOLOGICAL LOG	MINERALIZATION	VEINING	FRACTURES	Fluorescence	Assays Cu	Pb	Zn	Ag	As	Au
22	23	1.0	100	EPICLASTIC, intensely altered, quartz/sericite/carbonate, contains significant black shale/siltstone clasts, is qtz rich, moderately veined.	Py 1-2% variable as fine aggregs. and thin veinlet infilling. Tr Sph.	Strong to mod qtz/carb veining generally at high angle 75-80° to ca. Second set @ ≈ 50° to ca.	Very weak fracturing.	Nil	15	100	305	0.5	200	0.034
23	24	1.0	100	Ditto: Significant increase in chloritic fiamme and pyritic cherty fragments. Some of large quartz clasts possible vesicle infillings? (vdc?)	Ditto: some thin pyritic cherty horizons with lamellae of blk shale @ 45° to ca.	Ditto.	Ditto.	Wk.	55	40	130	1.0	900	0.858
24	24.6	0.6	100	EPICLASTIC, qtz rich, extensively and intensely silica/sericite/carb minor chlorite altered.	Py 3-4% predominantly as fine stringers and lamellae.	Fairly intense qtz/carb veining and veinletting minor chlorite/pyrite veining as well	Ditto.	Wk	80	15	110	1.0	300	0.650
E.O.H				END OF HOLE.										

395192

noranda

E.L. 10/88 – PARTS 1 & 2
CETHANA AREA

LOCATION PLAN

5 cm

SCALE 1 : 25,000 500 0 500 1000 METRES

DRAWN BY : P.J.
DRAFTSMAN : T.G.D.S.
DATE : May '90
REVISIONS :

FILE No. NORC25TB

ENCLOSURE 1

GN
TN
MN
GRID CONVERGENCE 0.5°
GRID/MAGNETIC 12.6°

305193

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9993

MOUNTAIN ROAD
CRADLE
Egmont
Strathbogie Road
Clerkes Hill
WILMOT PLANTATION
BARRINGTON
LAKE CETHANA
Cethana Power Station
Wilmot Power Station
STAVERTON
Promised Land
Staverton
ROUND MOUNTAIN
E.L. BOUNDARY
GOWRIE PARK
PROTECTED AREA BOUNDARY
Dolcoath Hill
LB-2
LB-1&3
LB-4

LEGEND

QUATERNARY
Q : alluvial
Q : scree cover
TERTIARY
Tb – Basalt
LATE CAMBRIAN
Om – Molina Sandstone
EARLY ORDOVICIAN
Or – Roland Conglomerate

CAMBRIAN
- €d – dacitic pyroclastics
- €l – rhyolite lavas / tuffs
- €rq – quartz phyric rhyolite lava
- €cvt – rhyolitic crystal vitric tuff
- €s – tuffaceous siltstone
- €xt – rhyolitic crystal tuff
- €ft – felsic tuff
- €fl – felsic lava
- €fa – felsic agglomerate

Minnow Keratophyre

Heulah Formation
- €sg – turbiditic greywacke siltstone
- €es – volcaniclastic lithicwackes
- €ap – porphyritic andesite
- €at – andesitic lithic tuffs

Gog Range Greywacke
- €lw – lithic wacke, mudstone, conglomerate
- €fs – felsic volcaniclastics, tuffs, lavas
- €f – Undifferentiated felsic volcanics

CAMBRIAN
- Dg – Dolcoath Granite

– Zone of intense cleavage / foliation with alteration to quartz – sericite schist
● STP – 1 – Diamond Drill Hole

GRID CONVERGENCE 0.5°
GRID/MAGNETIC ANGLE 12.2°

5 cm

noranda

E.L. 10/88 – PART 1
LAKE BARRINGTON
INTERPRETIVE GEOLOGY
395194

DRAWN BY : P.J.
DRAFTSMAN : T.G.D.S.
DATE : July '89
REVISIONS :
FILE No.

SCALE 1 : 10000 METRES
ENCLOSURE 2

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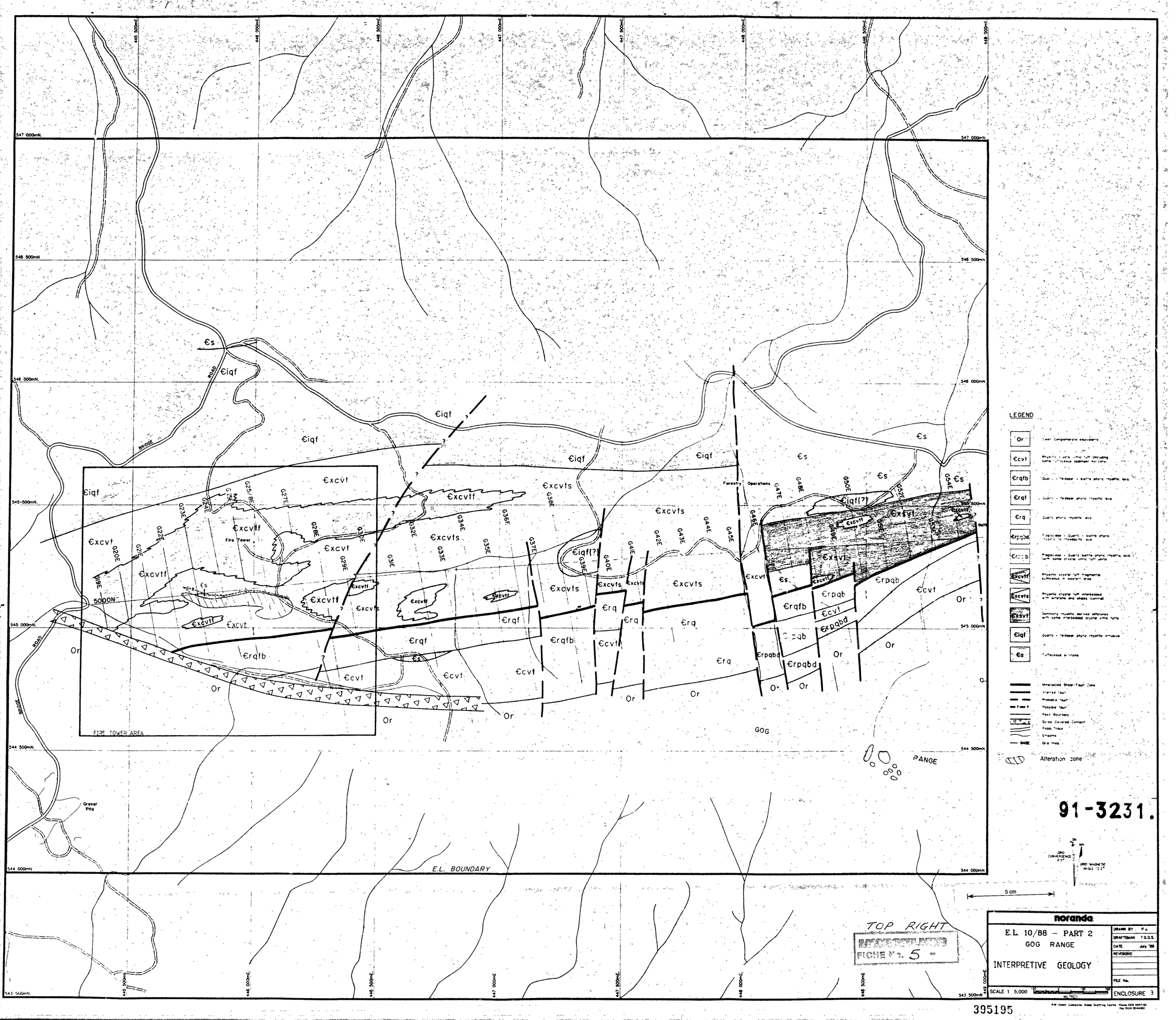


LEGEND
Or
€cvt
€rqfb
€rqf
€rq
€rpqbd
€xcvtf
€xcvts
€xsvt
€iqf
€s
Alteration zone
91-3231.
FIRE TOWER AREA
Fire Tower
Forestry Operations
GOG RANGE
E.L. BOUNDARY
Gravel Pits
BRIDGE ROAD
5000N
5 cm
TOP RIGHT
FICHE No. 5
noranda
E.L. 10/88 - PART 2
GOG RANGE
INTERPRETIVE GEOLOGY
DRAWN BY P.J.
DRAFTSMAN T.G.D.S.
DATE July '89
REVISIONS
FILE No.
SCALE 1 5,000
ENCLOSURE 3

395195

9995

FIRE TOWER PROSPECT

SCALE 1 : 500

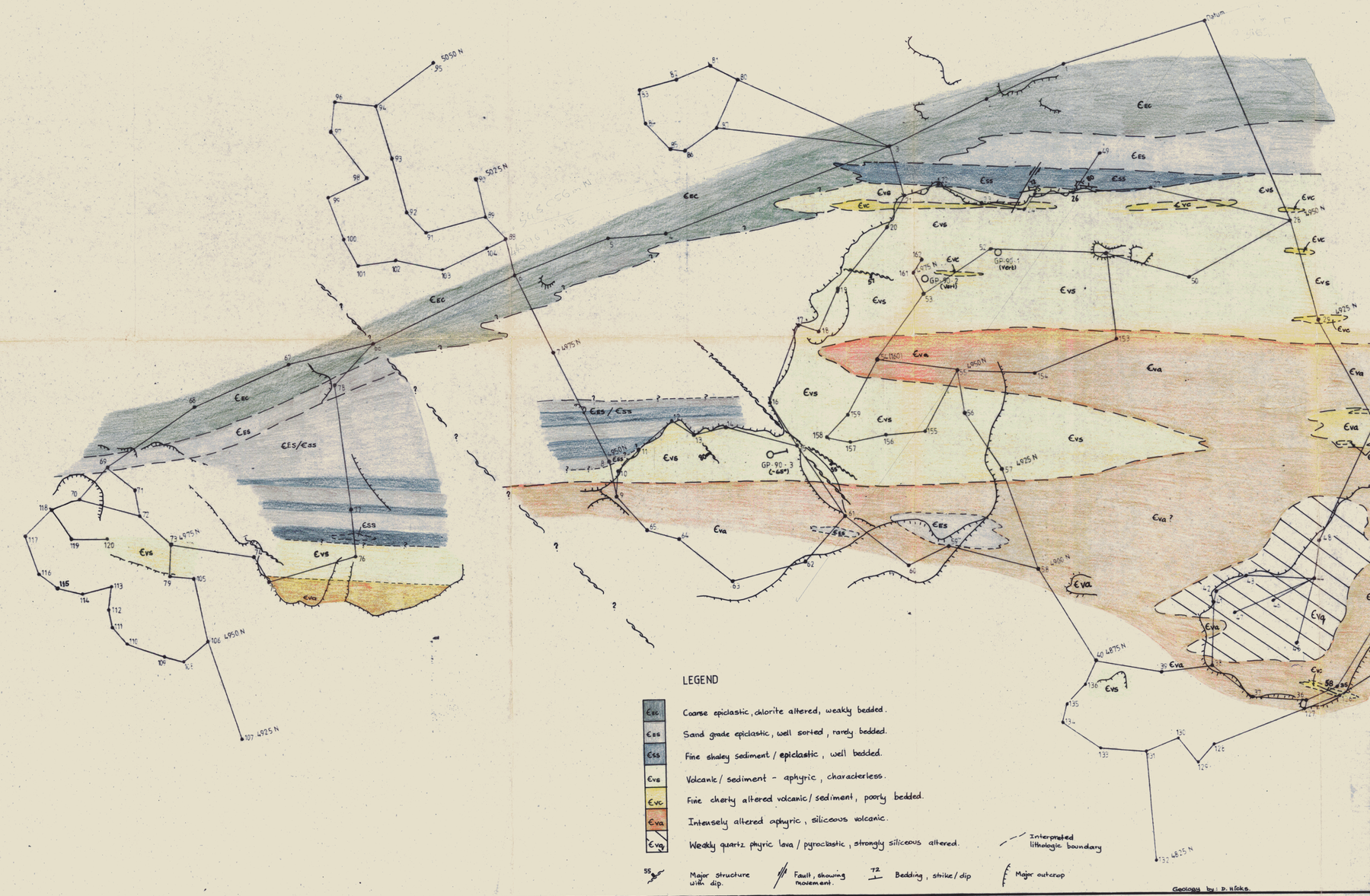
LINE 23E

LINE 24 E

LINE 25 E

LINE 25'80 E

Base Line 5000 N



LEGEND

- Ɛec — Coarse epiclastic, chlorite altered, weakly bedded.
- Ɛes — Sand grade epiclastic, well sorted, rarely bedded.
- Ɛss — Fine shaley sediment / epiclastic, well bedded.
- Ɛvs — Volcanic / sediment - aphyric, characterless.
- Ɛvc — Fine cherty altered volcanic / sediment, poorly bedded.
- Ɛva — Intensely altered aphyric, siliceous volcanic.
- Ɛvq — Weakly quartz phyric lava / pyroclastic, strongly siliceous altered.

Interpreted lithologic boundary

55 — Major structure with dip.

Fault, showing movement.

72 — Bedding, strike / dip

Major outcrop

91-3231

5 cm

noranda

E.L. 10/88 – PART 1
FIRE TOWER PROSPECT

INTERPRETIVE GEOLOGY

DRAWN BY :	P.J.
DRAFTSMAN :	T.G.D.S.
DATE	Oct. '90
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SCALE 1 : 500 — METRES 50 0 50 100

ENCLOSURE 4

395196

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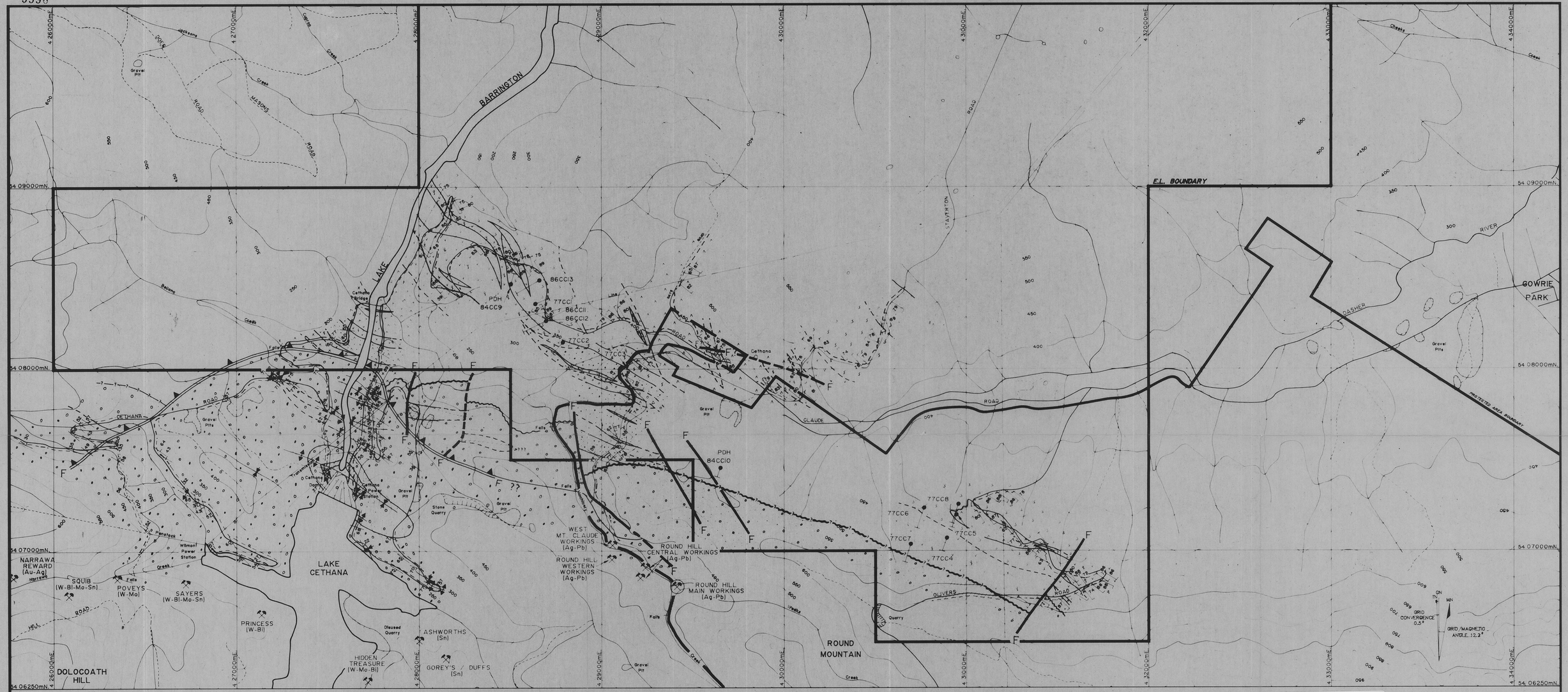

LEGEND

EARLY ORDOVICIAN - LATE CAMBRIAN :
(Denison Group)

- = Marine quartzose sandstone, shale, minor conglomerate (Moina Sandstone)
- = Quartzite and vein quartz pebble to boulder conglomerate, polymict towards base (Roland conglomerate)
- = interbedded quartzite/sandstone beds

= Angular (erosional) unconformity

CAMBRIAN FELSIC VOLCANICS :
(including Minnow Keratophyre, Bull Creek Formation)

not in stratigraphic order

- = Acid vitric tuff
- = Quartz – phyric, glassy rhyolitic lava
- = Fine to coarse grained epiclastic/volcaniclastics (occasionally bedded)
- = Coarse conglomerate/breccia volcaniclastics
- = Rhyolitic crystal – vitric tuff (showing weak ignimbritic textures)
- = Quartz – phyric crystal tuff
- = Fine grained (siliceous) bedded, variable volcaniclastic sediments
- = Quartz + feldspar – phyric rhyolitic tuffs and/or lavas
- = Quartz – phyric rhyolitic lavas and/or tuffs

MIXED VOLCANO - SEDIMENTARY ROCKS OF UNCERTAIN AGE :
(Lorinna Greywacke correlates)

- = Silicified and recrystallized volcaniclastic/lava units
- = Dacitic (explosive) pyroclastics

CAMBRIAN INTRUSIVE ROCKS :
(Dove River Granodiorite correlate ?)

- = Granite dyke (coarsely crystalline, altered and severely weathered granodiorite bodies)

CAMBRIAN HYDROTHERMAL ALTERATION :

- = Quartz – sericite schists

= Geological boundary (observed; inferred/extrapolated)

= Unconformity (observed; inferred/extrapolated)

= Fault (observed, position approximate); Fault (inferred/extrapolated)

= Thrust Fault (teeth on upper plate)

= Anticline (position approximate, plunge shown where measured)

= Syncline (position approximate, plunge shown where measured)

= Bedding (dip and strike as shown) ; Cleavage (dip and strike as shown)

= Abandoned prospect ; active prospect

5 cm

91-3231.

noranda

E.L. 10/88

INTERPRETIVE SURFACE GEOLOGY OF THE CETHANA PYRITE ZONE

DRAWN BY	D.J.H.
DRAFTSMAN	T.G.D.S.
DATE	Oct '89
REVISIONS	
FILE No.	NOR10CPZ
SCALE 1 : 10000	200 0 200 400 METRES
ENCLOSURE	5

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395197

noranda

E.L. 10/88 - PART 1
LAKE BARRINGTON
IP SURVEYING CETHANA

DRAWN BY : R.J.
DRAFTSMAN T.G.D.S.
DATE May 1990
REVISIONS
FILE No.

SCALE 1 : 10000 (200 0 200 400 METRES)

ENCLOSURE 6

GRID CONVERGENCE 0.5°
GRID MAGNETIC ANGLE 12.2°

5 cm

395198

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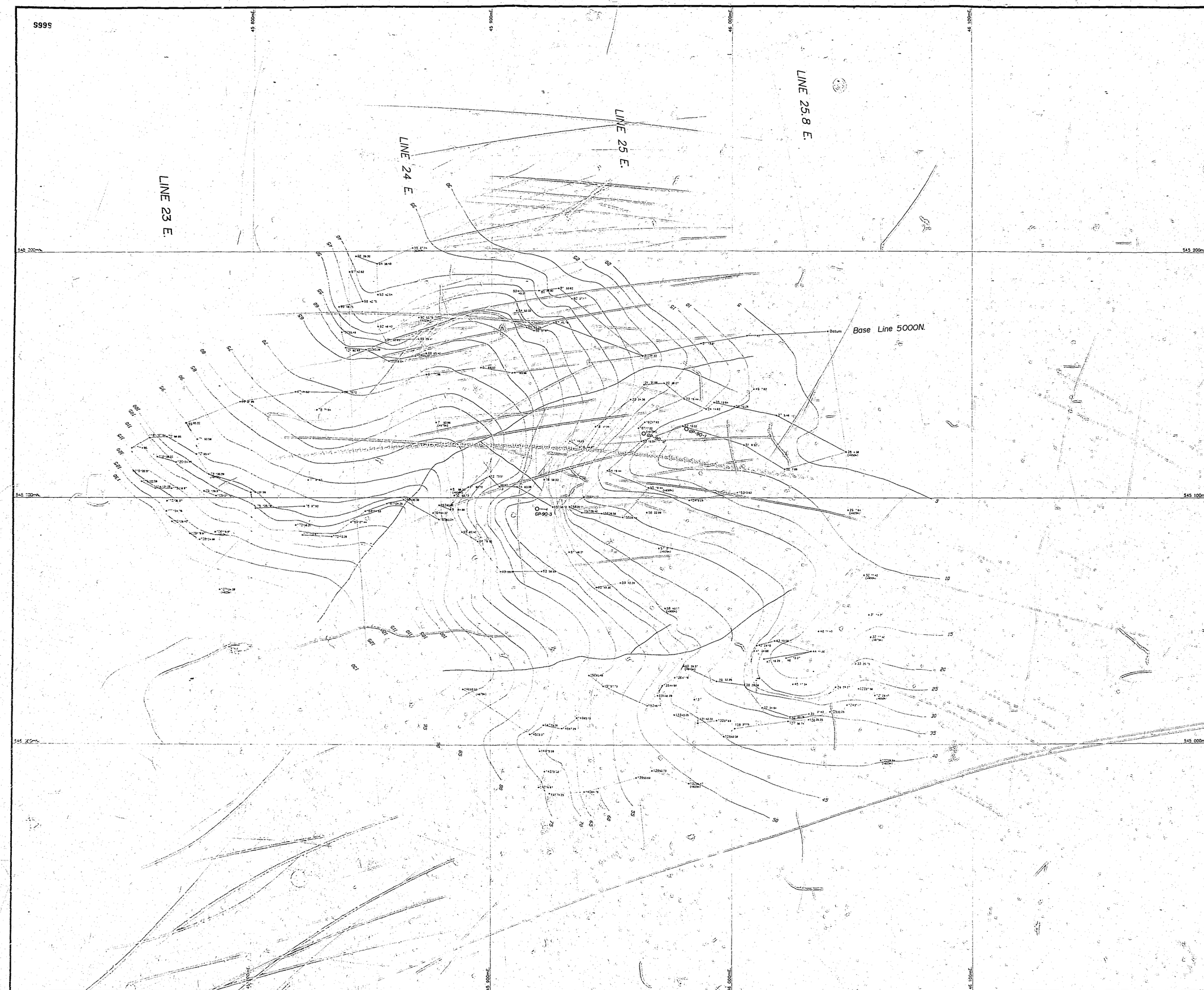


FIRE TOWER DATUM - 0 metres

CONTOUR INTERVAL - 5 metres

91-3231.

GRID CONVERGENCE 0.5°

GRID/MAGNETIC 12.3°

noranda

E.L. 10/88 – PART 2

FIRE TOWER PROSPECT

SURVEY PLAN

DRAWN BY :	P.J.
DRAFTSMAN :	T.G.D.S.
DATE :	Oct. '90
REVISIONS :	
FILE No.	

SCALE 1 : 500 — METRES

ENCLOSURE 7

N.W. Coast Computer Aided Drafting Centre Phone 1024 324531 Fax 1024 324492

9999

445 500mE. 446 000mE. 446 500mE. 447 000mE. 447 500mE. 448 000mE. 448 500mE. 449 000mE.

547 000mN.

546 500mN.

546 000mN.

545 500mN.

545 000mN.

544 500mN.

544 000mN.

543 500mN.

ROAD

BRIDGE

Fire Tower

Forestry Operations

5000N

G19E G20E G21E G22E G23E G24E G25E G25/85 G27E G28E G29E G30E G31E G32E G33E G34E G35E G36E G37E G38E G39E G40E G41E G42E G43E G44E G45E G46E G47E G48E G49E G50E G51E G52E G53E G54E

GOG RANGE

Gravel Pits

E.L. BOUNDARY

CONTOUR INTERVAL

- > 400 ppm
- 200 – 400
- 100 – 200
- < 100 ppm

5 cm

GN TN MN

GRID CONVERGENCE 0.5°

GRID/MAGNETIC ANGLE 12.2°

91-3231.

noranda

E.L. 10/88 – PART 2
GOG RANGE

SOIL GEOCHEMISTRY
COPPER

DRAWN BY : P.J.
DRAFTSMAN : T.G.D.S.
DATE : July '89
REVISIONS :
MAY 1990

FILE No.

SCALE 1 : 5,000 100 0 100 200 METRES

ENCLOSURE 8

395200

10000

445 500mE. 446 000mE. 446 500mE. 447 000mE. 447 500mE. 448 000mE. 448 500mE. 449 000mE.

547 000mN.
546 500mN.
546 000mN.
545 500mN.
545 000mN.
544 500mN.
544 000mN.
543 500mN.

ROAD
BRIDGE
Fire Tower
5000N
Forestry Operations
GOG
RANGE
Gravel Pits
E.L. BOUNDARY

G19E G20E G21E G22E G23E G24E G25E G25/8E G27E G28E G29E G30E G31E G32E G33E G34E G35E G36E G37E G38E G39E G40E G41E G42E G43E G44E G45E G46E G47E G48E G49E G50E G51E G52E G53E G54E

CONTOUR INTERVAL
- > 300 ppm
- 200 – 300
- 100 – 200
- 50 – 100
- < 50 ppm

5 cm

GRID CONVERGENCE 0.5°
GRID/MAGNETIC ANGLE 12.2°

91-3231.

noranda

E.L. 10/88 – PART 2
GOG RANGE

SOIL GEOCHEMISTRY
LEAD

DRAWN BY : P.J.
DRAFTSMAN : T.G.D.S.
DATE : July '89
REVISIONS :
MAY 1990
FILE No.

SCALE 1 : 5,000 100 0 100 200 METRES

ENCLOSURE 9

395201

10001

445 500mE. 446 000mE. 446 500mE. 447 000mE. 447 500mE. 448 000mE. 448 500mE. 449 000mE.

547 000mN.
546 500mN.
546 000mN.
545 500mN.
545 000mN.
544 500mN.
544 000mN.
543 500mN.

ROAD
BRIDGE
ROAD
BRIDGE
5000N
Fire Tower
Gravel Pits
E.L. BOUNDARY
GOG
RANGE
Forestry Operations

G19E G20E G21E G22E G23E G24E G25E G25/85E G27E G28E G29E G30E G31E G32E G33E G34E G35E G36E G37E G38E G39E G40E G41E G42E G43E G44E G45E G46E G47E G48E G49E G50E G51E G52E G53E G54E

CONTOUR INTERVAL
- > 400 ppm
- 200-400
- 100-200
- < 100ppm

5 cm

GN TN MN
GRID CONVERGENCE 0.5°
GRID/MAGNETIC ANGLE 12.2°

91-3231

noranda

E.L. 10/88 – PART 2
GOG RANGE

SOIL GEOCHEMISTRY
ZINC

DRAWN BY :	P.J.
DRAFTSMAN :	T.G.D.S.
DATE :	July '89
REVISIONS :	
MAY 1990	
FILE No.	
ENCLOSURE 10	

SCALE 1 : 5,000 100 0 100 300 METRES

395202

10002

445 500mE. 446 000mE. 446 500mE. 447 000mE. 447 500mE. 448 000mE. 448 500mE. 449 000mE.

547 000mN.
546 500mN.
546 000mN.
545 500mN.
545 000mN.
544 500mN.
544 000mN.
543 500mN.

ROAD
BRIDGE
Fire Tower
Forestry Operations
5000N
Gravel Pits
E.L. BOUNDARY
GOG
RANGE

G19E G20E G21E G22E G23E G24E G25E G25/8E G27E G28E G29E G30E G31E G32E G33E G34E G35E G36E G37E G38E G39E G40E G41E G42E G43E G44E G45E G46E G47E G48E G49E G50E G51E G52E G53E G54E

91-3231.

GN
TN
MN
GRID CONVERGENCE 0.5°
GRID/MAGNETIC ANGLE 12.2°

5 cm

noranda

E.L. 10/88 – PART 2
GOG RANGE

SOIL GEOCHEMISTRY
SILVER

DRAWN BY : P.J.
DRAFTSMAN : T.G.D.S.
DATE : July '89
REVISIONS :
MAY 1990
FILE No.

SCALE 1 : 5,000 100 0 100 200 METRES

ENCLOSURE 11

395203

10003

445 500mE. 446 000mE. 446 500mE. 447 000mE. 447 500mE. 448 000mE. 448 500mE. 449 000mE.

547 000mN.

546 500mN.

546 000mN.

545 500mN.

545 000mN.

544 500mN.

544 000mN.

543 500mN.

ROAD

BRIDGE

Fire Tower

5000N

Gravel Pits

E.L. BOUNDARY

GOG

RANGE

Forestry Operations

G19E G20E G21E G22E G23E G24E G25E G25/8E G27E G28E G29E G30E G31E G32E G33E G34E G35E G36E G37E G38E G39E G40E G41E G42E G43E G44E G45E G46E G47E G48E G49E G50E G51E G52E G53E G54E

CONTOUR INTERVAL

- >250 ppm
- 150 - 250
- 50 - 150
- 25 - 50
- < 25 ppm

5 cm

GN TN MN

GRID CONVERGENCE 0.5°

GRID/MAGNETIC ANGLE 12.2°

91-3231.

noranda

E.L. 10/88 – PART 2
GOG RANGE

SOIL GEOCHEMISTRY
ARSENIC

DRAWN BY :	P.J.
DRAFTSMAN :	T.G.D.S.
DATE :	July '89
REVISIONS :	MAY 1990
FILE No.	
SCALE 1 : 5,000	100 0 100 200 METRES
ENCLOSURE 12	

395204

10004

445 500mE. 446 000mE. 446 500mE. 447 000mE. 447 500mE. 448 000mE. 448 500mE. 449 000mE.

547 000mN.
546 500mN.
546 000mN.
545 500mN.
545 000mN.
544 500mN.
544 000mN.
543 500mN.

ROAD
BRIDGE
ROAD
Fire Tower
Forestry Operations
Gravel Pits
E.L. BOUNDARY
GOG
RANGE

G19E G20E G21E G22E G23E G24E G25E G25/B5E G27E G28E G29E G30E G31E G32E G33E G34E G35E G36E G37E G38E G39E G40E G41E G42E G43E G44E G45E G46E G47E G48E G49E G50E G51E G52E G53E G54E

5000N
3800E

CONTOUR INTERVAL
- >1·400
- 0·400 - 1·400
- 0·200 - 0·400
- 0·100 - 0·200
- 0·005 - 0·100
- <0·005

5 cm

GRID CONVERGENCE 0.5°
GRID/MAGNETIC ANGLE 12.2°

91-3231.

noranda

E.L. 10/88 – PART 2
GOG RANGE

SOIL GEOCHEMISTRY
GOLD

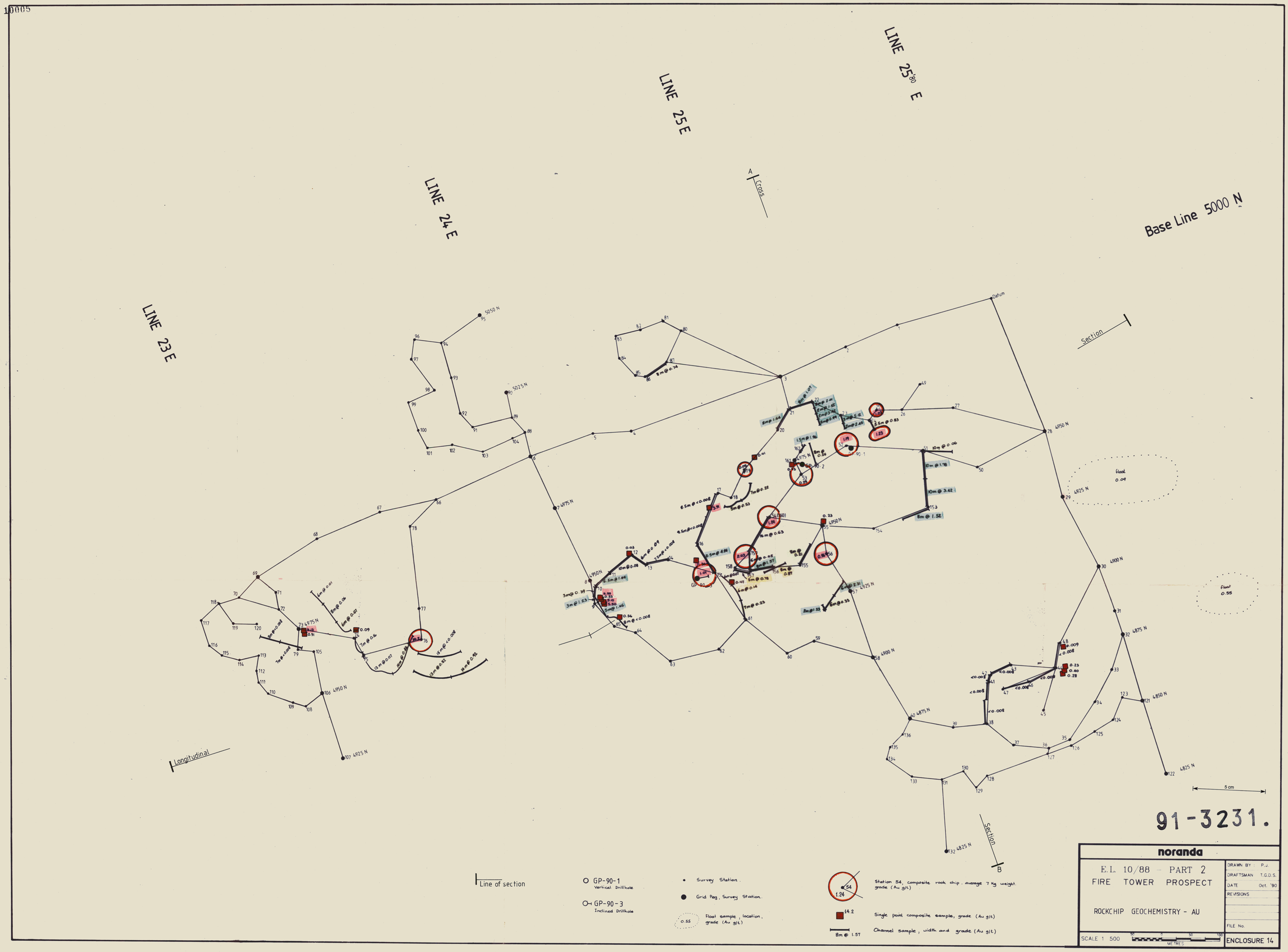
DRAWN BY : P.J.
DRAFTSMAN : T.G.D.S.
DATE : July '89
REVISIONS :
MAY 1990

FILE No.

SCALE 1 : 5,000 100 0 100 200 METRES

ENCLOSURE 13

395205



91-3231.

noranda

E.L. 10/88 - PART 2
FIRE TOWER PROSPECT

ROCKCHIP GEOCHEMISTRY - AU

DRAWN BY :	P.J.
DRAFTSMAN	T.G.D.S.
DATE	Oct. '90
REVISIONS	
FILE No.	

SCALE 1 500 — METRES

ENCLOSURE 14

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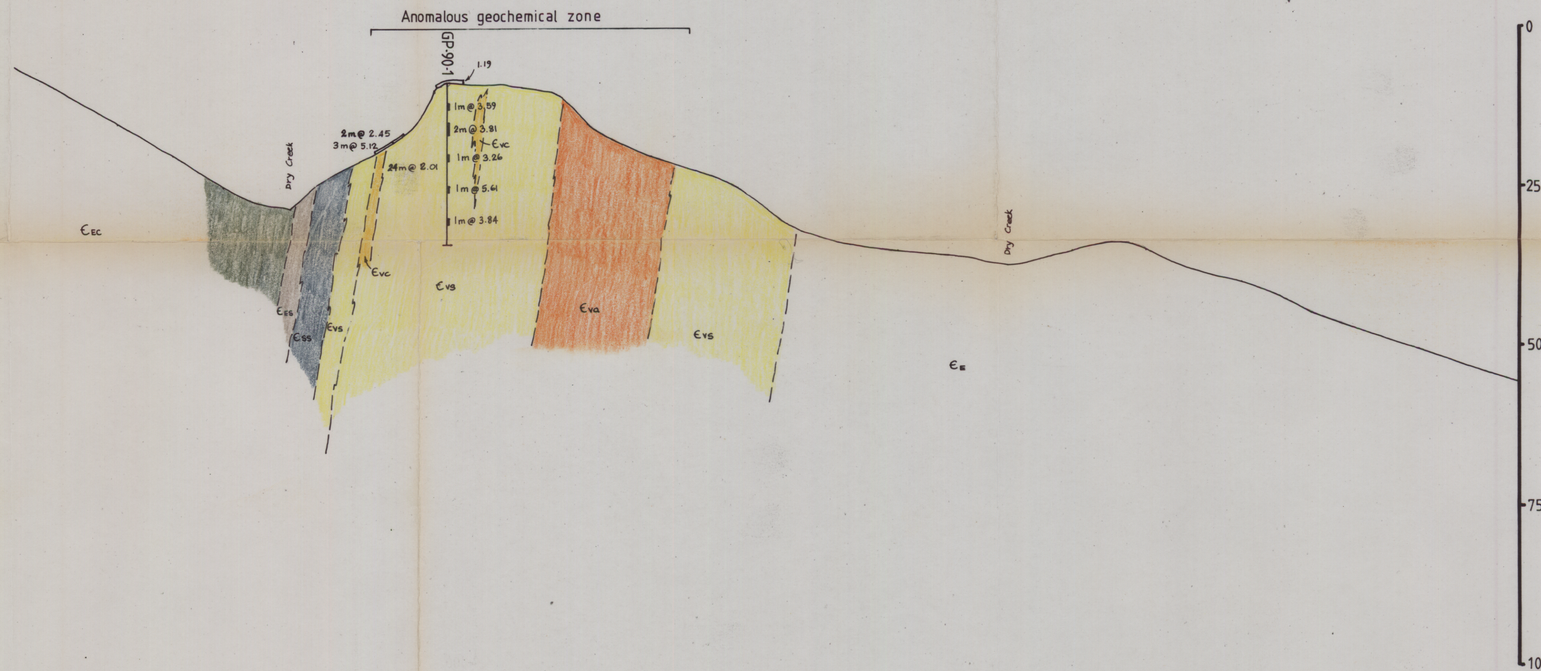
395206

10006



LEGEND

Єec	Coarse epiclastic, chlorite altered, weakly bedded.
Єes	Sand grade epiclastic, well sorted, rarely bedded.
Єss	Fine shaley sediment / epiclastic, well bedded.
Єvc	Fine cherty altered volcanic / sediment, poorly bedded.
Єvs	Volcanic / Sediment - aphyric, characterless.
Єva	Intensely altered aphyric, siliceous volcanic.
Єe	Moderately altered, epiclastic.

5 cm

91-3231.

noranda

E.L. 10/88 PART 1
FIRE TOWER PROSPECT

SECTION A - B
with drillhole & other geochemical data

DRAWN BY P.J.
DRAFTSMAN T.G.D.S.
DATE Oct. '90
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SCALE 1 : 500
VERTICAL / HORIZ. (1:1)
50 0 50 100
METRES

ENCLOSURE 15

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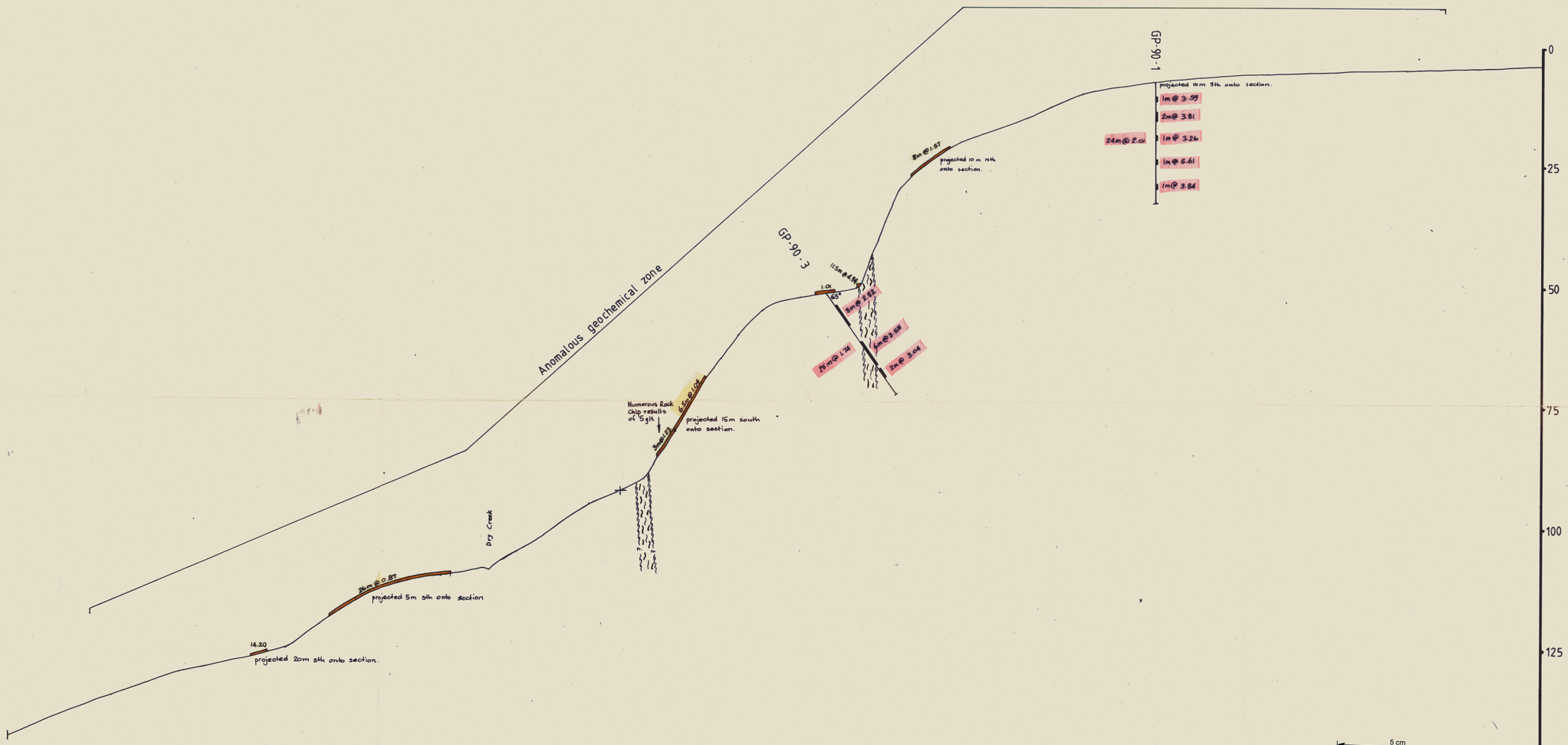
395207

10007



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Assay data in g/t Au

noranda

E.L. 10/88 – PART 2
FIRE TOWER PROSPECT

LONGITUDINAL SECTION
Drillhole / geochemical
Data

DRAWN BY: P.J.
DRAFTSMAN: T.G.D.S.
DATE: Oct. '90
REVISIONS
FILE No.

SCALE 1:500
VERT / HORIZ. (1:1)
50 0 50 100
METRES

ENCLOSURE 16

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