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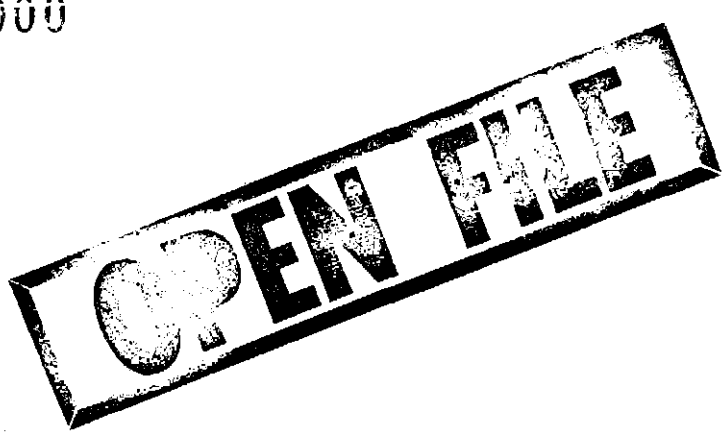

SK 55-3
PROJECT 258

PLACER EXPLORATION LIMITED

RENEWAL REPORT, 1991
EXPLORATION LICENCE NO. 39/85

BULGOBAC RIVER, TASMANIA

PLACER EXPLORATION REPORT TAS 1/91

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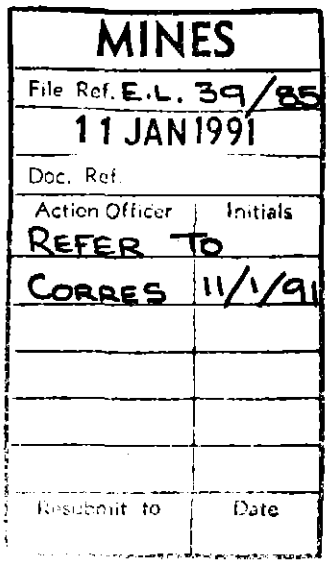

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DOWNHOLE EM

ALTERATION

GEOLOGY

GEOPHYSICS

EXPLORATION

GOLD

SK 55-03

QUE RIVER SHALES

HELLYER BASALT

GEOCHEMISTRY

MT READ VOLCANICS

SOPHIA

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PETROLOGY

003

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1. SUMMARY

Exploration continued during 1990 with the drilling of BRD 05 to 1181m. An upper 40m thick primitive basalt within the Que River Shale in this hole had significant silica, pyrite and chalcopyrite. The drilling shows Hellyer Basalt and the underlying dacitic rocks dip to the south with the base of the Hellyer Basalt being at 1045.9m in BRD 05 (only at 850.5m in BRD 01).

A downhole EM 37 survey of BRD 05 showed disappointing results with no significant anomalies.

Thin section petrology and whole rock/trace element geochemistry was completed. The thin section work and geochemistry both showed areas of significant alteration interspersed with areas of lesser alteration. The geochemistry of all the drillholes enabled correlations to be made between the EL 39/85 holes and with the Hellyer and Mt Charter areas. This correlation also showed the volcanics in the bottom of BRD 01 were very similar to the lavas of the Mt Read Central Belt. This may represent the basement for the Que/Hellyer volcanic pile.

Geological mapping in the northeast corner of the Licence showed an abundance of quartz-feldspar porphyritic rocks in Animal Creek Greywacke type sediments. These were similar to the Animal Creek Greywacke sequence occurring southwest of the Mt Charter Fault.

Rehabilitation of the BRD 03 drill access track continued with seeding and fertilising.

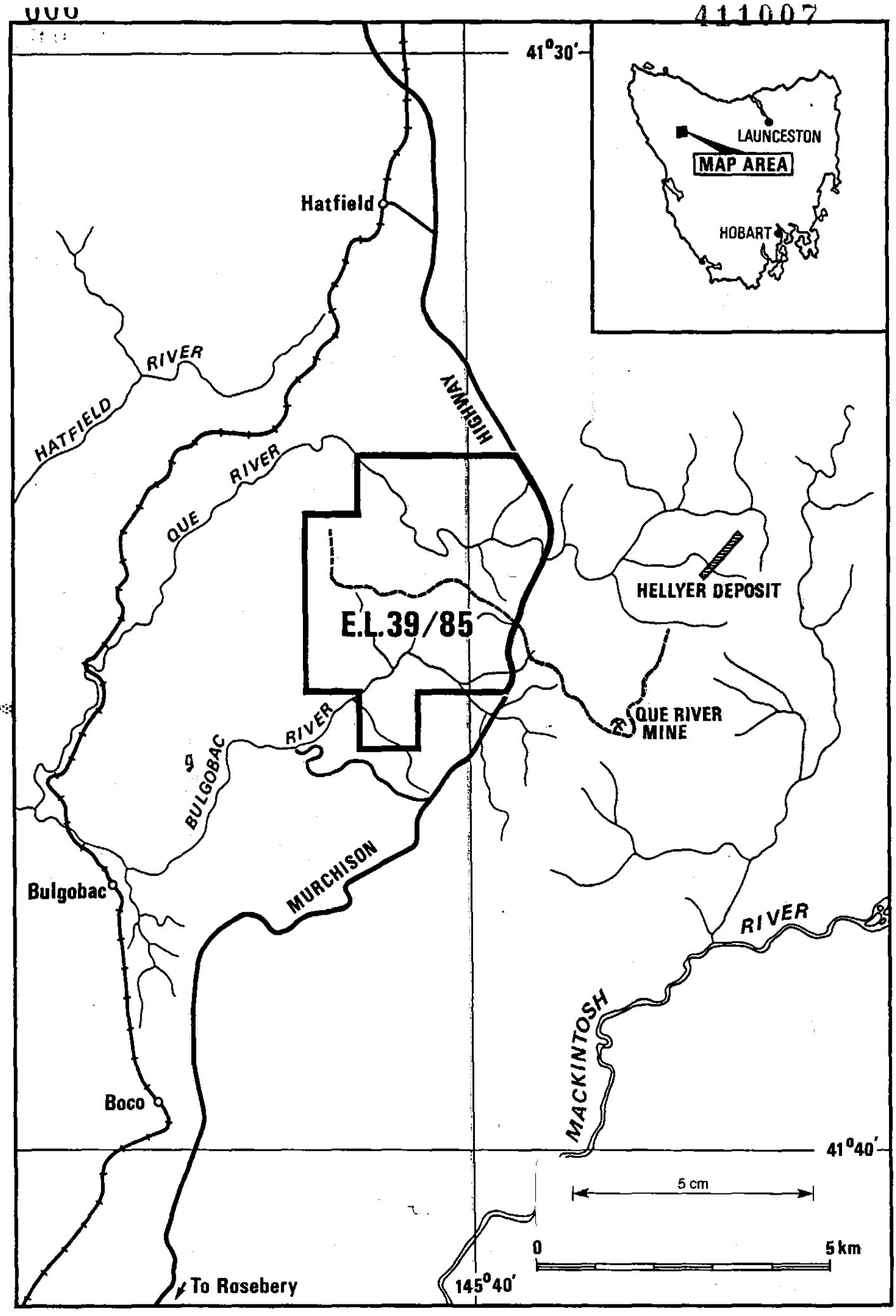

FIG. 1 LOCATION MAP E.L.39/85 BULGOBAC RIVER TAS.

1. INTRODUCTION

EL 39/85, "Bulgobac River", is located 60km SSW of Burnie, a major industrial town and port on the NW coast of Tasmania. The Murchison Highway formed the eastern boundary of the original 11km² title which was granted on 14 February, 1986. Aberfoyle's Que River and Hellyer Mines are located immediately east of the adjacent Murchison Highway (Figure 1).

The EL was granted after an application under the recently introduced tender system. The area, which had been held by Comstaff Pty Ltd as part of EL 5/63, became available when EL 5/63 was reduced to the maximum allowable area of 125km².

In June 1988, the area of EL 39/85 was increased to 16km² (Figure 1). This was caused by the Department of Mines adjusting the Licence boundaries to the AMG kilometre graticules on the relinquishment of the adjacent Exploration Licence (EL 12/72 formerly held by EZ).

Infrastructure in the area is excellent with major electricity transmission lines passing through Aberfoyle's nearby mining leases; the Murchison Highway being the eastern boundary of the title area; the close proximity of EZ's Burnie to Rosebery railway line; abundant water and new link roads bringing population centres within commuting distances of any possible mining operation.

The exploration target in EL 39/85 is a volcanogenic polymetallic base and precious metal deposit similar to the nearby Hellyer deposit. The Hellyer deposit has a published resource of 15m tonnes indicated at 13.0% Zn, 6.9% Pb, 0.4% Cu, 156 g/t Ag and 2.3 g/t Au with a further 4.0m tonnes inferred (Aberfoyle, 1987).

This report summarizes the investigations completed by Placer Exploration Ltd (the purchaser of CSR's Mineral Group) in the fifth twelve month term of the Licence ending on February 14, 1991. This is only a short covering report as much of the detail of the 1990 work in included in an earlier report (Appendix 1). No further information on location, access, previous exploration or the regional geology will be included here (already in Appendix I). Only the 1990 work will be summarised. Details are available in Appendices I and II.

3. CURRENT EXPLORATION

3.1 Diamond Drilling

The drilling of BRD 05 (600m south of BRD 01) was completed to 1181m. Details of this drilling have been included in Appendix I (Section 10.6). The drill log summary for BRD 05 is:

0 - 11.5m	Quartz-feldspar porphyry
11.5 - 24.4m	Shale
24.4 - 36.5m	Quartz-feldspar porphyry
36.5 - 48.4m	Interlayered shale and quartz-feldspar porphyry
48.4 - 92.5m	Shale (micaceous)
92.5 - 157.6m	Pyroclastics (mass flow unit with conglomeratic base)
157.6 - 530.6m	Que River Shale
530.6 - 530.7m	Basalt
530.7 - 531.8m	Que River Shale
531.8 - 570.7m	Hellyer Basalt (with py + qtz veins)
570.7 - 570.9m	Pyrite and Quartz
570.9 - 634.0m	Que River Shale
634.0 - 684.2m	Conglomerate
684.2 - 687.8m	Que River Shale
687.8 - 697.4m	Pepperitic Basalt and Shale
697.4 - 698.6m	Quartz-carbonate vein
698.6 -1045.9m	Hellyer Basalt
1045.9 -1055.0m	Polymict Breccia
1055.0 -1061.0m	Monomict Dacitic Breccia
1061.0 -1067.0m	Polymict Breccia
1067.0 -1181.0m	Dacitic Lavas and Breccias

Weak alteration with some stronger patches were observed in the core. This included some fuchsite-carbonate alteration in the Hellyer Basalt and other green carbonate (malacite?). In thin section the Hellyer Basalt tended to be strong to

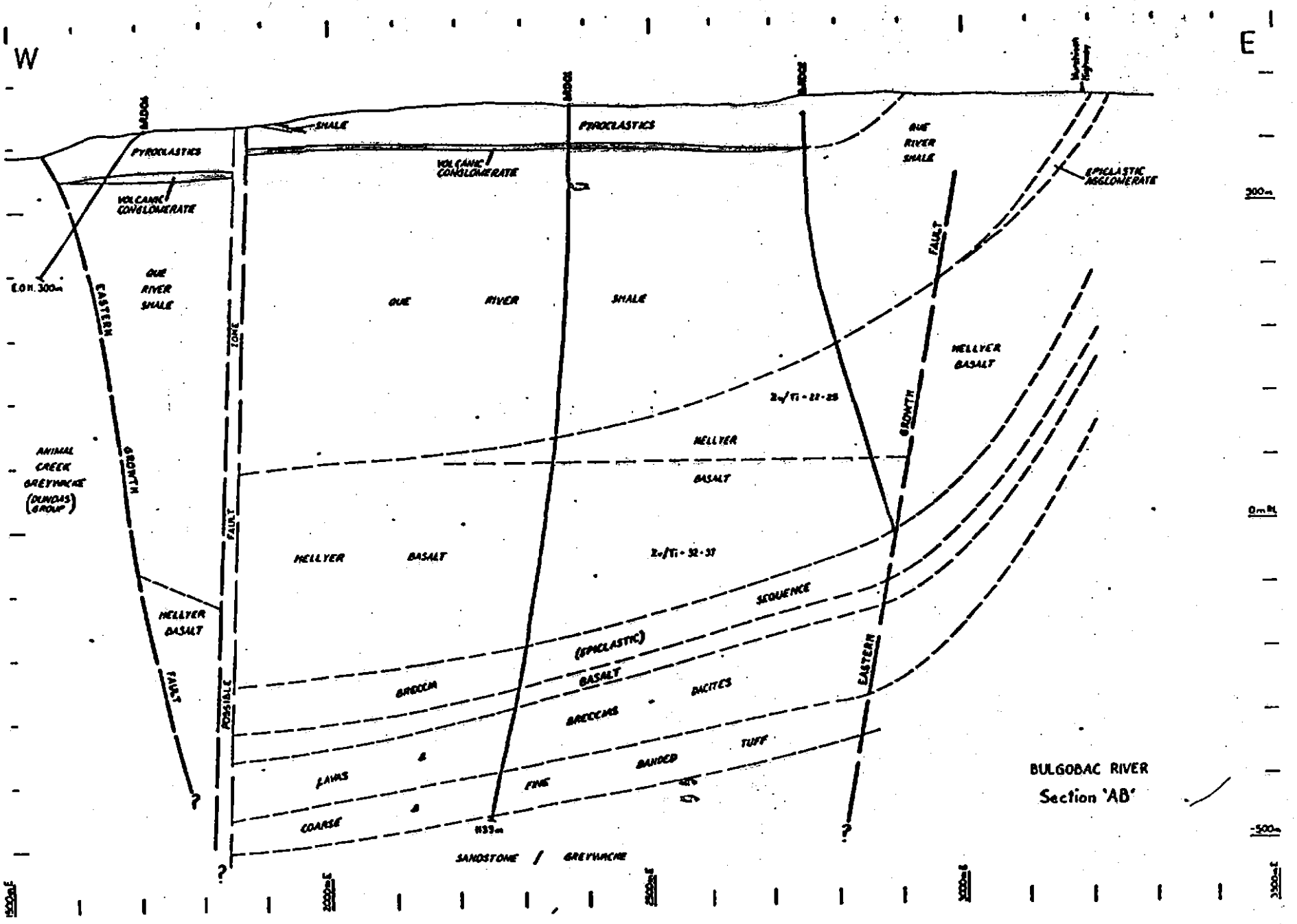

FIGURE 2 EAST - WEST SECTION EL 39/85 BULGOBAC RIVER

intensely calcite altered with only small patches of weaker (regionally metamorphosed) prehnite alteration. The stronger alteration tended to be at the top and bottom of the basalt units.

The underlying dacitic units showed strong but patchy zones of chlorite, silica and sericite alteration. Minor quartz-epidote-chlorite alteration occurred significantly after extrusion of these dacites.

No andesites were observed in BRD 05. (Figures 2 and 3).

3.2 Downhole EM 37

On completion of BRD 05 to 1181m, the hole was logged using five separate 600 by 600m square loops and the EM 37 downhole logger and probe. Readings were taken at 20m intervals to 680m and then at 10m intervals for the remainder of the hole. Results were disappointing, with plots of the data showing a simple decay curve for the electromagnetic field generated by the surface loops. The curves showed very little "noise" with only a few points falling off the curves. These odd points probably represent off-hole thin, small concentrations of pyrite. Interestingly, the high pyrite veins and disseminations with quartz and chalcopyrite occurring in and around the upper basalt (primitive) in the Que River Shale did not show in the EM survey.

3.3 GEOCHEMISTRY/PETROLOGY

BRD 05 contained no mineralisation requiring splitting the drill core. However most of the volcanic rocks have been chip sampled and analysed while selected samples were thin sectioned (from both BRD 01 and 05). Geochemical results (Appendix I) were analysed by Dr. A. Crawford (Appendix II) in conjunction with the thin section petrology (Appendix I).

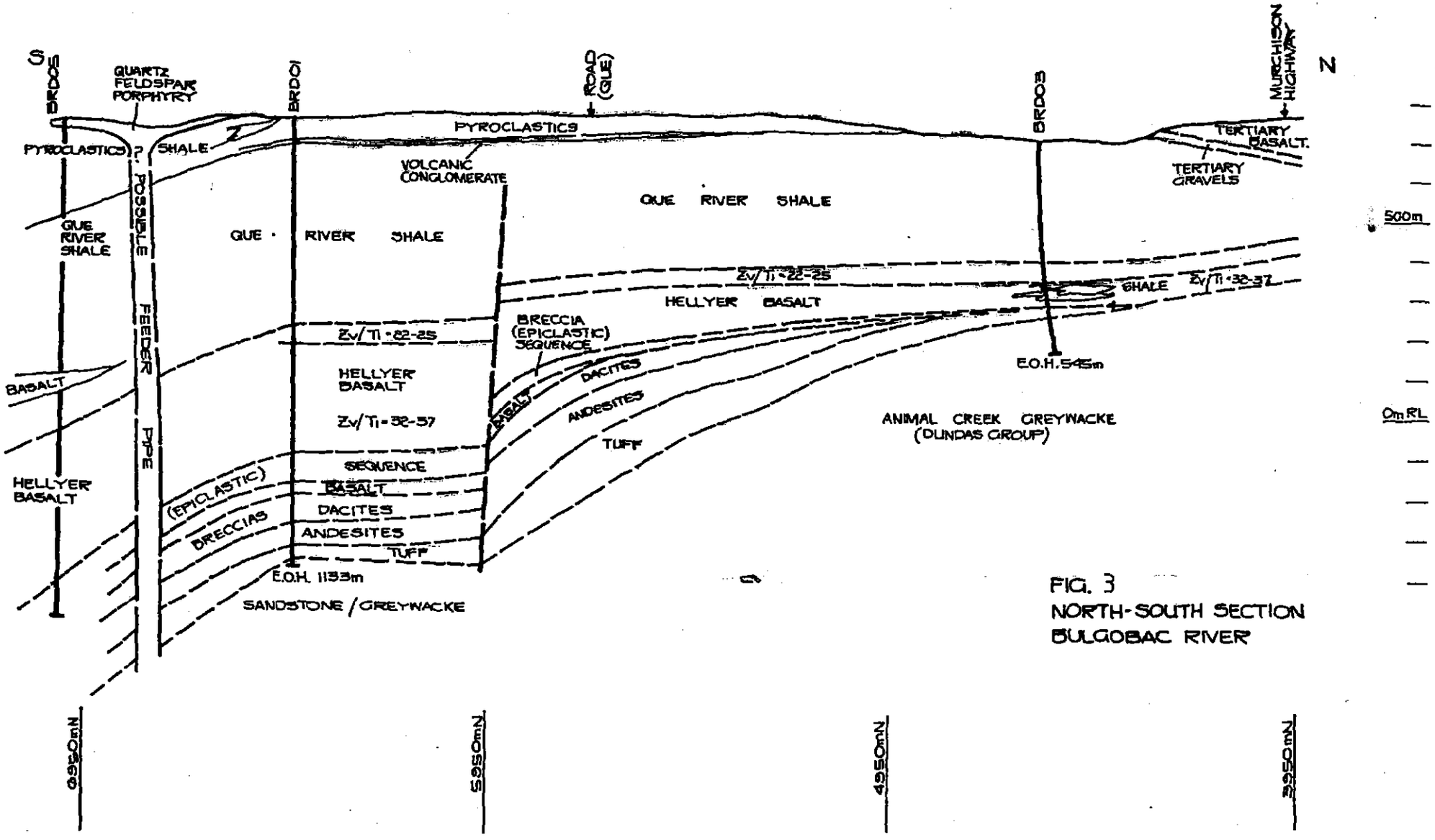

FIG. 3
NORTH-SOUTH SECTION
BULGOBAC RIVER

The evaluation of all the geochemistry and petrology from the EL 39/85 area suggested BRD 01 was stopped in Central Volcanic Complex rocks of the Mt Read Volcanics overlain by only a thinned (20-30m) Animal Creek Greywacke horizon. This greywacke unit thickened northwards through BRD 03. Overlying the greywacke in BRD 01 and 03 are about 30m of andesite rocks correlated with the Que/Hellyer Footwall Andesites. None of the above units occur to the south in BRD 05 as the sequence dips significantly south of BRD 01.

Above the andesites are considerable thicknesses of dacitic lavas capped (everywhere by MCH 1) by basalts (Hellyer Basalt). Some of these are correlatable on petrochemistry (Appendix II).

The petrology/geochemistry suggests there is a significant basin in the area of EL 39/85. This basin contains rocks which are correlatable with the Que/Hellyer mine sequences and is thus a prospective target for Hellyer style polymetallic mineralisation. It has also been suggested that, because of the basin morphology the EL 39/85 area has potential for mineralisation at the contact of the Hellyer Basin with the Que River Shale.

Alteration was variable and patchy throughout.

3.4 GEOLOGICAL MAPPING

During 1990 the northwest corner of the Licence was geologically mapped (See Appendix I for map and details).

Most of the northwest corner is underlain by a cover of Tertiary Basalt. This is typical of the Tertiary Basalt over large parts of Northwestern Tasmania. It tends to become thicker towards the west, outcropping at lower levels in the valley of the Que River and its steep rocky tributaries.

Underlying the basalt and outcropping in the floor of the Que River (not much in the tributaries) are mainly quartz-feldspar porphyritic rocks similar to that found in the top of BRD 05 and to the southwest of the Mt Charter Fault. These appear to intrude micaceous greywackes, sandstones and siltstones which may be correlates of the Animal Creek Greywacke. Another alternative is that they are the same siltstone as that found intruded by porphyries in the top of BRD 05 (i.e. Southwell subgroup). The former correlation appears most likely.

3.5 REHABILITATION

Further rehabilitation has been completed on the drill access track to the north of Que Road (to BRD 03). The initial rehabilitation programme (completed previously) resulted in some vegetation regrowing. However, a prolonged period of dry weather and the exposed nature of the track led to much of the vegetation dying.

During 1990 the track was reseeded and then covered by ti-tree in an attempt to give some protection to the young new vegetation and to prevent moisture loss. The entire track was also fertilised at the rate prescribed for forestry activity (by the Forestry Commission).

Revegetation is currently progressing well and will be monitored (along with refertilising) in the future.

4. PROPOSED EXPLORATION

Currently a joint venture has been negotiated with Aberfoyle Resources to continue the exploration of the EL 39/85 area. This joint venture includes the proposed exploration for the next period (until February 1992).

The proposed exploration (as suggested by Aberfoyle) for the first six months of 1991 is:

- the drilling of an 800m hole into the structure north of BRD 01 (near Que Road).
- geochemistry, petrology of the core from this hole.
- downhole EM to be run in this hole.
- 14kms of gridding (including EM loop lines) in the southern area of the Licence to cover the Sock Creek Volcanics.
- geological mapping along these grid lines.
- UTEM coverage of these lines, to explore the Sock Creek Volcanics for massive sulphides.

After evaluation of the results of this grid based work and the diamond drilling, it is expected at least one further hole will be drilled (at a site to be determined).

APPENDIX I

See:

ELLIS, P.D., 1990 BULGOBAC RIVER - EL 39/85 - CURRENT STATUS AT THE COMPLETION OF BRD 05

PLACER EXPLORATION LIMITED REPORT NO TAS 2/90
(4 volumes)

APPENDIX II

See:

CRAWFORD, A.J., 1990 PETROLOGY, GEOCHEMISTRY AND CORRELATION OF LAVAS IN BULGOBAC RIVER DRILLHOLES BRD 01, 02, 02 AND 05, W. TASMANIA

REPORT FOR PLACER EXPLORATION FROM UNI OF TAS GEOLOGY DEPT

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PLACER EXPLORATION LIMITED

REPORT TAS 2/90
EXPLORATION LICENCE NO. 39/85

BULGOBAC RIVER, TASMANIA

CURRENT STATUS AT THE COMPLETION OF BRD 05

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SK55.3-3304	BULGOBAC RIVER, FLIGHT PATH RECOVERY	1:10000
SK55.3-3305	BULGOBAC RIVER, FRASER FILTERED VLF PROFILES	1:5000
SK55.3-3306	BULGOBAC RIVER, IP CHARGEABILITY	1:5000
SK55.3-3307	EL39/85, BULGOBAC RIVER, BRD 01 - BRD 02 SECTION	1:1000
SK55.3-3312	EL39/85, BULGOBAC RIVER, BRD 01 - BRD 05 SECTION	1:1000

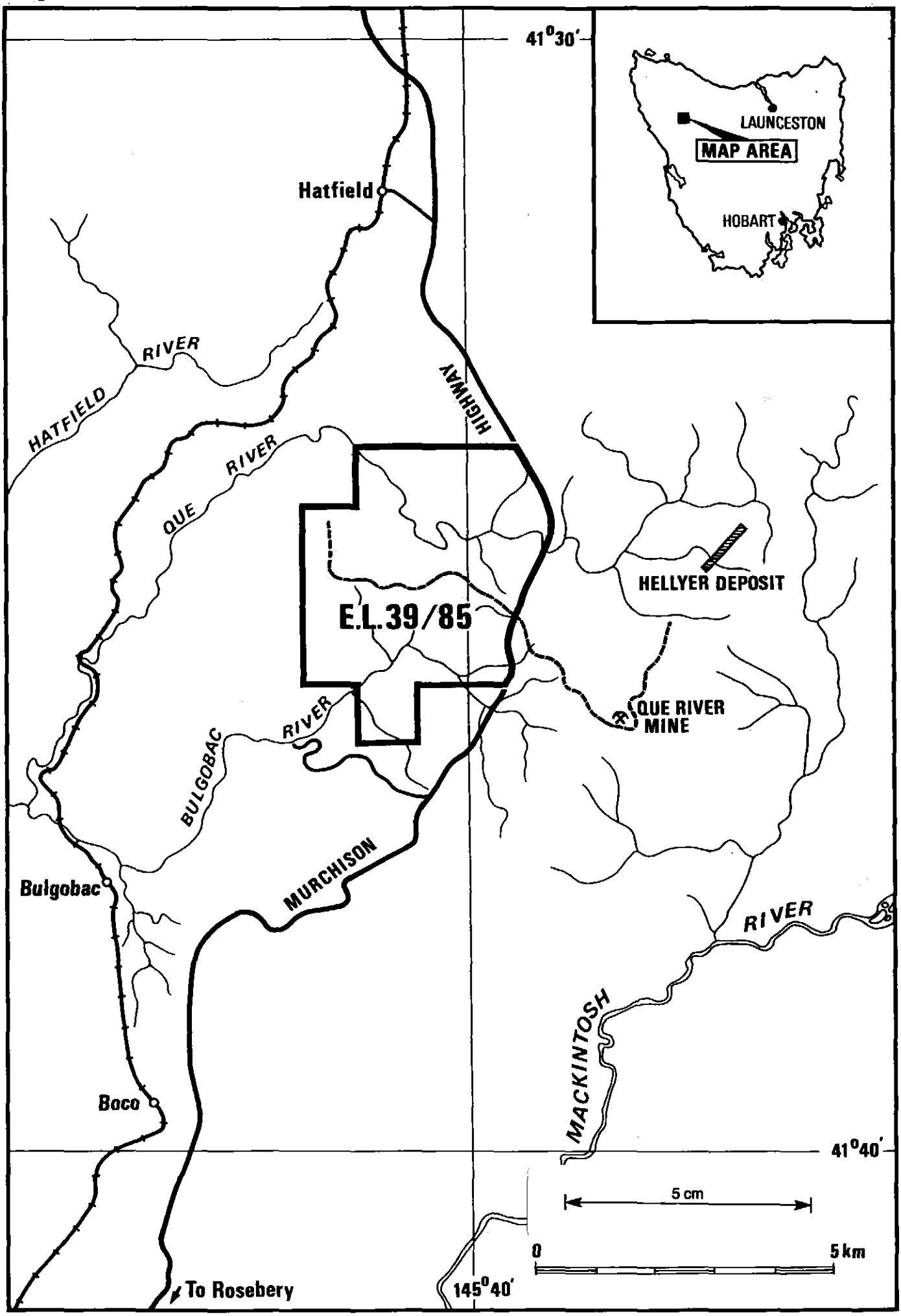

FIG. 1 LOCATION MAP E.L.39/85 BULGOBAC RIVER TAS.

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The EL was granted after an application under the recently introduced tender system. The area, which had been held by Comstaff Pty Ltd as part of EL5/63, became available when EL 5/63 was reduced to the maximum allowable area of 125km².

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Infrastructure in the area is excellent with:

- major electricity transmission lines passing through Aberfoyle's nearby mining leases;
- the Murchison Highway being the eastern boundary of the title area;
- the close proximity of EZ's Burnie to Rosebery railway line;
- abundant water;
- new link roads bringing population centres within commuting distances of any possible mining operation.

The exploration target in EL 39/85 is a volcanogenic polymetallic base and precious metal deposit similar to the nearby Hellyer deposit. The Hellyer deposit has a published resource of 15m tonnes indicated at 13.0% Zn, 6.9% Pb, 0.4% Cu, 156 g/t Ag and 2.3 g/t Au with a further 4.0m tonnes inferred (Aberfoyle, 1987).

This report summarizes the investigations completed by Placer Exploration Ltd (the purchaser of CSR's Mineral Group) and CSR Limited in the term of the Licence from February 14, 1986 until March 1990.

2. SUMMARY

The 1989/90 programme continued with the drilling of BRD05 to 1181m. A 40m thick primitive basalt within the Que River Shale showed significant alteration and pyrite/quartz/chalcopyrite veining, particularly near the contacts with the shale. This suggests a late phase of volcanic activity in the southern portion of the graben structure. Mineralised fluids were associated with this final phase of volcanic activity.

This programme showed the Que/Hellyer Volcanics with the stratagraphic horizon containing the Que River and Hellyer mineralisation continued south from BRD 01 to the BRD 05 area. However, the overlying Hellyer Basalt and Que River Shale thicknesses increased towards the South. Thin section petrology and geochemistry showed sections of the Hellyer Basalt and the basalt within the Que River Shale were derived from very primitive magmas similar to those near the Hellyer mineralisation.

Exploration completed has:

- defined a highly prospective 1.5 x 1.5km downfaulted graben.

- shown the graben bounding faults to be active during the deposition of the Que/Hellyer volcanics and the basal part of the Que River Shale but not the upper part of the shale.

- shown the Hellyer/Que River mineralised horizon to occur at depths of 850+m in the graben, probably deepening to the south.

- shown the presence of fine grained sphalerite, galena and chalcopyrite within the basalts and dacites in the graben.

- shown significant sericite, calcite, silica and/or chlorite alteration with minor areas with fuchsite alteration in the volcanics in the graben.

- shown several possible structures within the graben which may be suitable for mineralisation conduits (similar to the Jack Fault?)

Only the eastern portion of the graben has been explored by drilling with follow-up downhole EM. Further drilling with essential downhole EM is required particularly in the area of the proposed possible fault zone in the west of the graben.

The area west of the graben has not been significantly explored. Mapping has shown this area is probably west of the Mt Charter Fault with basement Animal Creek Greywacke underlying Tertiary Basalt. This has been confirmed by drilling (BRD 04) and partial coverage by the gravity survey.

North of the graben (north of Que River) mapping has shown the occurrence of Que River Shale forming a shallow dipping syncline. However, drilling (BRD 03) has shown the Que/Hellyer Volcanics thin rapidly northwards (confirmed by Mines Department mapping in the area towards and northwest of Hellyer.) A detailed gravity survey shows this thinning north of the graben. This survey also shows a very clean gravity field in this area suggesting there is no large basemetal deposit in this area.

East of the graben the Que/Hellyer volcanics tend to be steeply west dipping and thin significantly. Many of the units in this sequence outcrop towards and beyond the Murchison Highway.

The graben continues to the south of the Licence boundary as shown by the BHP drilling in the former EL5/63 (HP 3).

Further exploration should be confined to the graben structure adjacent to the postulated internal fault in the western part of the graben. This exploration should be further deep drilling with associated downhole EM surveys.

3. LOCATION AND GENERAL

EL 39/85 is centred 5km west of the Hellyer base metal deposit and 25km North of Rosebery on the West Coast of Tasmania. The 6km (N-S) by 4km (E-W) area is adjacent to and West of Aberfoyle's EL 106/87 containing both the Hellyer and Que River base metal deposits (Figure 1).

Excellent access to the Licence area is provided by the sealed Murchison Highway, which forms the eastern boundary. The forestry constructed gravel Que Road bisects the Licence from east to west providing good driving access to within 2km of most parts. Access is further improved by a forestry track to the Bulgobac River (in the south of the Licence) and CSR/Placer constructed drill tracks in the central area to the south of Que Road. A CSR drill track to the north of Que Road has been rehabilitated, although this requires continuing fertilization. Regrowth on this track was impeded by a dry period shortly after rehabilitation. Recently this track has been fertilised and covered by cut ti-tree with seed pods.

Most of the northwestern half of the Licence is a plateau underlain by a cover of Tertiary Basalt flows. These flows weather to form a rich soil supporting a thick rainforest vegetation. Most of this rainforest was selectively logged earlier this century (evidenced by large old butts and numerous overgrown skidways) while the area around the western end of Que Road was clear felled in recent times.

The southwestern portion of the Licence is underlain by relatively flat lying late Middle Cambrian volcanoclastics and sediments overlying the Que/Hellyer volcanic sequence. Much of

the volcanoclastics support only button grass type vegetation which is now periodically burnt by the forestry industry. To the south, the volcanoclastics and intrusives are covered by rainforest, horizontal and regrowth.

The Licence is drained by two main drainages. The area to the north of Que Road is drained by the Que River while the south is drained by the Bulgobac River. These rivers join to the west of the Licence and drain via the Huskisson River to the Pieman River. The Que and Bulgobac Rivers and their tributaries are deeply incised in steep gorges resulting in a plateau area at an elevation of 630-680m and drainages at heights to 480m above sea level.

4. TITLE

Exploration Licence 39/85 (Bulgobac River) resulted from an application for the Bulgobac Exempt Area (ETA 8464) under the tender system operated by the Department of Mines. This tender was for the proposed work in the first 2 years of the Licence's period of tenure.

Area selection by CSR resulted from geological experience of the Mt Read Volcanics gathered over the preceding 12 years. Additional to the data compilation, new airphoto and Landsat interpretations were undertaken.

On 14th February 1986, EL39/85 was granted to CSR Limited and covered an area of approximately 11km^2. The Licence area was increased to approximately 16km^2 in June 1988. This resulted from Licence boundary adjustments to AMG coordinates on the expiry of the adjacent EL12/72. On the sale of the Minerals Group of CSR Limited to Placer Exploration Limited in 1988, EL39/85 was transferred to the Placer Group.

EL39/85 is subject to yearly renewals. EL39/85 is due for 50% reduction on the 14th February 1991 and expires in 1996.

5. PREVIOUS EXPLORATION

(a) Pre CSR/Placer

The Gold Hill prospect, located immediately north of the Que River Mine, was located by prospecting activity in the 1920's. Prospectors followed pannable gold upstream from the Que River to locate Gold Hill. Consequently, it is probable that prospecting activity extended into EL 39/85. However, no mineral occurrences are recorded within EL 39/85 and exploration to date has not located any evidence of early prospecting.

Forestry operations were undertaken in the late 1960's - early 1970's in the plateau area on the western section of EL 39/85. The area logged was the myrtle rainforest growing on red soils developed over Tertiary basalt. Access to this area was by a gravelled road, the "Que Road", from the Murchison Highway.

Geological mapping of the area was undertaken on a limited basis by geologists employed by Rio Tinto as part of a joint venture with EZ in the 1950's. Department of Mines' geologists mapped part of the area as shown on the published Mackintosh 1" = 1 mile geological map.

In 1969-1971, Comstaff Pty Ltd completed stream sediment and geological mapping of the area as part of a reconnaissance programme on EL 5/63. Results for this stream sediment sampling are available on open-file reports at the Department of Mines. Evidence of this sampling programme was observed during geological mapping of EL 39/85.

The programme undertaken by Comstaff consisted of detailed -80 mesh stream sediment sampling and limited heavy mineral concentrate stream sediment sampling. This sampling produced two areas in or adjacent to EL 39/85 which were followed up:

(i) Debussey Creek resulted from an anomalous gold assay in a heavy mineral concentrate stream sediment sample, and

(ii) Sock Creek area resulted from anomalous -80 mesh stream sediment samples.

The Debussey Creek anomaly was followed up with additional stream sediment geochemistry and A° horizon soil sampling with negative results. Additional follow-up in 1984 located only one sample with detectable gold in a heavy mineral concentrate, Comstaff Pty Ltd (1985).

The Sock Creek anomalies were followed up and the Sock Creek vein type Ag-Pb-Zn mineralization discovered. The Sock Creek prospect is located 1km southwest of the south-west corner of EL 39/85. The follow-up sampling programme in the Sock Creek area extended into EL 39/85 with grid lines being cut into the Hash and Joint Creek areas. It is believed that geological mapping, soil geochemistry and a moving loop EM system was undertaken on these grid lines, but no data for this work are available on open-file reports at the Department of Mines.

In 1975, as part of a larger programme on EL 5/63, an INPUT EM and magnetics survey was flown over the area. Within EL 39/85, no follow-up to this survey was undertaken as the major conductive zones located were interpreted to be due to surficial or stratagraphic conductors, Butt et al. (1975).

(b) CSR/Placer

After EL 39/85 was granted to CSR in February 1986, as a result of a successful tender application for the Bulgobac Exempt Area (ETA 8464), work was commenced in the search for a polymetallic volcanogenic deposit. An initial programme of geological mapping and geophysical surveys involving aeromagnetics, grid based VLF-EM, induced polarization, CSAMT and gravity, resulted in the drilling of two diamond drill holes. These two vertical holes BRD01 to 860.5m and BRD02 to 676m tested apparent CSAMT anomalies with some supporting gravity anomalies. Weak mineralization in the hanging wall Hellyer Basalt was intersected in BRD01. However, the greatly increased thicknesses of the Que River Shales and the Hellyer Basalt intersected in these holes suggests the Que/Hellyer mineralization host horizons are deeper than the effective depth penetration of electrical geophysics. O and C isotope data on calcite veining and vesicle infilling from within the Hellyer Basalt in BRD 01 and 02 indicated formation temperatures of 150°C and 110-120°C, respectively. Downhole EM was successfully completed to the full depth of BRD02, but reached only 700m in BRD01 with no anomalies being detected (Williams 1987a, 1987b).

Two further stratagraphic holes were drilled in 1988. BRD03 near Que River showed the Que/Hellyer volcanic sequence thinned dramatically to the north (north of Que Road) while BRD04 near Mutter Creek showed the Tertiary Basalt to the west was underlain by Animal Creek Greywacke. Mutter Creek was thought to be on or near the Mt Charter Fault.

The programme of gridding, geological mapping and 50m spaced gravity surveys were extended to cover most of the Licence area. This work suggested the most prospective area of

the Licence was a 1.5km square block between BRD02 and BRD04 and extending from between Que Road and BRD01 to the Licence boundary in the south. This area contains an abnormal thickness of Que River Shale and Hellyer Basalt and is bounded by growth faults active during the deposition of these rocks.

A UTEM III survey was completed over the area north of Que Road. Elsewhere the shale and basalt units extend to depths in excess of 600m below surface. Weak anomalies associated with the Tertiary basalt and sediments cover were noted. No deeper significant anomalies were observed.

An evaluation of the BRD01 core showed the base of the hole (850-860m) intersected Hellyer type "Mixed Sequence" breccias (polymict), the host horizon for the Que River and Hellyer massive sulphide deposits. This part of BRD01 was not explored with downhole EM.

BRD01 was re-opened and deepened to 1131m (BRD01A). Much of the dacitic/basaltic/andesitic sequence below the Hellyer Basalt was significantly altered calcite/sericite and, in parts of the lower Basalt, by fuchsite. Minor basemetal sulphides were observed in vesicles and veins. Pb isotope evaluation of these sulphides, trace element and whole rock analyses and thin section descriptions show strong similarities to the Que River/Hellyer deposit.

The lower part of BRD01A (below the wedge at 600m) was logged with an EM37 survey. Results were disappointing.

Magnetic remanance calculations for basalts from BRD01, 02, 03 showed the core basalts were atypical of fresh surface basalt but like glossy weathered/altered basalts.

6. REGIONAL GEOLOGY AND MINERALIZATION

The lithologies of exploration interest are the Cambrian calc-alkaline Mt Read Volcanics which host important base metal deposits at Mt Lyell, Hercules, Rosebery, Que River and Hellyer. The regional geology is described in numerous publications, e.g. Corbett and Lees (1987).

Prior to the discovery of the Que River Deposit in 1974, the geology of the area of EL 39/85 was poorly investigated. Knowledge of the geology and structure of the area progressed with exploration undertaken by Aberfoyle, Comstaff and EZ on various ELs within the general area. Mapping was undertaken by the Department of Mines prior to preparation of the explanatory notes on the Mackintosh 1 mile map (Collins et al., 1981).

Collins (op cit) postulated the following sub-division of the Mt Read Volcanics in the Que River area:

(i) a western volcano-sedimentary sequence of which the Que River Beds (Que River Shales), of late Middle Cambrian age, were interpreted as the basal sediments in the Que River area, and

(ii) an eastern (central) volcanic sequence which in the Que River area was dominantly andesitic.

The boundary between the two sequences was interpreted to be discordant and in places in faulted contact.

With the discovery of the Hellyer deposit in the early 1980's, and the consequent generation of more detailed knowledge of the stratigraphy and structure, the Que River

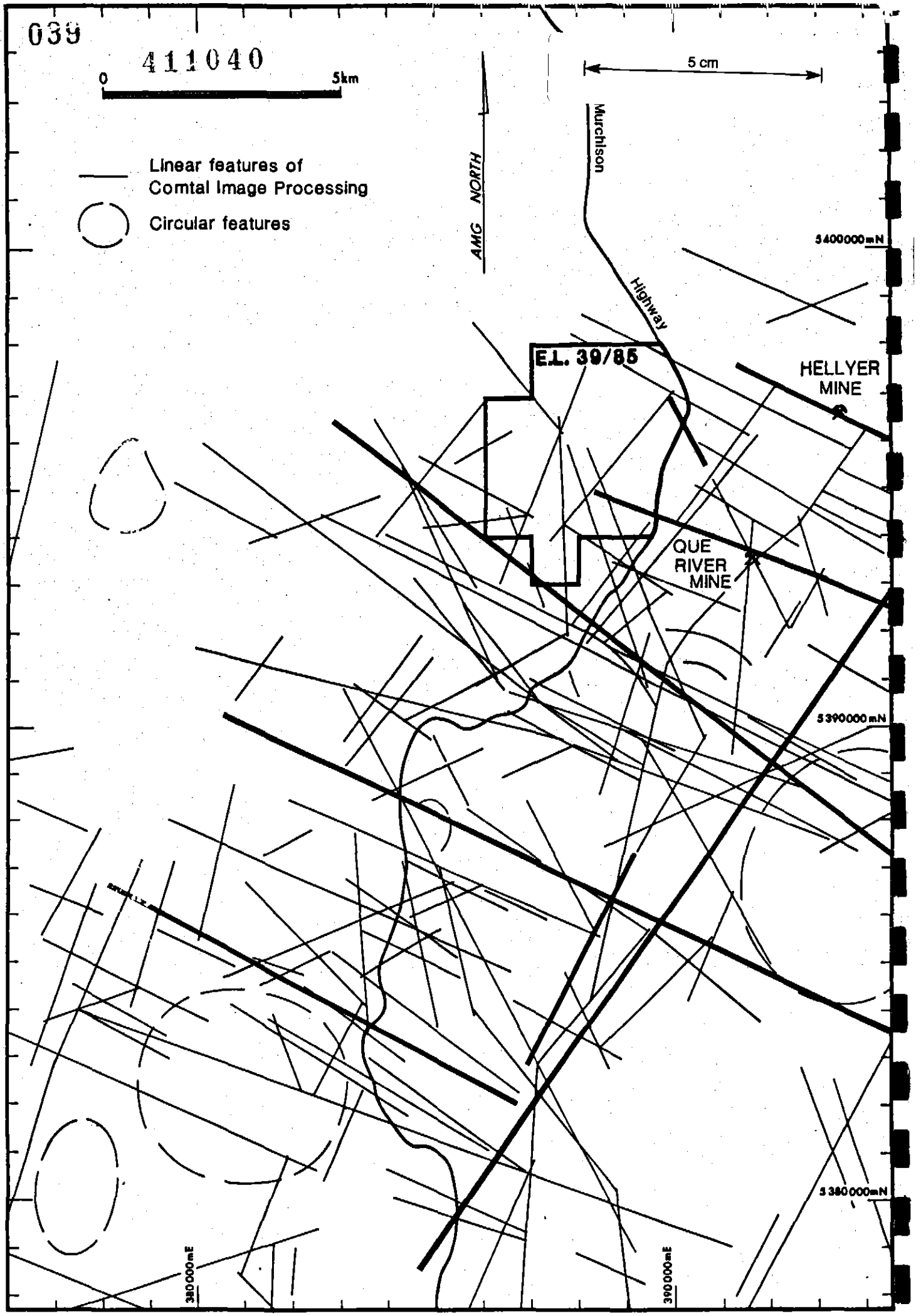

FIG. 2 LANDSAT LINEARS BULGOBAC RIVER TAS.

Shale was interpreted to be in conformable contact with the underlying volcanics. Thus, the stratigraphy hosting the Hellyer deposit could be projected down dip into the eastern area of EL 39/85.

Previous conceptual thinking regarded the volcanics at Que River-Hellyer as forming part of Corbett's "Central Volcanic Sequence". However, recent geological mapping (Komyshan, 1986) and trace and whole rock analyses (Crawford, 1987) have resulted in a revised interpretation of the Que River-Hellyer volcanics as forming the basal part of the Dundas Group. This can be equated with Corbett's "Western Sequence" to the northwest of the Henty Fault Zone.

Regional studies revealed the following features pertinent to EL39/85 from aerial photographs an interpreted:

- major thrust cuts E-W immediately South of Mt. Charter (as subsequently shown on the 1:25000 Mines Department mapping)

- a systematic pattern of Landsat linears was interpreted as possible controls on the Que River and possibly Hellyer deposits. Similar intersecting linears occur in EL39/85. This interpretation, using images generated after geometric correction of the digital data to the Australian Metric Grid was undertaken as part of a regional study. The relevant area of EL39/85 is included as Figure 2.

Exploration undertaken since granting of EL 39/85 has extended the area of potential host stratigraphically for Hellyer-Que River type mineralization. However, drilled thicknesses of the Que River Shale have exceeded those indicated by previous mapping and drilling on adjacent titles.

Although presenting problems for exploration, this increased thickness of the Que River Shale and the underlying Hellyer Basalt possibly suggests an increase in the size of any massive sulphide deposits, (if the Kuroko model is considered and believed).

7. ACCESS, GRIDDING AND SURVEY CONTROL

Pre-existing vehicular access to the EL was good with the eastern boundary being the Murchison Highway, the "Que Road" logging track running east to west through the centre of the title and other logging tracks providing access into the SW corner.

A 100m wide Scenic Reserve occurs along the side of the Murchison Highway. Discussions with the Department of Mines indicate that the National Parks and Wildlife Service will not allow any access construction for exploration purposes through this Scenic Reserve.

Initial geological mapping was undertaken along creeks and several grid lines cut on the AMG orientation (DRG No. SK55.3-3302). Creek names shown on plans produced by Comstaff have been utilised where no evidence of a previous name exists.

This phase of geological mapping indicated a grid orientation similar to that used by Aberfoyle over the adjacent EL would be suitable for geophysical surveys. The mathematical formula for transformation of the Aberfoyle grid from AMG was obtained from the Department of Mines and a base line at 2400E established using Forestry Department survey points on Que Road.

Parallel lines were cut from this baseline at 200m intervals. Eventually this grid was extended to cover most of the Licence area with two further sub-baselines being cut at 1600E and 800E.

In order to provide accurate survey locations for the detailed gravity survey, closed traverses were completed along the 2400E and 800E base lines, and the Murchison Highway by Peacock, Darcy and Anderson, consulting surveyors. During these closed traverses, all visible grid pegs were co-ordinated. Subsequently, all remaining gravity stations were levelled by CSR personnel.

On completion of the deepening of BRD01A and the drilling of BRD05 loops for downhole EM were roughly cut. These nominally 600 x 600m loops utilised existing cut cross lines, wherever possible, and were joined by new N-S end lines. The central loop over both holes were new lines. These new loops were not surveyed or levelled but were controlled by existing grid stations.

Following discussions with the Department of Mines, bulldozed access tracks were constructed to the north and south of Que Road to provide access for diamond drilling.

Subsequently, the access track to the north of Que Road was rehabilitated. It was envisaged that this area had little potential for massive sulphide deposits since no anomalies occurred on either the UTEM or gravity surveys. Mapping and drilling suggests any Hellyer sized orebodies should have been detected by these methods.

Further tracks have recently been made to the BRD05 drill site. The proposed route was examined by T. Duckett (Forestry rehabilitation) and F. Podger (CSIRO) to discuss problems and methods. Little soil and/or weathering occurs on the quartz-feldspar porphyry occurring in this area, but tracks tend to be very slippery.

8. GEOLOGICAL MAPPING

The first phase of geological mapping was undertaken to improve geological knowledge and thus enable the more prospective sections of the EL to be identified for early geophysical testing, as well as to determine the structural framework, and hence the most applicable grid orientation.

This mapping outlined the following important aspects of the geology as shown on DRG No. SK55.3-3301.

(1) shale units in the Bulgobac River downstream of the Murchison Highway and in southward flowing tributaries of the Bulgobac River form a flat-lying synclinal structure within the acid pyroclastics overlying the Que River Shales.

(ii) mapping in Mutter Creek, a major SSW flowing tributary of the Bulgobac River, located shales and pyritised and altered acid to intermediate volcanics. These rocks were interpreted as correlates of the Que River Shales. A single thin sediment horizon within the volcanics indicated a 20° dip to the SE.

(iii) mapping on a grid line cut along AMG 5395000mN between 388000mE and 389000mE located shallow, SE-dipping shales to the east of Mutter Creek. These shales were also considered to be correlates of the Que River Shales, thus supporting a flat-lying syncline with a SW-NE axis in the area between Mutter Creek and the

Murchison Highway. The western side of this syncline had potential for the location of mineralisation at a shallow depth.

(iv) the stratigraphy hosting the Sock Creek mineralisation to the SW of the EL continues NE into the SW corner of the EL and must be truncated by the presumed continuation of the Mt. Charter Fault as shown on the Department of Mines recent 1:25,000 scale mapping.

Subsequently, the geophysical grid was cut and mapping completed on these lines. This mapping produced limited extra geological information, but confirmed the previously interpreted geology.

In early 1990 the Que River was mapped to the northwest corner of the grid. This showed the quartz-feldspar porphyritic rocks continue almost to the Licence boundary. Around the Licence boundary micaceous greywacke, sandstone and siltstone occurs. This is similar to that occurring west of the Mt. Charter Fault in the southern part of the Licence.

Geological mapping was supported with petrological examination of 54 samples.

9. GEOPHYSICS

9.1 Aeromagnetics

Although a very subtle response can be demonstrated for the massive sulphide deposits of Western Tasmania (Leaman, 1987), aeromagnetics was not considered as a direct search method but only as an aid to geological interpretation. In the summer of 1985-1986, CSR had arranged a contractor to fly aeromagnetics on another project in Western Tasmania and thus EL39/85 was flown at marginal extra cost. Previous reprocessing of the 1981 Department of Mines aeromagnetic survey had suggested a vague linear distortion of the magnetics which was interpreted as demagnetising alteration of a possible fracture zone within EL39/85.

The low-level detailed aeromagnetic survey, completed early in 1986, used the Geometric gradiometer system and was flown at a nominal terrain clearance of 70m and a flight line spacing of 100m. The data presented as DRG No. SK55.3-3303 and SK55.3-3304 are the contouring of the tail boom magnetometer data as the pitch and roll measurement/corrections are inadequate for the full gradiometer data in relation to the detail obtained by 100m line spacing. Contouring of the gradiometer data results in distortions due to altitude and levelling difficulties. DRG No. SK55.3-3304 indicates the flight path recovery of the survey.

As shown on DRG. No. SK55.3-3303 the aeromagnetic responses can be divided into the following:

(i) an intense pattern of highs and lows over Tertiary basalt, and

(ii) over the Cambrian rocks, a flat magnetic field within which a strong regional gradient increasing to the SW is observed.

(iii) a high/low dipole in the southern 1 km^2 portion of the EL is probably straddling the NW continuation of the Mt. Charter Fault.

(iv) a NE-SW trending ridge in the contouring on the eastern side of the Murchison Highway is considered to result from a +3-4 Nt response over the Hellyer Basalt which is footwall to the Que River Shales.

The only ground follow-up of the aeromagnetics has been a single short traverse along 388350mE AMG south from 5395000mN to locate an intense magnetic high. Tertiary basalt located on this coincides with this magnetic high and is considered to be the source of the magnetic anomaly.

9.2 VLF-EM

With the exception of the areas covered by Tertiary basalt and the swampy area around the confluence of Mutter Creeks with the Bulgobac River, soil cover is probably less than 1.0m depth over the EL. Thus it was considered that VLF-EM could provide a technique to map conductive shale units within resistive volcanics. Consequently, CSR's VLF-EM 16 unit using the NW Cape frequency, was run on the grid lines south of Que Road.

The orientation of the NW Cape signal to the orientation of the relatively flat-lying lithologies is far from ideal and has added to the circumspection with which the VLF data were regarded. The signal from the Japanese transmitter is almost inaudible, and consequently could not be utilised.

The VLF data are presented in Fraser filtered form as DRG No. SK55.3-3305.

9.3 Induced Polarisation

With the interpretation of a synclinorial structure between Mutter Creek and the Murchison Highway, it was decided to use gradient array IP to outline the extent of the chargeable and low resistivity shale unit within the more resistive volcanics. In addition, the extent of the pyritised volcanics in Mutter Creek could be determined and any other zone of chargeable volcanics located.

Zonge Engineering undertook this work in December 1986 and January 1987 using a current electrode separation of 3.5km and energisation with a 7.5 KVA generator. Potential electrode measurements were made at 25m dipole separation. The data are presented as chargeability (Dr. No. SK55.3-3306).

Results for this survey indicate the following:

(i) a western zone of high resistivity and low chargeability (phase response) except over the pyritised volcanics in Mutter Creek, and

(ii) an eastern zone of low resistivities and moderate to high chargeabilities.

The western zone is interpreted to represent volcanic footwall to the Que River Shale horizon. The eastern zone is dominated by the response from the Que River Shale horizon which is interpreted to have a shallower dip than indicated by the geological mapping. Due to the effects of the current channelling in such a flat-lying conductive lithology, it is

doubtful that the gradient array would have penetrated beneath the Que River Shale horizon. Depth penetration in the resistive western zone is estimated as a maximum of 100m.

Basalt from the CSR drilled holes of BRD 01, 02 and 03 had magnetic remanance calculations made using field measurements taken with a proton precision magnetometer. Measurements were made of the magnetic field changes caused by a section of the core basalt being inverted close to the magnetometer head. These measurements were made for the basalt core at 3m intervals down each of the holes.

Dr. D. Leaman used the measurement of field changes to calculate rough relative magnetic remanance. These showed the Hellyer Basalt intersected in the CSR diamond drilling at Bulgobac River was atypical of fresh surface basalt but more like glossy weathered or altered basalt. This would confirm the geological/geochemical evaluation of the core.

9.4 CSAMT

The input EM survey flown in 1975 (op cit) indicated that the near-surface bedrock immediately west of the Murchison Highway was of sufficiently low resistivity to generate strong EM anomalies. The extent of these anomalies indicated probable flat-lying Que River Shales. Consequently, application of a large, fixed loop EM system, was not regarded as an optimal exploration technique in the search for a conductive massive sulphide body beneath the Que River Shales. Previous experience with the CSAMT technique, offered by Zonge Engineering, suggested this could be applicable in the search for a conductive body beneath a flat-lying conductive horizon.

Line 7600N was selected as a test line to test the application of CSAMT to the area. This test line confirmed the geological interpretation of the flat-lying synclinal structure, and additionally, located an apparent phase anomaly at depth beneath the Que River Shales. Geophysical interpretation suggested this anomaly at 2350E/7600N was a drill target regardless of the gravity data.

With the success of the test line of CSAMT, an extended programme was undertaken during February/March 1987. A further apparent phase anomaly similar to that at 2350E/7600N was located at 2750E/7400N.

A Placer re-examination of the CSAMT survey data showed the data to be of limited use. Near and transitional field effects make most of the data below 256Hz to be un-interpretable. Except for odd stations (eg 2400E/7600N) most data was only from shallow depth. The base of the Que River Shales was not seen. (Appendix I).

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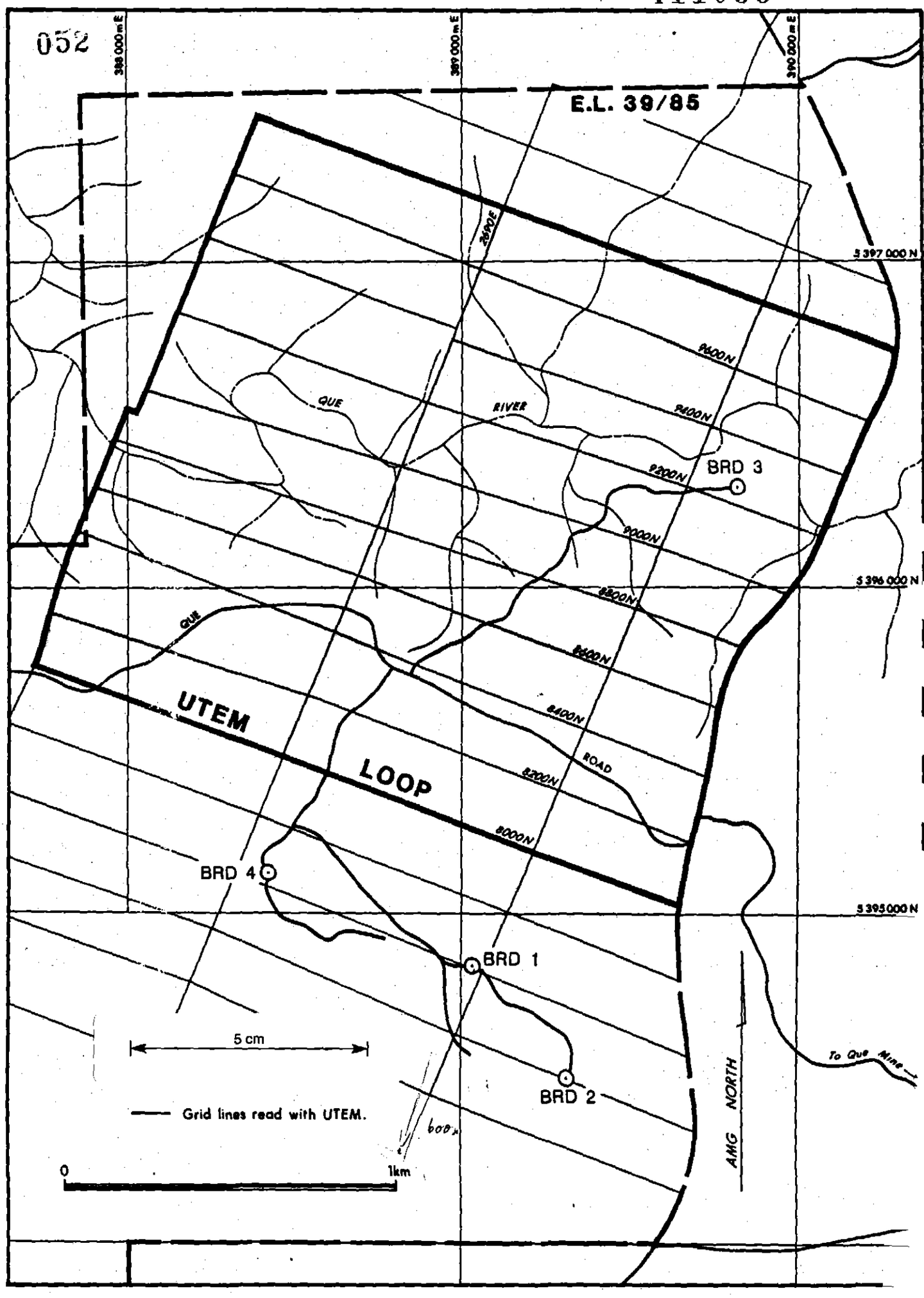

FIG. 3 UTEM COVERAGE BULGOBAC RIVER TAS

This Placer re-examination suggests a magnetotelluvics survey using frequencies in the range 0.025 to 16Hz would have to be used to penetrate to depths of 1.5 to 2.0km. Such a survey would have a decrease in the resolvability of geological units.

9.5 UTEM

A fixed-loop TEM survey (using UTEM III equipment) was completed over the northern half of the grid area, where CSAMT results had indicated possible shallower depths to the base of the Hellyer Basalt. The survey was conducted on 200 metre spaced lines, with readings at 50 metre intervals, recording both the horizontal and vertical components of the magnetic field. The transmitter loop location and surveyed area are shown in Figure 3 and results are included in Appendix ~~N~~ I

Only one feature of interest is evident in the UTEM profiles - at approximately 1450E on Lines 8200N and 8400N. An early-time (Channels 10 to 7) residual Z component cross-over and coincident X component peak are consistent with a steeply dipping, poor quality conductor. The anomaly position however coincides with an inferred fault position in an area of Tertiary basalt cover and is interpreted as a probable weathering feature in the pre-basalt surface. Elsewhere in the survey area, the results are generally uniform, with variations in the TEM response reflecting thickness of the major shale and volcanic units, intersected in DDH 3.

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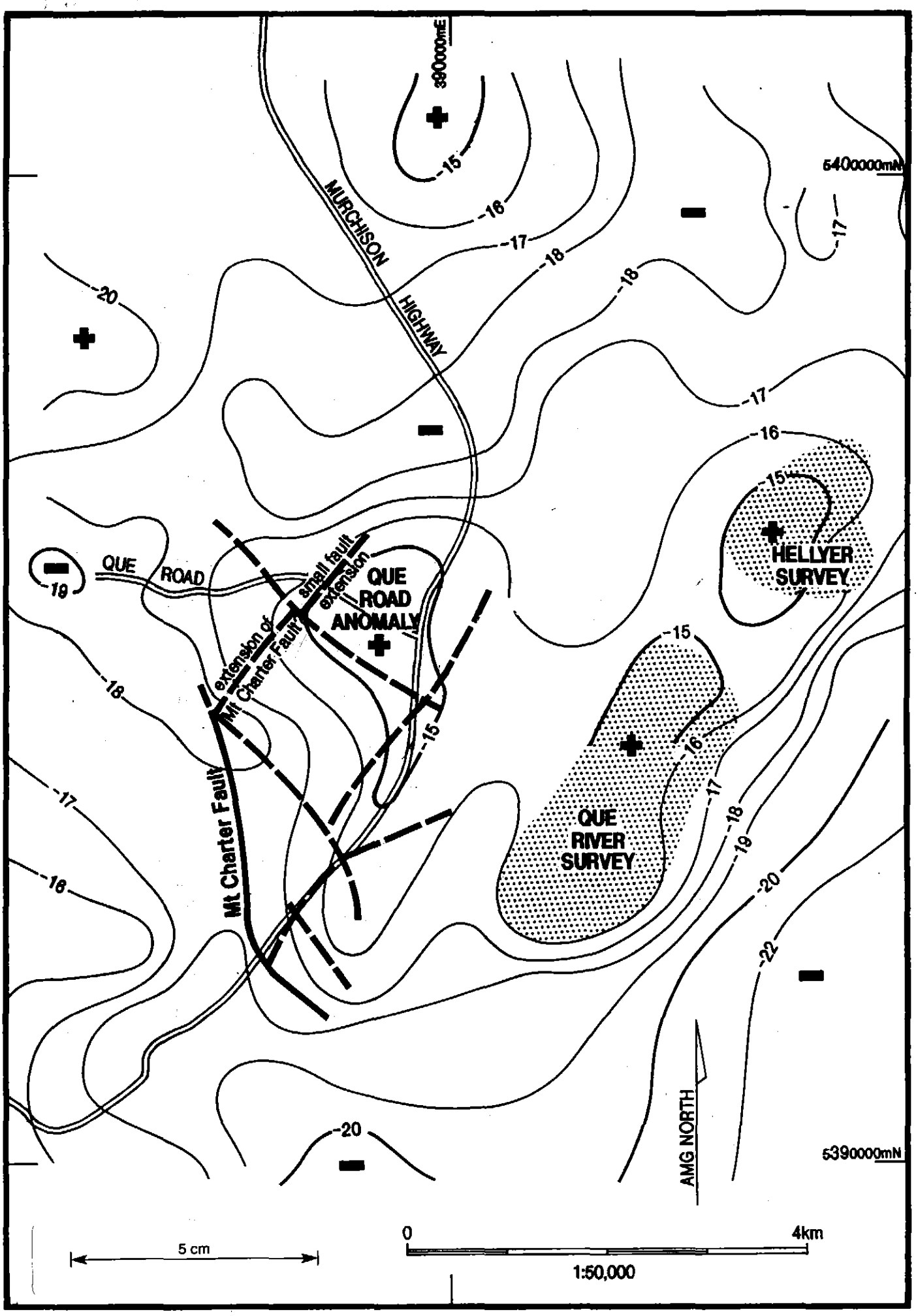


FIG.4 GRAVITY COMPOSITE BULGOBAC RIVER TAS.

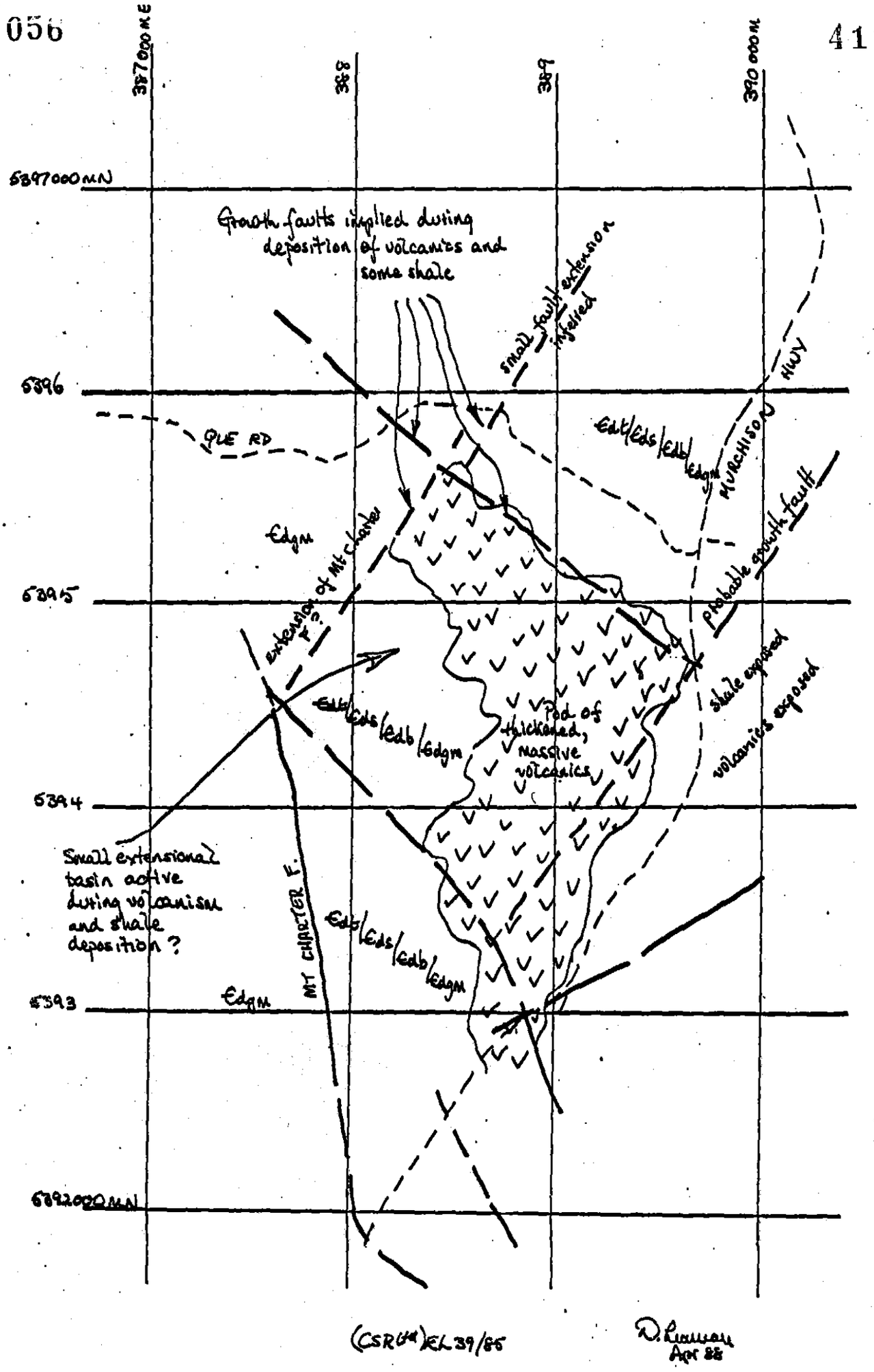
9.6 Gravity

A gravity survey undertaken by the Department of Mines (Hudspeth and Richardson, 1985) indicated a significant gravity anomaly over the Hellyer deposit. With this encouragement, a gravity survey was undertaken during the summer of 1986/87 over the gridded area immediately west of the Murchison Highway to cover the areas of favourable stratigraphy delineated by the available geological mapping.

The area covered by gravity surveying was extended over most of the original licence area during the summer of 1987/88. Further details of this survey, which was undertaken by Solo Geophysics with Leaman Geophysics processing the data are included as Appendix I. This Appendix includes Leaman's 3-D modelling and interpretation.

Data from CSR's surveys, the Department of Mines detailed surveys on the Que River and Hellyer areas and the regional survey data from the Mt. Read project have been integrated and are presented as Figure 4.

Three dimensional modelling of the geological interpretation derived from all available data has been completed by Leaman Geophysics. This modelling has indicated that the abnormal thicknesses of the Que River Shale and underlying volcanics, which are hangingwall to the expected ore position, are restricted to a small block where boundaries appear to have been growth faults during the deposition of the units. This small basin, measuring 1.5 x 1.0 km is shown on Figure 5.



(CSRM) EL 39/85 D. Rawlinson Apr 88

SUMMARY OF INTERPRETATION

FIGURE 5

DDH BRD 01A

The extension of BRD 01 was primarily to test the Que/Hellyer Volcanics beneath the Hellyer Basalt by both drill core analyses and a downhole EM survey. Petrology of the core from the bottom of the original hole suggested the hole terminated in the "Mixed Sequence", the host horizons for the Que River and Hellyer basemetal deposits. Downhole EM could not be completed on the original hole, even though it was cased with PVC, due to a cave-in at about 680m.

An NQ drill string was lowered down the original hole over the PVC casing. With some difficulties the drill string was lowered to 600m, the base of the NQ in the original hole. The casing was removed and a Hallrowe Wedge set at 586m down hole (to the top). Due to hole conditions this could not be set at the most appropriate direction. A new NQ hole was drilled off this wedge to a depth of 1133m. (Drg. No. SK55.3-3307)

The lithologies intersected in this hole were:

0 - 75m	Pyroclastics
75 - 531m	Que River Shale
531 - 850.5m	Hellyer Basalt
850.5m - 917m	Mixed Epiclastic
917 - 953m	Lower Basalt
953 - 1052m	Dacites - Lavas and Breccias
1052 - 1086m	Andesites
1086 - 1120m	Tuffs and Sediments
1120 - 1131m	Animal Creek Greywacke Type Sediments
1131 - 1133m	Basaltic Andesite Lava
1133m	EOH

9.7 Developmental Geophysics

With the drillhole data indicating a depth penetration of about 100 - 500m by CSAMT, the problem remains of exploration at depths greater than 500m. Current thinking if that the large fixed loop EM systems such as UTEM would have no greater depth penetration. Gravity remains as one technique by which real data can be collected, but the decrease in anomaly magnitude due to increasing depth, again reduces the ability to detect Hellyer-sized massive sulphides.

Downhole EM is known to detect massive sulphides at depths of at least 1300m and is thus a viable exploration tool.

Consideration is being given to testing the potential of using a grounded fixed loop EM system in which the grounded section of the loop would be from the bottom of drill holes reaching beneath the Que River Shale. A large transmitter system such as that manufactured by Zonge may be suitable to generate the primary EM field. A SIROTEM receiver could be used to measure the secondary field.

10. DIAMOND DRILLING

10.1 Introduction

The following programme was proposed for CSR's budget year from 1st April, 1987 to 31st March, 1988.

DDH BRD 001 : a vertical hole at 2350E/7600N to a depth of 450m. The target was a CSAMT-phase anomaly at a depth of 370m. This anomaly was located in the interpreted less intense flank of the gravity high.

DDH BRD 002 : a vertical hole at 2750E/7400N to a depth of 500m. The hole was centred on a gravity high and a CSAMT-phase anomaly at a depth of 400m.

The following stratigraphy was expected in these holes.

	BRD 001	BRD 002
Acid pyroclastics	0-50m	0-50m
Que River Shale	50-200m	50-200m
Volcanics	200-EOH	200-EOH
Drill Target	370m	400m

DDH BRD 003 : a stratigraphic hole immediately south of Que River and west of the Murchison Highway.

DDH BRD 004 : an angle-hole on a westerly azimuth to test the pyritised and altered volcanic

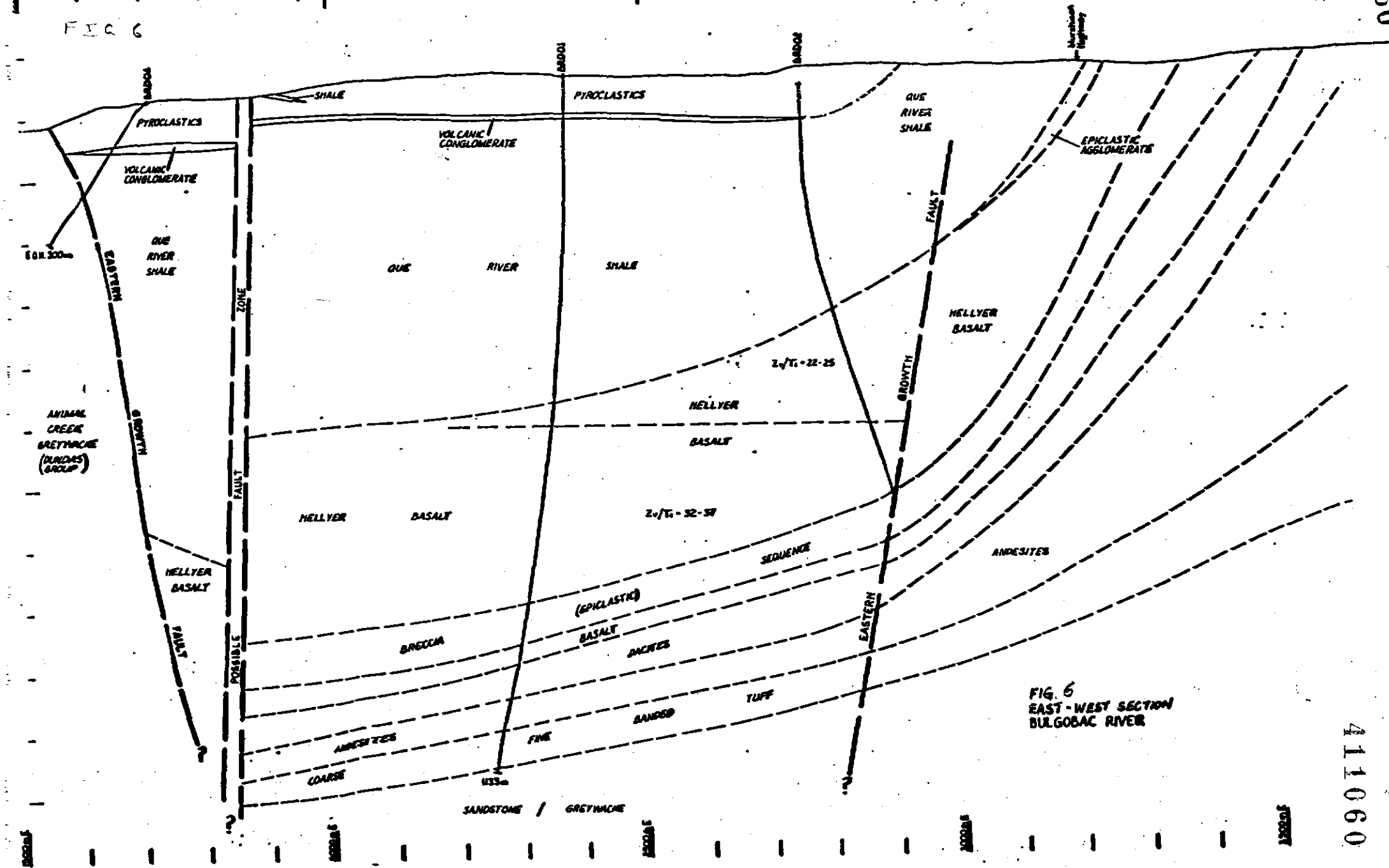


FIG 6
PYROCLASTICS
SHALE
VOLCANIC CONGLOMERATE
QUE RIVER SHALE
EASTERN
ZONE
FAULT
ANIMAL CREEK GREYWACKE (DUNDAS GROUP)
HELLYER BASALT
POSSIBLE
BRECCIA
(EPICLASTIC)
BASALT
DACITES
ANDESITES
COARSE
FINE
BANDED
TUFF
SANDSTONE / GREYWACKE
EPICLASTIC AGGLOMERATE
GROWTH
SEQUENCE
ANDESITES
FIG. 6
EAST - WEST SECTION
BULGOBAC RIVER

stratigraphy west of 1750E on Line 7600N.

The following 2 hole programme was proposed for the current period to February 1990 (Drill locations are shown on Drg. No. SK55.3-3301).

DDH BRD 01A : re-open and extend the old hole to 1100m after penetrating the Que/Hellyer Volcanics - this would enable a "wide-seeing" down hole EM survey to be completed (former BRD01 was blocked with no EM coverage below 680m).

DDH BRD 05 : a vertical hole 600m grid south of BRD01 with a final depth of 1100m - to test the Que/Hellyer Volcanics outside the downhole EM37 surveys zone of exclusion of 450m from BRD 01.

These holes have now been completed.

(1) BRD 01 - as proposed but considerably deeper than expected with a final depth of 860.5m.

(ii) BRD 01A - as proposed with a final depth of 1131m ending in thin Animal Creek Greywacke type micaceous sediments over further volcanics.

(iii) BRD 02 - as proposed but with a final depth of 676.0m.

A cross-section showing both these holes is presented as Figure 6.

(iv) BRD 03 - as proposed to a final depth of 541.4m.

FIG. 7
NORTH-SOUTH SECTION
BULGOBAC RIVER

(v) BRD 04 - as proposed to a final depth of 301.0m.

(vi) BRD 05 - as proposed but with a final depth of 1181.0m still in dacite volcanics.

Cross sections showing correlations between holes are presented as Figures 6 and 7.

Core logging was undertaken using a computerised format (CSR derived). Appendix IV includes a description of this system and the detailed drill logs for all drill holes. (BRD 01-05).

10.2 DDH BRD 01/01A

DDH BRD 01

This vertical hole was sited at grid co-ordinates 2375E, 7600N and intersected the expected stratigraphy. However, the thickness of the Que River Shale was considerably greater than recognised elsewhere which resulted in the target horizon being at a significantly greater depth, i.e.

	Proposed	Actual
Acid Pyroclastics	0 - 50 m	0 - 75 m
Que River Shale	50 - 200 m	75 - 527.5 m
Hellyer Basalt	200 - 420 m	527.5- 850.5 m
Mixed Sequence	420 - EOH	850.5 - EOH
EOH	450 m	860.5 m

This hole remained remarkably near-vertical, flattening to -83° at a depth of 750 m. on completion, the hole was cased with plastic casing to the full depth.

Petrography completed on 12 samples confirmed the visual logging of a basic volcanic unit with pyroxene phenocrysts, but no feldspar phenocrysts over the interval, 529.5 to 850.5m. This unit is considered to be the Hellyer Basalt. Mineralisation was restricted to minor sphalerite-galena associated with strong quartz-carbonate veining in the top section of the basalt. In addition, sphalerite, galena and iron sulphides occur in vesicles in the basalt.

In hand specimen large parts of the core between 850.5 and 1086m were significantly altered. Much of the alteration was calcite-sericite but some zones were silica-chlorite-pyrite-epidote altered. Fuchsite was visible in parts of the Lower Basalt unit, particularly at 917-922m.

Core samples were selected for thin section petrography by A. Crawford. This work (Appendix V) confirmed the above rock types and showed the alteration to be extremely patchy. Some samples showed little more than normal regional burial metamorphism (prehnite-pumpellyite facies as in 701305 at 856m) through local hydrothermal alteration (calcite-sericite as in 701306 at 862.8m) to intense hydrothermal alteration (epidote-sericite-fuchsite alteration overprinted by calcite-sericite alteration as in 701315 at 917.9m).

Intervals sampled for thin section evaluation were generally sampled for comparative whole rock and trace element analyses. Most of the core from below the Hellyer Basalt to the end of the hole have been rock chip sampled (half core in strongly altered zones). Results of analyses confirmed:

- the extensive alteration of the volcanics

- the thin section rock descriptions.

Several thin sections of core are being studied by Dr. G. Green (Mines Department) for deposition/extrusion temperature as determined by probe analysis of the primary chlorites occurring in the volcanics. Results are not yet available.

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BULGOBAC PROSPECT

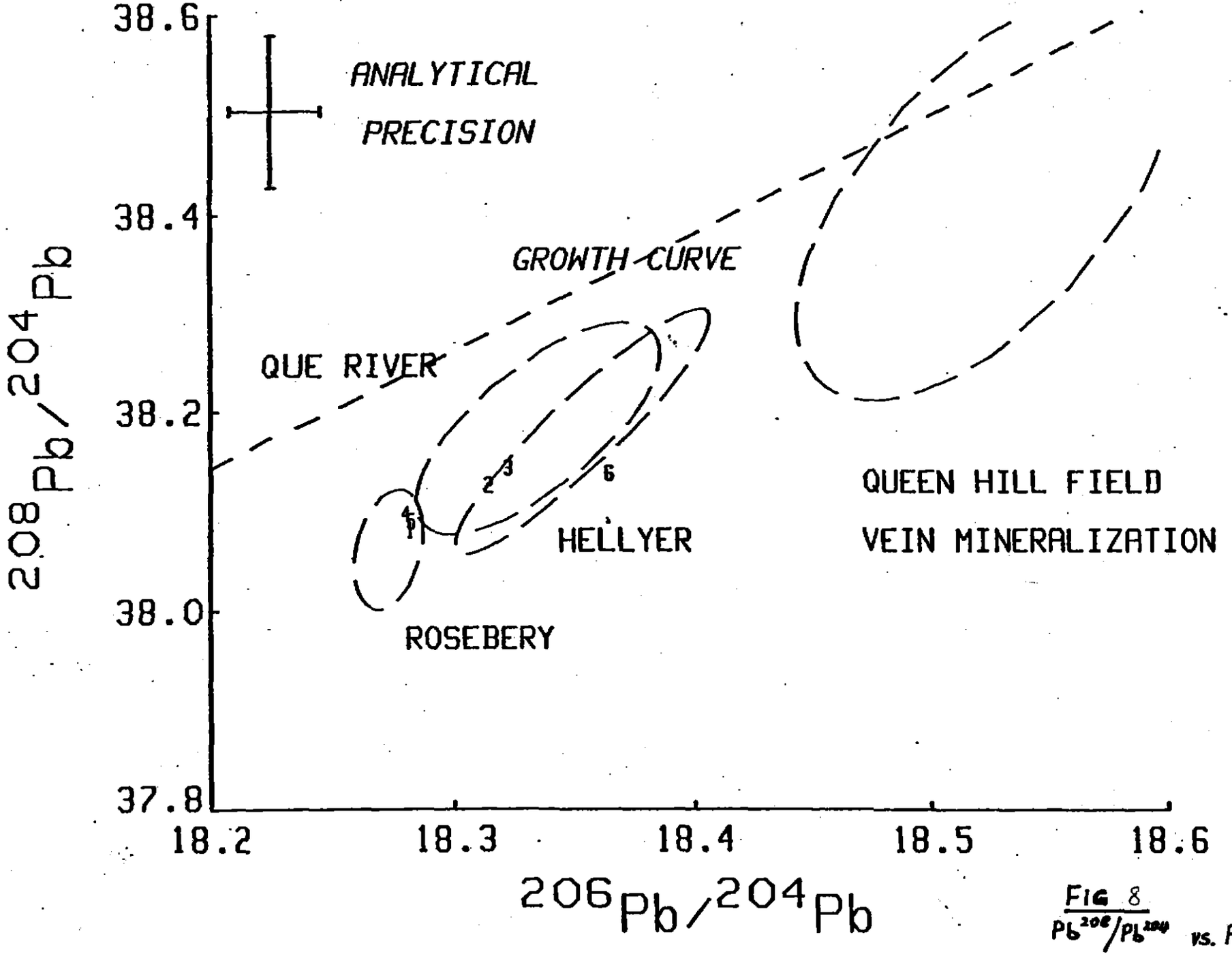

FIG 8
Pb^{208}/Pb^{204} vs. Pb^{206}/Pb^{204}

Four pieces of basalt were analysed for Pb isotope composition. Three samples contained sphalerite and galena in vesicules in the basalt while the fourth sample was adjacent to and included blobs of galena/sphalerite. Samples came from both the Hellyer Basalt and Lower Basalt horizons. Results of the analyses showed the Pb mineralization within the basalt horizons of the Que/Hellyer Volcanics to have a similar isotopic age to the Que River-Hellyer-Rosebery massive sulphide mineralization (Figures 8 and 9).

BULGOBAC PROSPECT

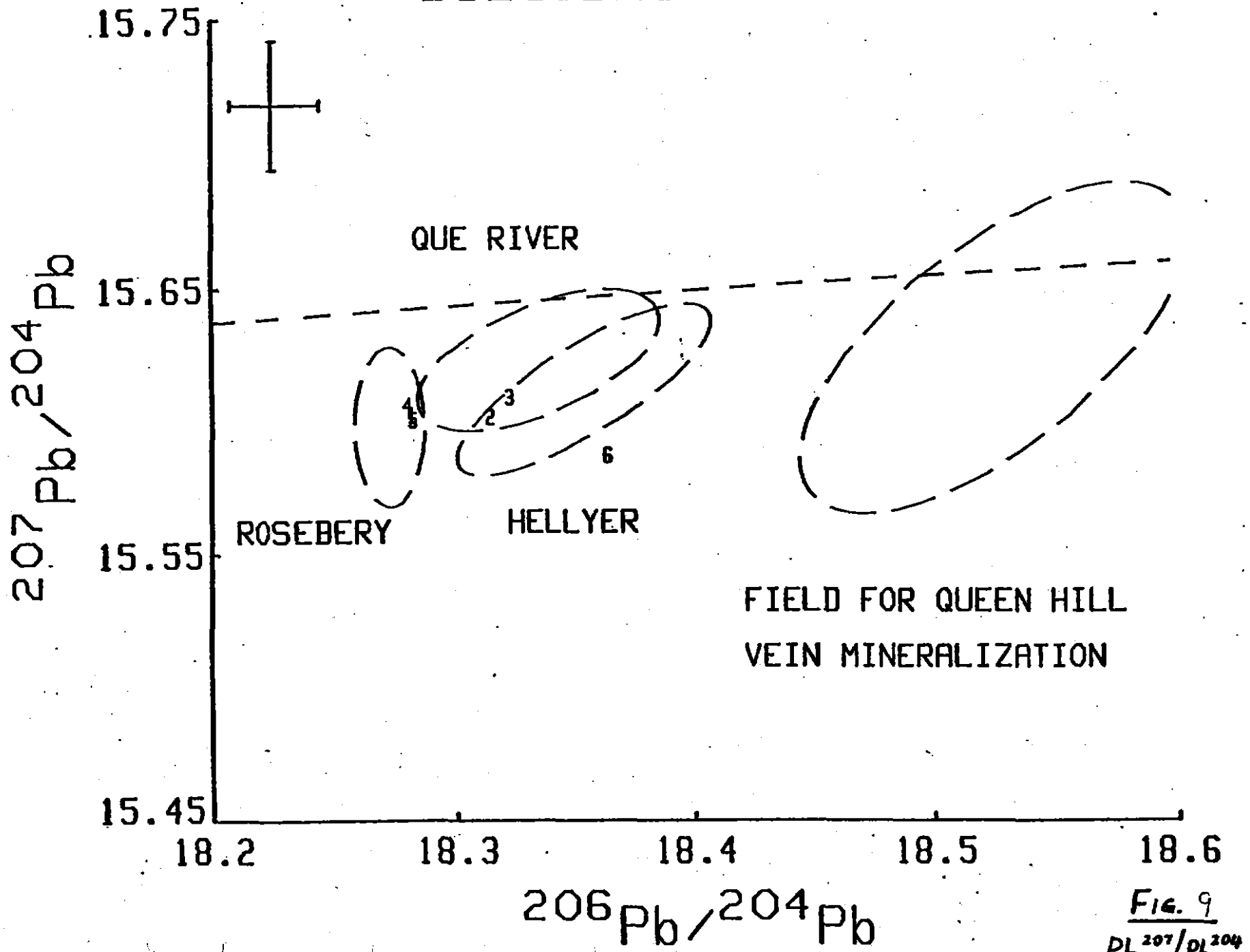

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FIG. 9

Pb^{207}/Pb^{204} vs. Pb^{206}/Pb

10.3 DDH BRD 02

Following the limited deflection (from vertical) experienced in BRD 01, BRD 02 was a vertical hole drilled at 2750E, 7400N. Re-interpretation of the CSAMT data suggested that the phase anomaly may have been due to hangingwall mineralisation above the target stratigraphy.

The original comparison of the stratigraphy in BRD 01 and a re-evaluation of the CSAMT data indicated that the CSAMT may have been penetrating to a maximum depth of 500m and consequently would not have penetrated to the required target depth. BRD 02 was sited directly over a 0.5 mgal gravity anomaly. However, the hole flattened more rapidly than BRD 01 and consequently deflected on an easterly azimuth and passed into the Hellyer Basalt up dip of the target zone. The hole was continued to 676m to enable downhole EM to be run and cased with plastic casing to the full depth. The comparison of expected and actual stratigraphic intersections is tabulated below:

	Proposed	Actual
Acid Pyroclastics	0 - 50m	0 - 65.8m
Que River Shale	50 - 200m	65.8 - 373.0m
Hellyer Basalt	200 -	373.0 - EOH
Mixed Sequence	- EOH	
EOH	400m	676.6m

The hole was terminated in broken ground which created drilling problems.

Petrography was completed on 19 samples and confirmed that the hole ended in a basic volcanic containing pyroxene phenocrysts, but no feldspar phenocrysts. Thus, the hole is considered to have ended in Hellyer Basalt.

Visually identified base metal mineralisation was more sparse in BRD 02 than observed in BRD 01.

10.4 DDH BRD 03

This hole, collared immediately west of the Murchison Highway and south of the Que River, was primarily drilled to test the stratigraphy in an area of flat gravity response. The geological data provided vital information for the 3D gravity interpretation.

The lithologies intersected in this hole were:

0 - 301		Que River Shale
301 - 426		Hellyer Basalt
426 - 427		"Mixed Sequence"
427 - 458		Footwall Andesite
458 - 541	EOH	Dundas Group (greywacke and shale sequence)

Re-interpretation of Komysham's mapping suggests that the Que-Hellyer volcanics thin northwards onto a basement of Dundas Group sediments. This appears to be the case in BRD 03.

10.5 DDH BRD 04

This hole collared at -55° and drilled on a 292°M azimuth, was designed to test the postulated fault striking NNE-SSW in the proximity of Mutter Creek. The pyritised volcanics in Mutter Creek were also of interest. The data were required for the 3-D gravity interpretation.

The lithologies intersected were:

0 - 86	Volcanoclastics
86 - 205	Que River Shale
205 - 209	Fault Zone
209 - 301	Greywacke, etc. = Dundas Group.

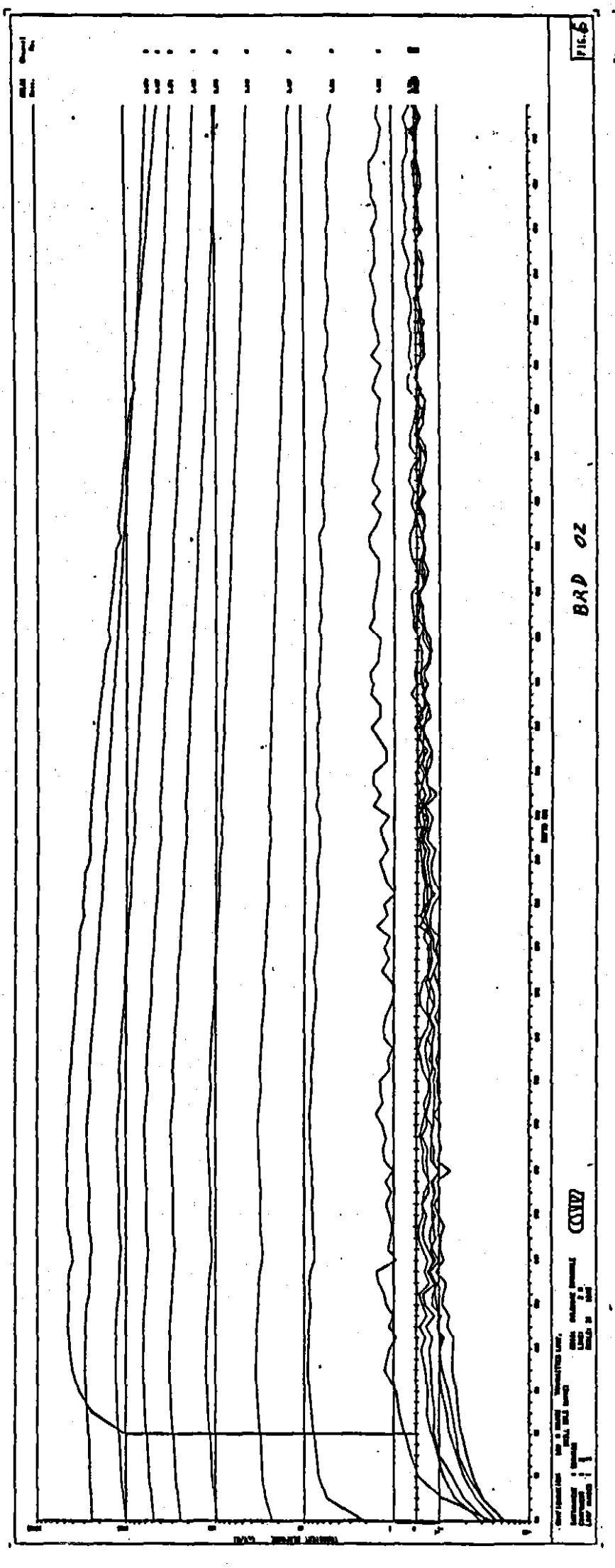


Figure 10

10.6 DDH BRD 05

This hole was commenced in late November/early December 1989 and was completed in March 1990. Rocks intersected in the hole (Drg. No. SK55.3-3312) were:

0 - 11.5m	Quartz-feldspar porphyry
11.5 - 24.4m	Shale
24.4 - 36.5m	Quartz-feldspar porphyry
36.5 - 48.4m	Interlayered shale and quartz-feldspar porphyry
48.4 - 92.5m	Shale (micaceous)
92.5 - 157.6m	Pyroclastics (mass flow unit with conglomeratic base)
157.6 - 530.6m	Que River Shale
530.6 - 530.7m	Basalt
530.7 - 531.8m	Que River Shale
531.8 - 570.7m	Hellyer Basalt (with py + qtz veins)
570.7 - 570.9m	Pyrite and Quartz
570.9 - 634.0m	Que River Shale
634.0 - 684.2m	Conglomerate
684.2 - 687.8m	Que River Shale
687.8 - 697.4m	Pepperitic Basalt and Shale
697.4 - 698.6m	Quartz-carbonate vein
698.6 -1045.9m	Hellyer Basalt
1045.9 -1055.0m	Polymict Breccia
1055.0 -1061.0m	Monomict Dacitic Breccia
1061.0 -1067.0m	Polymict Breccia
1067.0 -1181.0m	Dacitic Lavas and Breccias

In hand specimen weak alteration with stronger patches were observed, including some fuchsite-carbonate alteration in the Hellyer Basalt. Some green carbonate (malacite?) was observed. In thin section (Appendix IV) the Hellyer Basalt

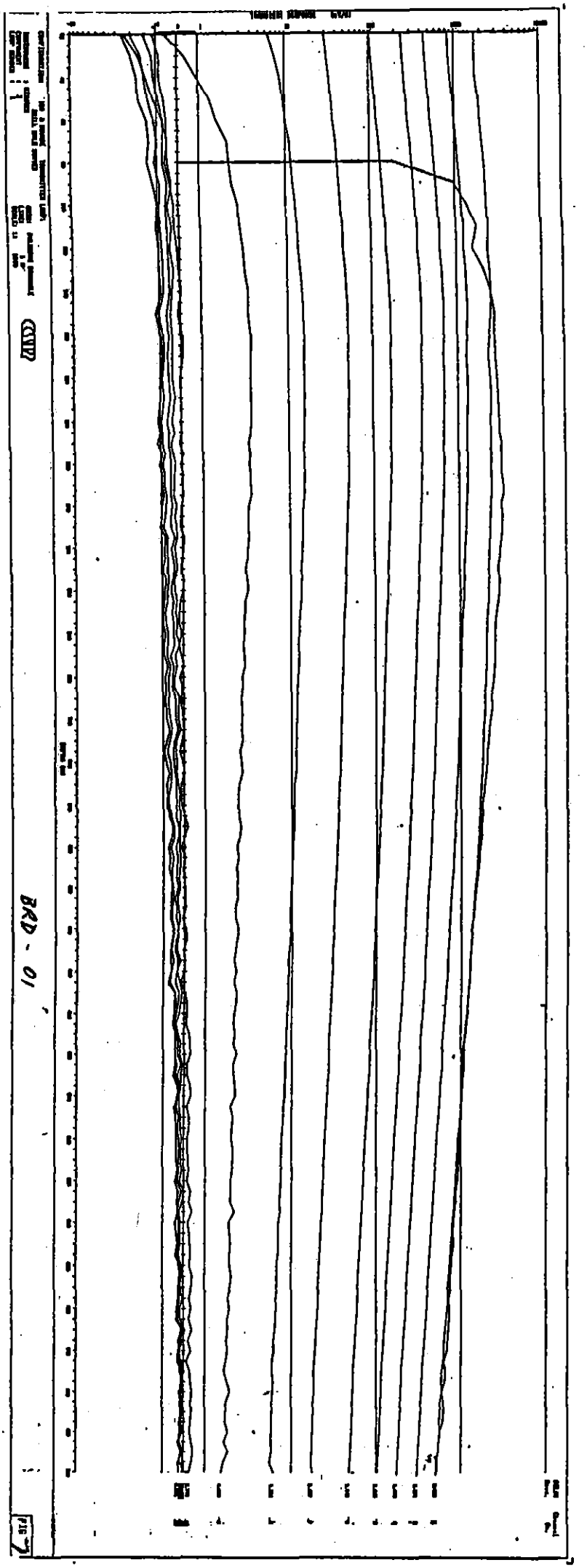
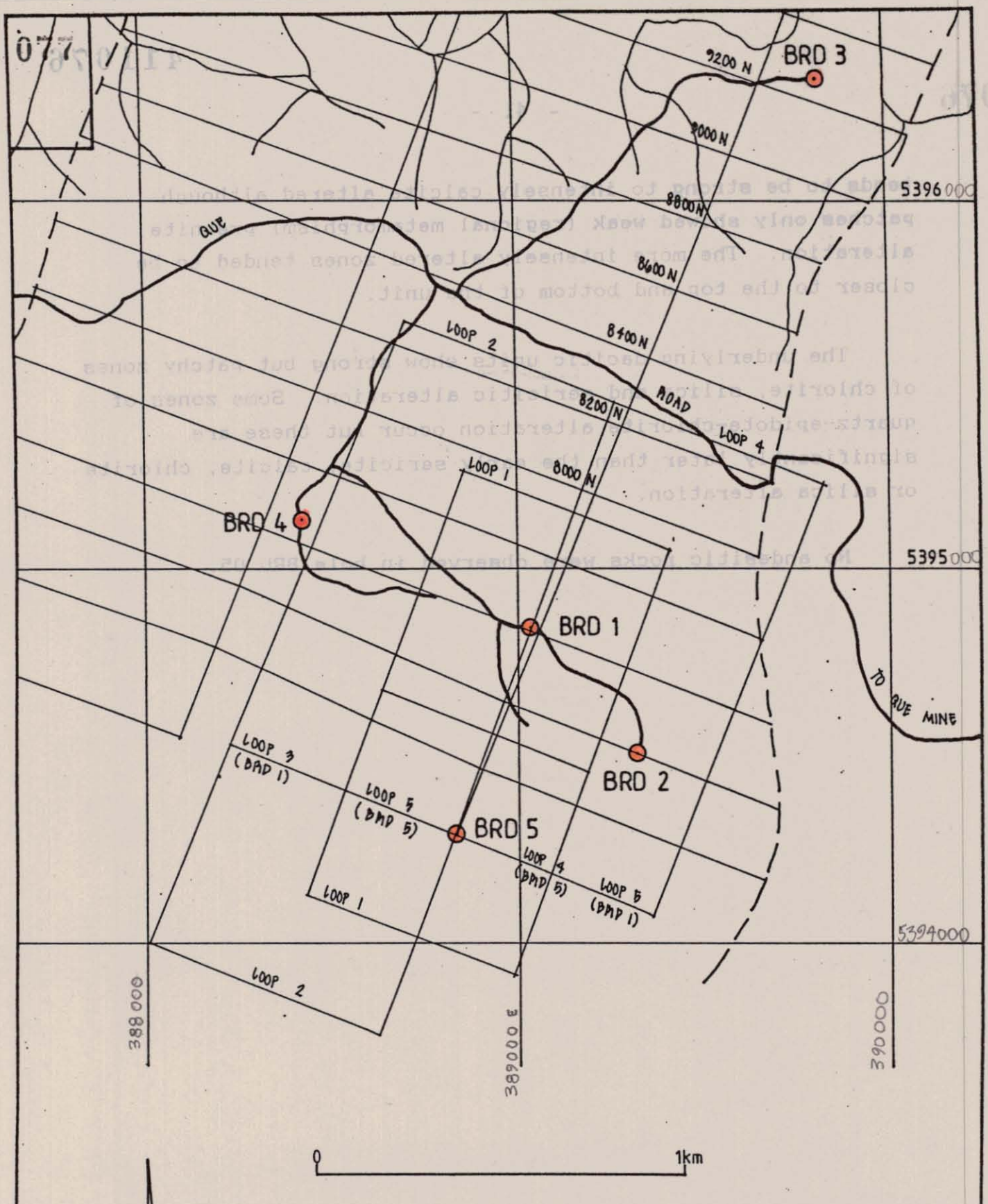


Figure 11

tends to be strong to intensely calcite altered although patches only showed weak (regional metamorphism) prehnite alteration. The more intensely altered zones tended to be closer to the top and bottom of the unit.

The underlying dacitic units show strong but patchy zones of chlorite, silica and sericitic alteration. Some zones of quartz-epidote-chlorite alteration occur but these are significantly later than the early sericite, calcite, chlorite or silica alteration.

No andesitic rocks were observed in hole BRD 05.


077
9200 N
BRD 3
9000 N
8800 N
5396000
QUE
8600 N
8400 N
LOOP 2
ROAD
8200 N
LOOP 4
LOOP 1
8000 N
BRD 4
5395000
BRD 1
TO QUE MINE
BRD 2
LOOP 3
(BMD 1)
LOOP 5
(BMD 5)
BRD 5
LOOP 4
(BMD 5)
LOOP 5
(BMD 1)
LOOP 1
5394000
LOOP 2
388000
389000 E
390000
0
1km
5 cm
AMG NORTH
411077
PLACER
FIG.12, DRILL HOLE LOCATIONS
AND E.M. 37 LOOPS,
E.L. 39/85, BULGOBAC RIVER.
Date:
Geologist: P.D.E
Checked:
Drawn: R.K
Revisions:
Plan No.: SE60-

10.7 DOWNHOLE EM

Downhole EM, using SIROTEM equipment, was run down both BRD 01 and BRD 02 to ascertain if a conductor (massive sulphide?) was detectable within the search radius.

This work was undertaken by McSkimming Geophysics using a 600m x 300m loop with corners at 7800N/2400E, 7800N/2700E, 7200N/2400E and 7200N/2700E. The holes were logged at 5m intervals and profile results are shown in Figures 10 and 11.

DDH BRD 01 was not logged to the full depth (860.5m) due to a blockage at 700m downhole. DDH BRD 02 was logged to the end of the hole (676.6m). No anomalies were detected.

On completion of DDH BRD 01A to 1133m the hole was logged using five separate 600m x 600m (nominally) square loops and the EM 37 downhole logger and probe. The loops (Figure 12) were set out such that Loop 1 was centred over the drill hole and the remaining four loops were on the previously cut geophysical grid with one common corner at the collar of BRD 01. Readings were taken at 10m intervals from 600m to 1133m down the hole. 0 - 600m was not read as the downhole SIROTEM EM survey of the original BRD 01 was completed to a blockage at 700m in 1987 (Williams 1987a, 1987b). The 600m to 700m zone gave a sufficient overlap to enable a comparison of the two EM systems to be made.

The downhole EM 37 survey results were very disappointing. Essentially they show a simple slow decay curve for the electromagnetic field generated at the surface by the loop (Figure 13). They are fairly "clean" curves with very little

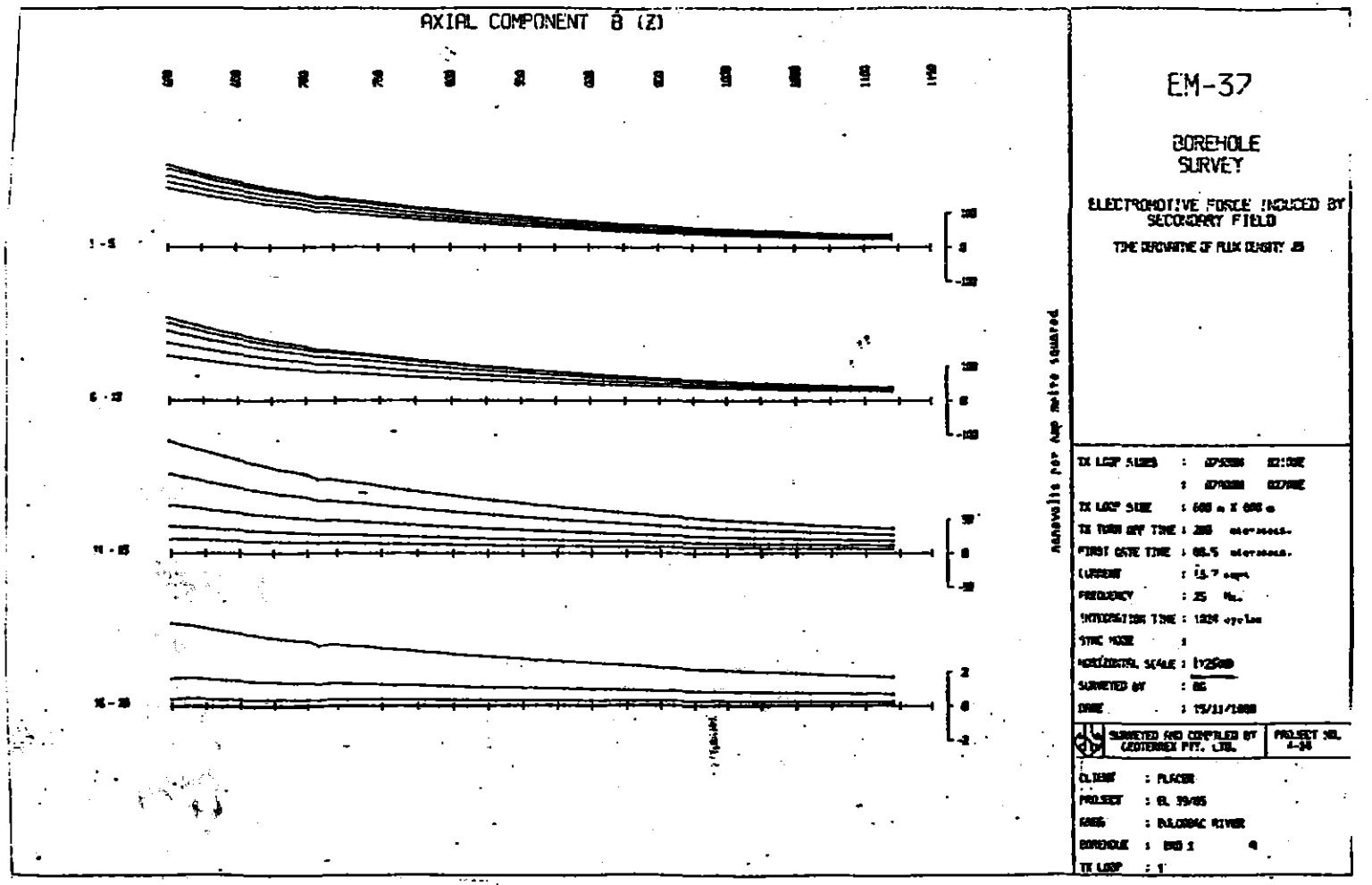


FIG. 13

BRD 01 EM37 RESULTS

080

411080

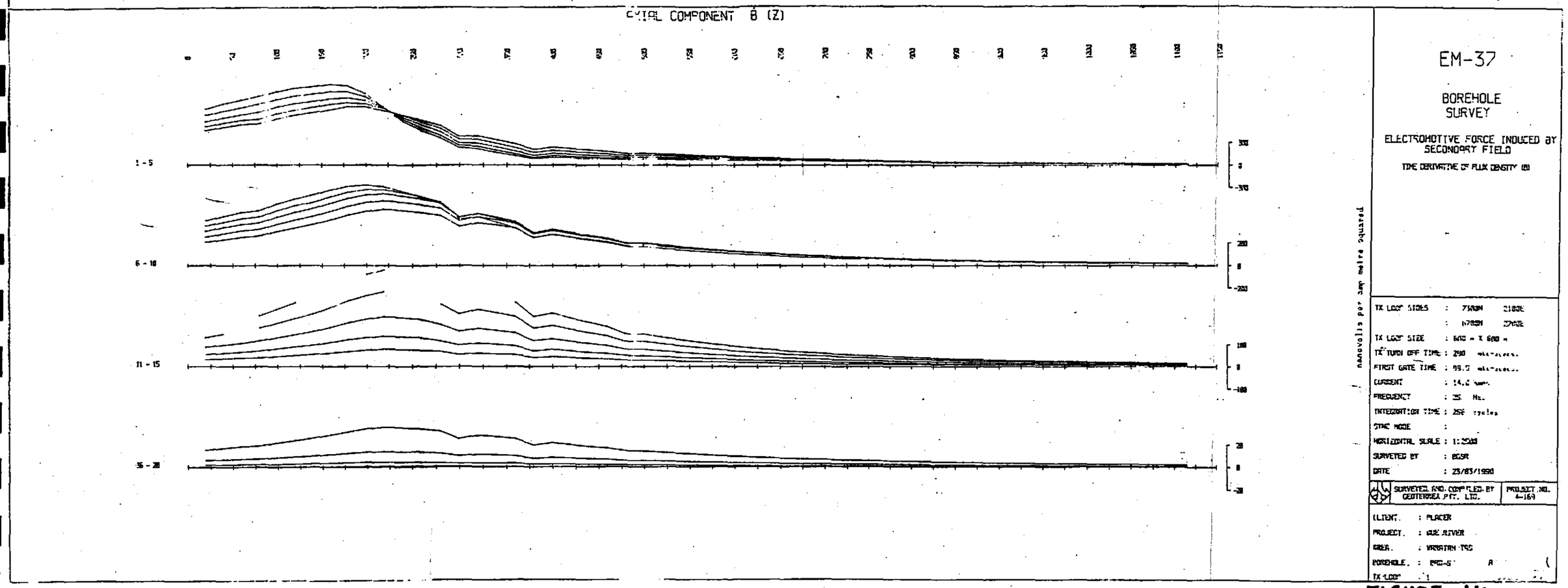


FIGURE 14

5 cm

91-3214.

"noise", probably due to the large thickness of shale. Only minor off points do not fall on the decay curve. These probably represent weak, off-hole but close, thin, concentrations of sulphides (pyrite?) with no economic significance.

Similarly, on completion of BRD 05 to 1181m, the hole was logged using five separate 600 by 600m square loops and the EM 37 downhole logger and probe. Readings were taken at 20m intervals to 680m and then at 10m intervals for the remainder of the hole. Again results were disappointing, with plots of the data showing a simple decay curve for the electromagnetic field generated by the surface loops. Again the curves (Appendix VII, Figure 14) showed very little "noise", and only a few points falling off the curves. These odd points again probably represent off-hole thin, small concentrations of pyrite. Interestingly, the high pyrite veins and disseminations with quartz and chalcopyrite occurring in and around the upper basalt (primitive) in the Que River Shale did not show in the EM survey.

082

411082

TABLE 1

Sample No. m	Conductivity 2.5MH$_z$ s/m	Ip Resistivity Ω m	Specific Gravity gm/cc	Magnetic Susceptibility 10^{-6} cgs
BRD001				
11.7	n.a.		2.68	
18.4	0.2		2.69	
63.0	0.2		2.69	
101.4	0.2	13	2.73	
200.0	0.2	32	2.76	
300.1	0.3		2.78	
343.2	0.4		2.74	
399.7	0.2	40	2.75	
501.5	0.2		2.77	
516.7	0.2		3.05	
538.7	0.3		2.90	
593.8	0.2		2.90	
647.6	0		2.89	
707.9	0.4		2.77	
759.9	0.4		2.77	
822.0	0.6		2.80	
860.4	0.4		2.73	
BRD002				
20.0	n.a.		2.68	
46.6	n.a.		2.66	
50.7	0.2		2.63	
61.9	0.2		2.70	
96.6	0.3		2.76	
150.0	0.2	32	2.75	
200.0	0.2	206	2.77	
301.4	0.3		2.78	
350.2	0.2		2.78	
379.6	0.2		2.75	
400.0	0.2		2.78	
410.0	0.2		2.76	
446.6	0.2		2.80	
458.6	0.2		2.78	
497.0	0.2		2.84	
550.0	0.3		2.86	
606.6	0.2		2.96	
667.0	0.2		3.00	

TABLE 2 WHOLE ROCK ANALYSES

Sample No.	DDH BRD	DEPTH (m)	V	Cr	Co	Ni	Cu	Zn	As	Rb	Sr	Y	Nb	Mo	Ag	Sn	Sb	Ba	La	W	Au	Eb
A295 051	02	376.6	140	280	35	177	52	1600	13	15	280	15	3	6	x	x	8	150	50	x	0.001	146
052	02	382.6	140	195	45	186	80	82	5	10	250	15	3	x	x	3	x	300	55	x	0.003	30
053	02	391.6	180	100	33	65	133	2900	20	15	290	25	8	5	0.3	x	3	560	90	x	0.003	1300
054	02	400.6	140	130	30	94	83	2750	19	50	280	20	6	4	0.5	5	x	>999	60	x	0.001	1050
055	02	403.6	160	220	38	180	44	420	8	7	270	15	7	x	0.1	x	x	120	40	x	0.004	137
056	02	424.6	160	90	34	74	11	1450	5	15	230	20	5	5	0.1	x	x	370	55	x	0.002	104
057	02	442.6	170	85	37	85	96	79	4	25	380	20	4	x	0.2	x	x	650	70	x	0.001	37
058	02	475.6	110	230	42	195	50	1250	21	10	190	20	6	3	0.1	x	x	180	85	x	0.002	87
059	02	496.6	160	95	35	110	65	94	16	80	450	20	5	5	0.1	5	x	>999	95	x	0.002	19
061	02	502.6	160	35	31	60	82	70	14	45	640	20	7	6	x	x	x	850	87	x	0.002	12
062	02	547.6	120	125	40	140	101	160	10	30	580	25	8	5	x	x	x	750	90	x	0.003	116
063	02	607.6	70	170	36	157	68	55	12	70	280	20	9	5	x	x	x	920	70	x	0.006	17
064	02	673.6	70	200	43	165	75	5	5	15	310	20	4	x	x	x	x	250	70	x	0.003	10
065	01	584.0	60	401	28	57	44	48	5	45	500	20	8	6	x	6	x	>999	80	x	0.002	7
066	01	691.8	75	60	35	72	73	156	10	40	560	20	9	3	x	x	x	>999	70	x	0.002	49
067	01	831.0	60	185	60	335	44	410	9	80	240	25	5	3	x	4	4	>999	120	x	0.003	183
068	01	855.7	x	20	15	32	10	70	9	20	150	30	15	8	0.1	3	x	170	150	x	0.004	11
075 Hellyer Mine			40	120	29	66	40	77	19	65	180	15	9	15	x	3	x	-	-	-	0.001	14
A321 402	03	336.3	270	-	35	87	101	59	2	15	450	25	7	x	x	x	x	690	150	x	0.001	x
405	03	404.4	220	-	35	50	17	59	6	25	440	20	3	5	x	x	x	1300	30	x	x	x
407	03	413.1	230	-	36	45	10	66	2	30	460	20	6	x	x	x	3	1200	25	x	0.002	x
409	03	422.4	260	-	38	91	88	50	9	75	380	20	x	x	x	x	x	2300	80	x	0.001	x
412	03	433.5	120	-	22	82	31	444	5	20	510	30	10	3	x	6	4	800	80	x	x	90
414	03	450.8	110	-	23	95	26	134	8	15	300	25	10	x	x	3	4	330	75	x	x	36
UNITS			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
DETECTION			5	5	1	1	1	1	1	5	5	5	5	3	0.1	3	3	10	10	20	0.001	1
METHOD			401	101	102	102/101	102	102/101	114	401	401	401	401	401	102	401	401	401	401	401/408	336	102

*All analyses completed by ANALABS.

TABLE 2 WHOLE ROCK ANALYSES continued...

Sample No.	DDH	BRD	DEPTH (m)	MgO	Na_2O	P_2O_5	Al_2O_3	CaO	Fe_2O_3	K_2O	MnO	SiO_2	TiO_2	CO_2	SO_3	LOI	Cr(XRF)	Zr
A295	051	02	376.6	-	-	-	-	-	-	-	-	-	-	-	-	-	750	90
	052	02	382.6	8.3	1.95	0.097	11.35	7.4	7.45	0.29	0.18	52.7	0.31	5.66	0.63	9.01	920	85
	053	02	391.6	-	-	-	-	-	-	-	-	-	-	-	-	-	270	160
	054	02	400.6	-	-	-	-	-	-	-	-	-	-	-	-	-	260	120
	055	02	403.6	-	-	-	-	-	-	-	-	-	-	-	-	-	760	90
	056	02	424.6	-	-	-	-	-	-	-	-	-	-	-	-	-	340	120
	057	02	442.6	9.1	2.65	0.33	11.60	8.37	9.35	0.89	0.23	50.4	0.51	3.36	0.16	5.89	370	130
	058	02	475.6	-	-	-	-	-	-	-	-	-	-	-	-	-	870	130
	059	02	496.6	-	-	-	-	-	-	-	-	-	-	-	-	-	380	140
	061	02	502.6	6.55	3.95	0.41	15.95	5.57	9.8	1.51	0.14	50.0	0.58	0.62	2.20	3.47	110	140
	062	02	547.6	8.3	2.25	0.65	12.0	11.6	10.1	1.01	0.24	48.4	0.54	2.42	0.43	4.14	570	150
	063	02	607.6	6.55	1.90	0.35	10.9	9.53	7.4	2.48	0.15	56.0	0.5	2.26	0.33	3.57	710	110
	064	02	673.6	7.45	2.20	0.87	9.25	20.1	7.8	0.52	0.19	38.7	0.51	10.58	0.33	12.50	710	110
	065	01	584.0	8.7	2.85	0.29	11.65	10.0	9.85	1.74	0.21	49.3	0.68	0.45	0.05	2.30	400	130
	066	01	691.8	7.45	2.25	0.30	11.45	7.3	10.05	1.43	0.17	54.2	0.63	0.99	0.08	2.59	400	120
	067	01	831.0	9.95	0.36	0.30	12.9	7.35	11.8	3.66	0.28	46.8	0.67	2.01	0.10	5.57	1100	130
	068	01	855.7	-	-	-	-	-	-	-	-	-	-	-	-	-	9	230
	075	Hellyer Mine		5.7	0.29	0.080	8.5	15.2	6.9	3.66	0.17	40.2	0.41	16.84	3.63	17.0	320	95
A321	402	03	336.3	7.3	2.5	0.788	11.8	10.3	9.05	0.53	0.15	46.7	0.58	6.60	0.22	10.43	450	170
	405	03	404.4	7.8	3.66	0.172	16.0	5.0	10.7	10.2	0.19	50.8	0.57	0.14	0.06	3.75	190	110
	407	03	413.1	8.3	3.3	0.119	16.0	5.15	10.9	1.10	0.19	50.0	0.58	0.48	0.06	4.02	180	100
	409	03	422.4	7.5	2.5	0.383	14.7	8.15	9.55	2.92	0.19	48.9	0.59	1.06	0.42	3.71	290	100
	412	03	433.5	3.45	5.94	0.147	16.8	1.87	6.6	0.70	0.20	60.8	0.50	0.56	0.34	2.87	120	1200 — ?
	414	03	450.8	3.4	5.4	0.135	14.9	2.19	6.65	0.5	0.16	61.8	0.46	1.46	0.56	3.55	150	170
UNITS				%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
DETECTION				0.005	0.005	0.007	0.1	0.01	0.05	0.01	0.01	0.1	0.01	0.02	0.02	0.01	5	5
METHOD				104	104	401/	408	408	408	408	408	408	408	612	613	615	401	401

*All analyses completed by ANALABS.

10.8 PETROPHYSICS

Petrophysical measurements were undertaken at the Petrophysics Laboratory, University of Sydney, on drill core from DDH's BRD 01 and BRD 02. Available results are presented in Table 1.

These results indicate low induced conductivity but galvanic measurements on some core samples indicate the Que River Shales to be quite chargeable.

10.9 PETROGRAPHY

Petrography on thin and polished sections of core samples selected from DDH's BRD 01 and BRD 02 was undertaken by a Consultant, Dr. Jane Barron. Petrography on thin sections of core samples selected from DDH's BRD 03 and 04 was completed by Dr. A. Crawford. Further petrography of samples from the DDH's BRD 01/01A and BRD 05 was recently completed by Dr. A. Crawford (Appendix VI).

10.10 GEOCHEMISTRY

No mineralisation warranting split sampling was intersected in any of the drill holes. However, selected intervals were sampled to confirm the visual estimates of sphalerite and galena mineralisation. In addition, 15 samples from the initial two holes (BRD 01 and BRD 02) were analysed for a full suite of whole rock and trace elements. These data are presented as Table 2.

All the samples analysed for whole rock and trace elements have a related thin section description. All these samples have suffered extensive alteration as indicated by the analyses.

Recent work by Dr. A Crawford demonstrated, on the basis of Ti/Zr ratios, that the Hellyer Basalt can be divided into two units. Interestingly enough, David Leaman came to the same conclusion from the specific gravities used in his gravity interpretation. These units are as follows:

Unit 1		e.g.	A321402 in BRD 03
	Ti/Zr	22-25	A321052 in BRD 02
			A321057 in BRD 02
			A321061 in BRD 02
Unit 2	Ti/Zr	32-37	A321064 in BRD 02
			A321064 in BRD 01
			A321064 in BRD 01

Crawford suggests that the Hellyer Basalt sequences, which he classifies as unusual shoshonitic magmas, represent discrete large basaltic volcanic centres constructed upon Central Volcanic Sequence basement. Alteration and mineralisation in

the Hellyer basalt is hangingwall to the orebody and thus it is probable that the mineralisation-related intrusive was the shoshonitic magma which was eventually extruded as the Hellyer Basalt (REW interpretation).

Recent work by D. Jack (pers. comm.) suggests there is a third, extremely primitive basalt occurring near the Hellyer mineralisation. This is characterised by a Ti/Zr ratio near 50.

With recent advances in trace element and stable element geochemistry around the Hellyer and Que River deposits further geochemistry has been completed on hole BRD 01/01A and is being completed on hole BRD 05. Results are summarised in Appendix VIII.

O and C isotopes have been analysed for calcites from the Hellyer Basalt intervals in BRD 01, 02 and 03. The calcites were from veins and from vesicle infillings. This work was undertaken by the Tasmanian Department of Mines as part of their Mt. Read Project. Preliminary results show temperatures of 150° in BRD 01 and 110-120°C in BRD 02 (G. Green). Green suggests that temperatures of 150° for BRD 01 would, in the context of data available over the Hellyer ore body, suggest BRD 01 was within 50 to 250m of a similar hydrothermal event. These data need closer examination.

G. Green is continuing the temperature of formation evaluation of BRD 01A and BRD 05 core. Recently, probing of chlorites to determine composition and then calculate formation temperatures proved difficult. Formation temperatures using C and O isotopes are currently being determined on selected samples from BRD 01A and BRD 05.

10.11 CONCLUSIONS

The diamond drilling completed to date has indicated:

(i) The presence of the horizon prospective for the location of a Hellyer-type deposit occurs at depth within EL 39/85

(ii) a surprising increase in the thicknesses of the Que River Shale (430m+) and the Hellyer Basalt (300m+) has decreased the effective application of geophysics to target drill holes and has increased the hole depth required.

(iii) CSAMT may be applied as a mapping tool but care should be taken with any survey as near and transitional field effects can be a problem. - magnetotelluvics in the low frequency range 0.25 to .6 Hz may "see" to 1 - 2 kms but with low resolution.

(iv) the positive gravity anomaly can be explained by increased thickness of Que River Shale and Hellyer Basalt. However, this increased thickness thus suggests a basin bounded by growth faults which must then be considered as a prime environment to generate and host the target deposit.

(v) near-surface gravity responses on the positive gravity anomaly generate too much geophysical noise to enable resolution of the gravity response of an orebody at 900m deposit.

(vi) the target horizon within the positive gravity anomaly is located at greater that 850m depth below surface, and tending to become deeper towards the south.

(vii) O and C isotope studies indicate higher temperatures of vesicle infilling and veining in BRD 01 than 02. The suggestion is that BRD 01 is, in the context of the data, above the Hellyer deposit, 50 to 250m lateral from an orebody (G. Green, pers. comm.).

11. CONCLUSIONS AND RECOMMENDATIONS

Exploration has vindicated the original geological concept of the subsurface extension of the Hellyer-Que River host rocks into EL 39/85. However, no significant mineralization was intersected in the five diamond drill holes completed to date.

Although the drilling has shown the target stratigraphy to be at a greater depth than originally interpreted, the greater thickness of Que River Shale and the Hellyer Basalt are considered to be favourable factors in the application of the Kuroko-type model to the search for Hellyer-type deposits.

BRD 05 has shown another possible prospective mineralising source with the intersection of a previously unknown pyrite-chalcopyrite-quartz rich primitive basalt within the Que River shale.

The use of O and C isotopes to determine temperatures of calcite formation in the Hellyer Basalt shows considerable promise as a technique to select favourable areas. Although the recently developed analysis of chlorite grains shows some problems as a quick method of determining temperatures of formation. G. Green from the Department of Mines is still completing temperature calculations for BRD 05. This work may suggest a direction of increasing temperature (and thus prospectivity).

It is recommended that exploration be continued with an emphasis on completing the subsurface evaluation of the graben area around BRD 01 and BRD 05 and between BRD 02 and BRD 04.

Further drilling is required within the downfaulted graben structure on a wide spaced grid. Downhole EM should be completed as the drilling of each hole is finished.

Between BRD 01/05 and BRD 04 is a possible fault zone which may have been a conduit for mineralisation. This is a very prospective zone and would best be tested by vertical holes 400m to the west of holes BRD 01 and BRD 05. O/C isotope temperature gradients may suggest the best site.

Geological mapping of the drainages in the north-western area of the Licence has been completed. This showed a predominance of quartz-feldspar porphyry with micaceous shales and tuffs to the rocks southwest of the Mt Charter Fault. This we considered to be less prospective.

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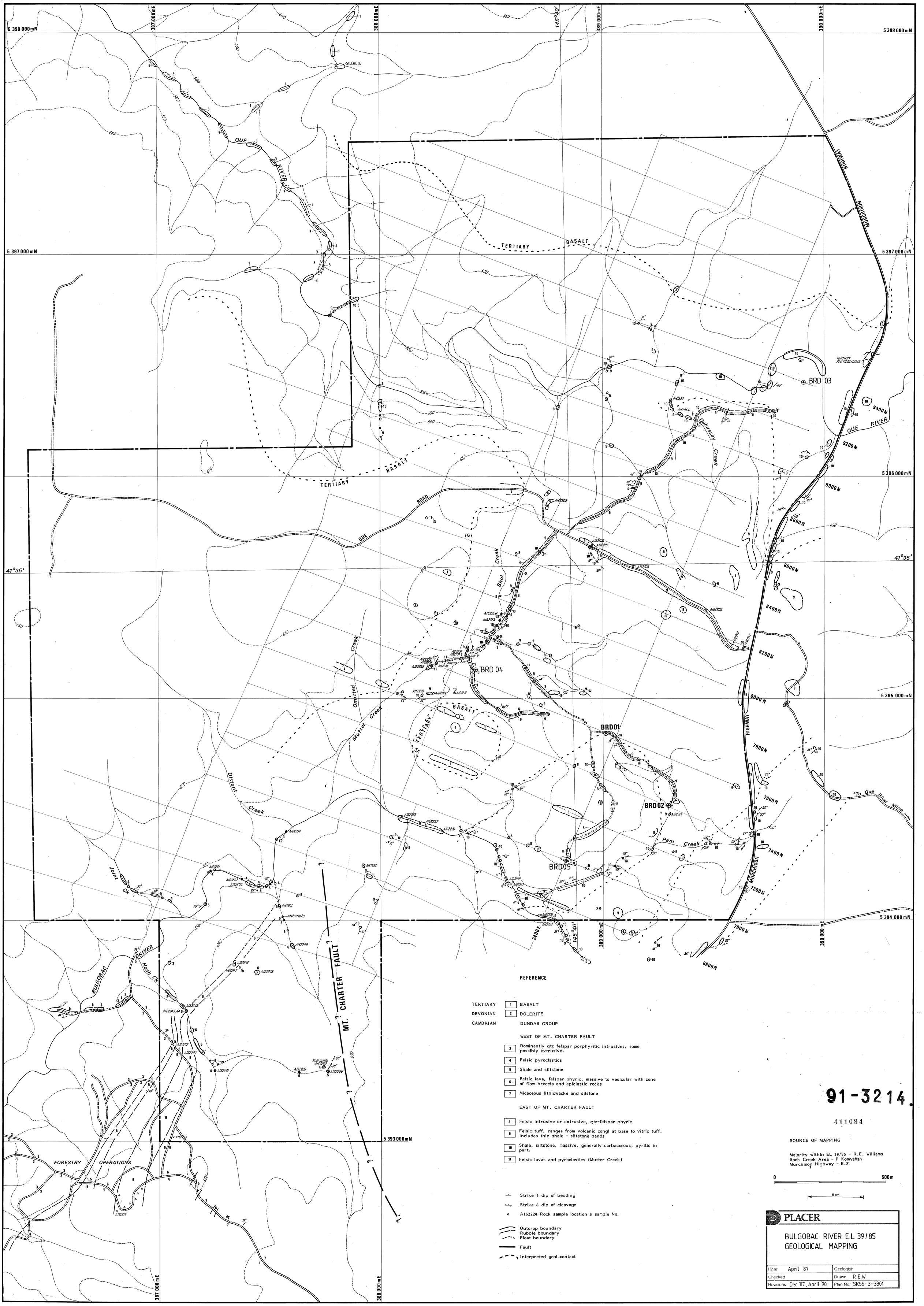


REFERENCE

TERTIARY	1	BASALT
DEVONIAN	2	DOLERITE
CAMBRIAN		DUNDAS GROUP

WEST OF MT. CHARTER FAULT

3	Dominantly qtz felspar porphyritic intrusives, some possibly extrusive.
4	Felsic pyroclastics
5	Shale and siltstone
6	Felsic lava, felspar phyric, massive to vesicular with zone of flow breccia and epiclastic rocks
7	Micaceous lithicwacke and siltstone

EAST OF MT. CHARTER FAULT

8	Felsic intrusive or extrusive, qtz-felspar phyric
9	Felsic tuff, ranges from volcanic congl at base to vitric tuff. Includes thin shale - siltstone bands
10	Shale, siltstone, massive, generally carbacceous, pyritic in part.
11	Felsic lavas and pyroclastics (Mutter Creek)

- Strike & dip of bedding
- Strike & dip of cleavage
- × A162224 Rock sample location & sample No.
- Outcrop boundary
- Rubble boundary
- Float boundary
- Fault
- Interpreted geol. contact

91-3214

411094

SOURCE OF MAPPING

Majority within EL 39/85 - R.E. Williams
Sock Creek Area - P Komyshan
Murchison Highway - E.Z.

0 500m

5 cm

PLACER

BULGOBAC RIVER E.L. 39/85 GEOLOGICAL MAPPING

Date: April '87	Geologist:
Checked	Drawn: R.E.W.
Revisions: Dec '87, April '90.	Plan No.: SK55-3-3301

16306

387 000mE | 388 000mE | 145°40' | 389 000mE | 390 000mE

5 398 000mN | 5 397 000mN | 5 396 000mN | 5 395 000mN | 5 394 000mN | 5 393 000mN

41°35'

QUE RIVER

QUE ROAD

MURCHISON HIGHWAY

To Que River Mine

BULGOBAC RIVER

FORESTRY OPERATIONS

10700N | 10600N | 9800N | 9400N | 9200N | 9000N | 8800N | 8600N | 8400N | 8200N | 8000N | 7800N | 7600N | 7400N | 7200N | 7000N | 6800N | 6600N

1600E | 1400E | 1615E

650 | 600 | 550 | 500

REFERENCE

GRIDDING & ACCESS TO 1ST APRIL '87

GRIDDING & ACCESS FROM 1ST APRIL '87

5 cm

0 500m

411095

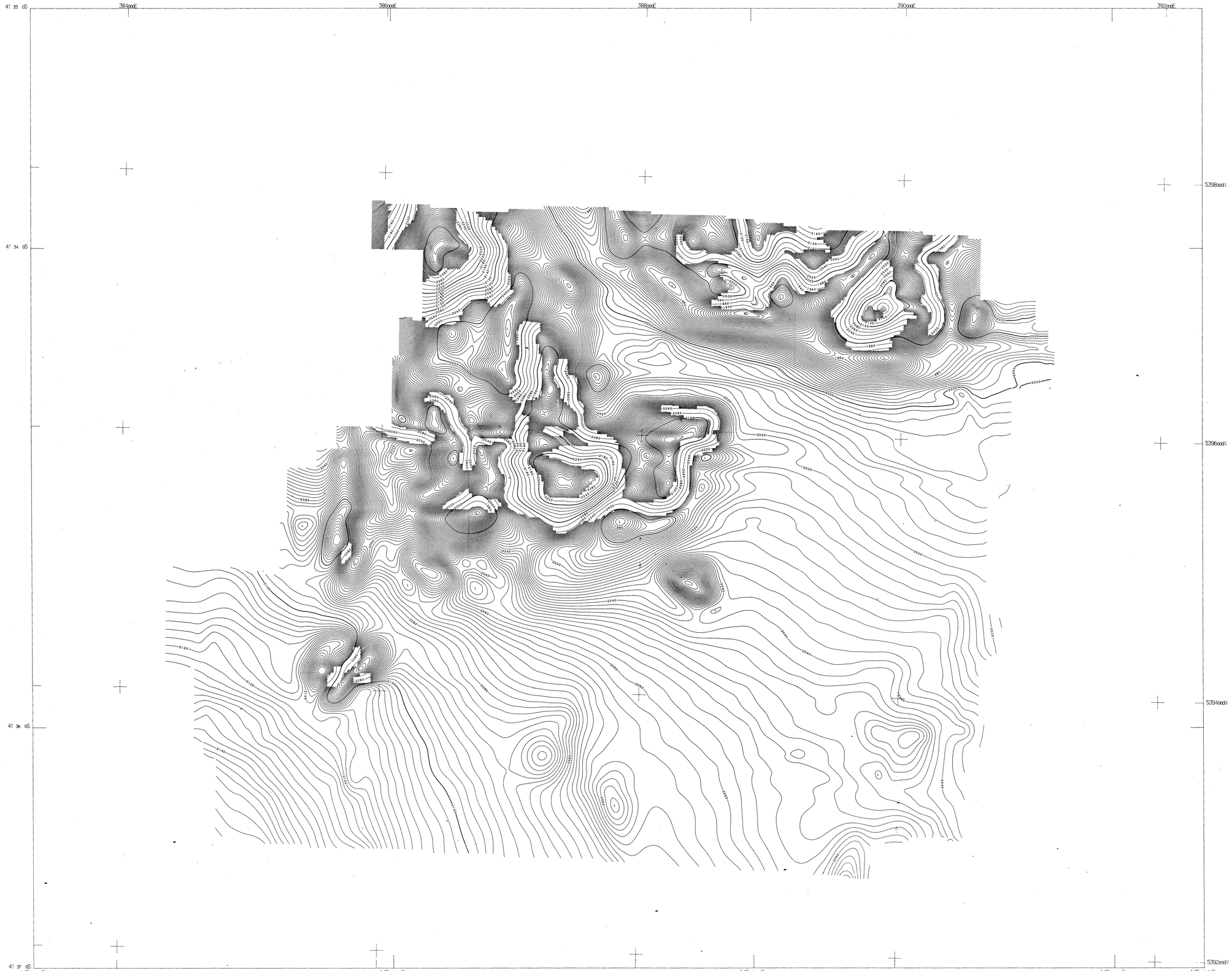
91-3214

PLACER

BULGOBAC RIVER E.L. 39/85
ACCESS AND GRIDDING

Date: DEC 87	Geologist:
Checked:	Drawn:
Revisions:	Plan No.: SK55-3-3302

10307



AIRBORNE SURVEY SPECIFICATIONS

MAGNETOMETER :	3 G-813 proton precession magnetometers in tail stinger and wing tips. Sensitivity +. 0.2 nT
RECORDING INTERVAL :	30m sampling
SPECTROMETER :	GR - 800 gamma ray spectrometer Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.8 - 3.00 MeV
POTASSIUM WINDOW :	1.36 - 1.56 MeV
URANIUM WINDOW :	1.66 - 1.86 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	60m sampling
DATA RECORDING :	Geometrics 714 acquisition system. Digital to magnetic tape.
NOMINAL TERRAIN CLEARANCE :	All detectors in aircraft at 70m.
NOMINAL LINE SPACING :	Traverse lines 100 metres. Tie lines 300 metres.
FLIGHT PATH RECORD :	continuous tracking colour video.
FLIGHT LINE RECOVERY :	Visually to 1:80.000 enlarged photos

RESIDUAL MAGNETIC CONTOURS

Grid notation refers to Australian Map Grid Zone 55
Digitised from colour photos at 1:8000
Magnetics :Tie line levelled and
:diurnal removed
IGRF (1980) :Updated to December 1985
IGRF (1980) :Removed. Datum 2000 nT added
Grid mesh size :25 x 25 metres
Grid filter :Polynomial. radius 50 metres
Contour Interval 2.20,100 and 200 nT

N

5cm

0.0 0.5 1.0 Km

SCALE 1:10000

91-3214.

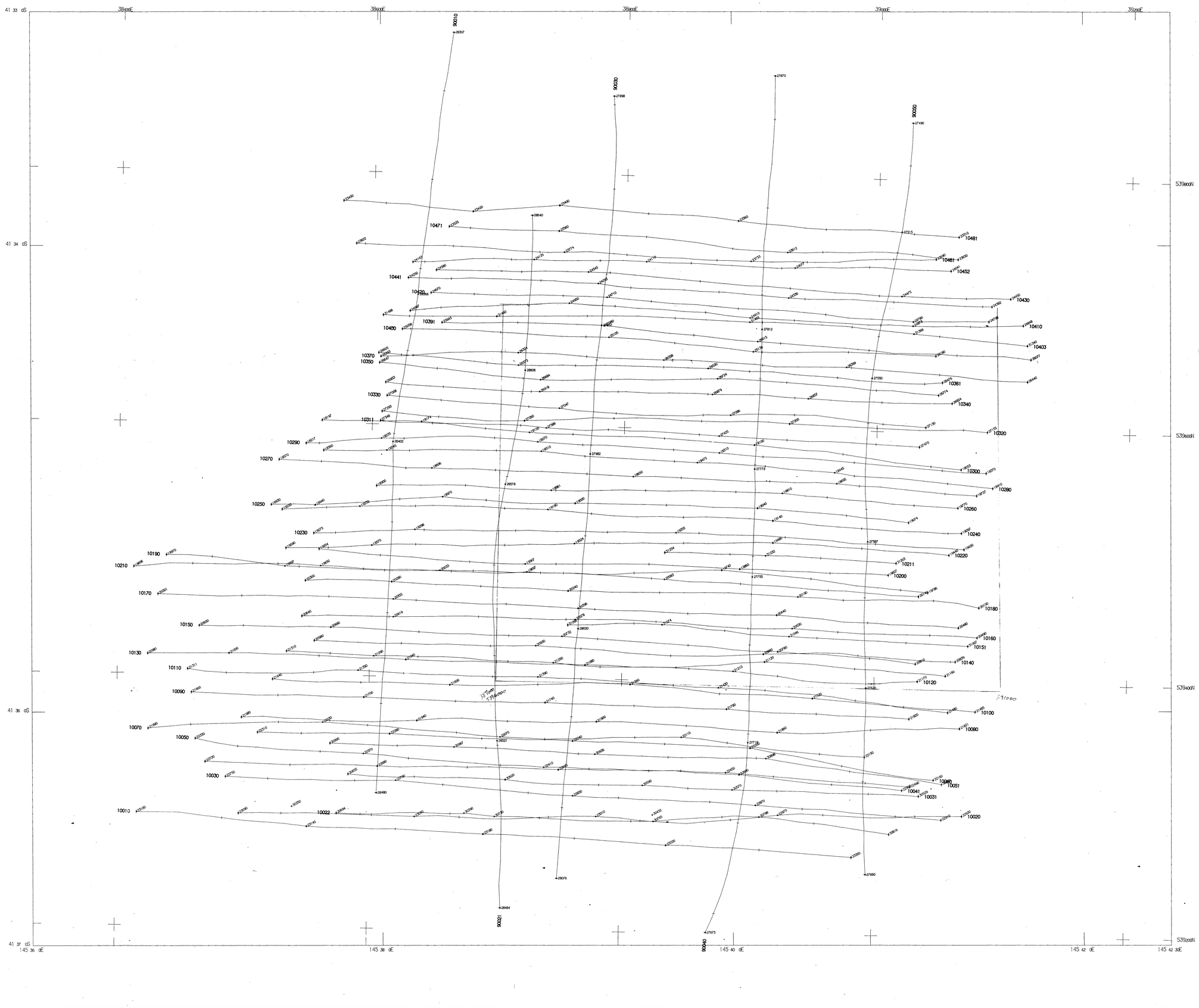
JOB NO : 9316
Flown by Geometrics International Corporation
November 1985
Processed by Engineering Computer Services, Bowral

PLACER 411096

BULGOBAC RIVER E.L. 39/85
RESIDUAL MAGNETIC CONTOURS

DRG.No. SK55-3-3303 | DATE: 20-MAR-86

10306



AIRBORNE SURVEY SPECIFICATIONS

MAGNETOMETER :	3 G-813 proton precession magnetometers in tail stinger and wing tips. Sensitivity : 0.2 nT
RECORDING INTERVAL :	30m sampling
SPECTROMETER :	GR - 800 gamma ray spectrometer Volume : 16.8 litres
TOTAL COUNT WINDOW :	0.8 - 3.00 MeV
POTASSIUM WINDOW :	1.36 - 1.56 MeV
URANIUM WINDOW :	1.66 - 1.86 MeV
THORIUM WINDOW :	2.42 - 2.82 MeV
RECORDING INTERVAL :	60m sampling
DATA RECORDING :	Geometrics 714 acquisition system. Digital to magnetic tape.
NOMINAL TERRAIN CLEARANCE :	All detectors in aircraft at 70m.
NOMINAL LINE SPACING :	Traverse lines 100 metres. Tie lines 300 metres.
FLIGHT PATH RECORD :	continuous tracking colour video.
FLIGHT LINE RECOVERY :	Visually to 1:80.000 enlarged photos

FLIGHT PATH RECOVERY

Grid notation refers to Australian Map Grid Zone 55
Digitised from colour photos at 1:80000

8 cm

0.0 0.5 1.0 Km

SCALE 1:10000

91-3214.

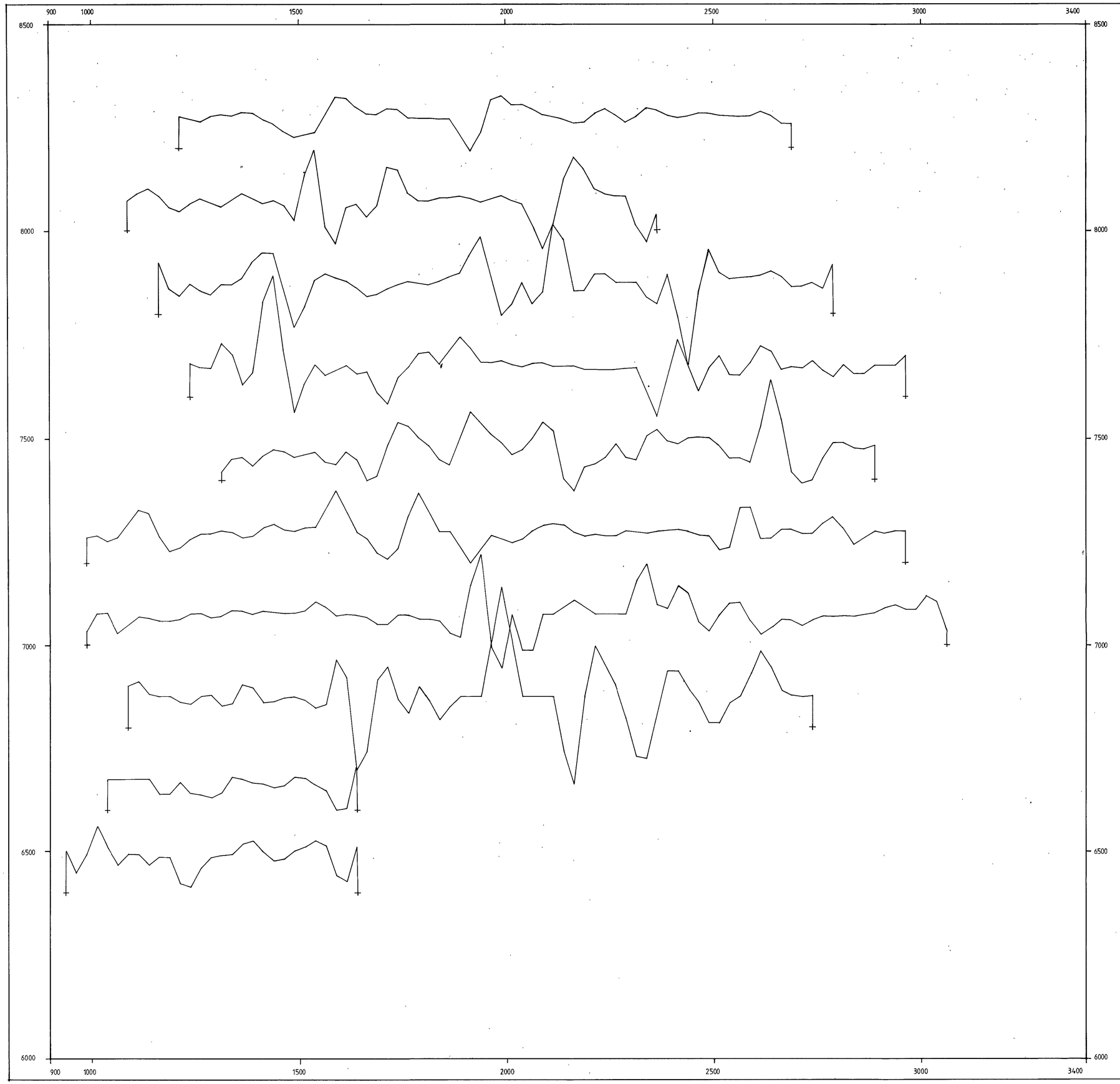
JOB NO : 9316
Flown by Geometrics International Corporation
November 1985
Processed by Engineering Computer Services, Bowral

PLACER 411097

BULGOBAC RIVER E.L.39/85
FLIGHT PATH RECOVERY

DRG. No. SK55-3-3304 | DATE: 20-MAR-86

10309



5 cm

METRES

100 50 0 50 100 150 200 250 300 350 400 450 500

VERT. SCALE - 150 DEG./cm

91-3214.

PLACER

BULGOBAC RIVER E.L. 39/85
FRAZER FILTERED,
V.L.F PROFILES. 411098

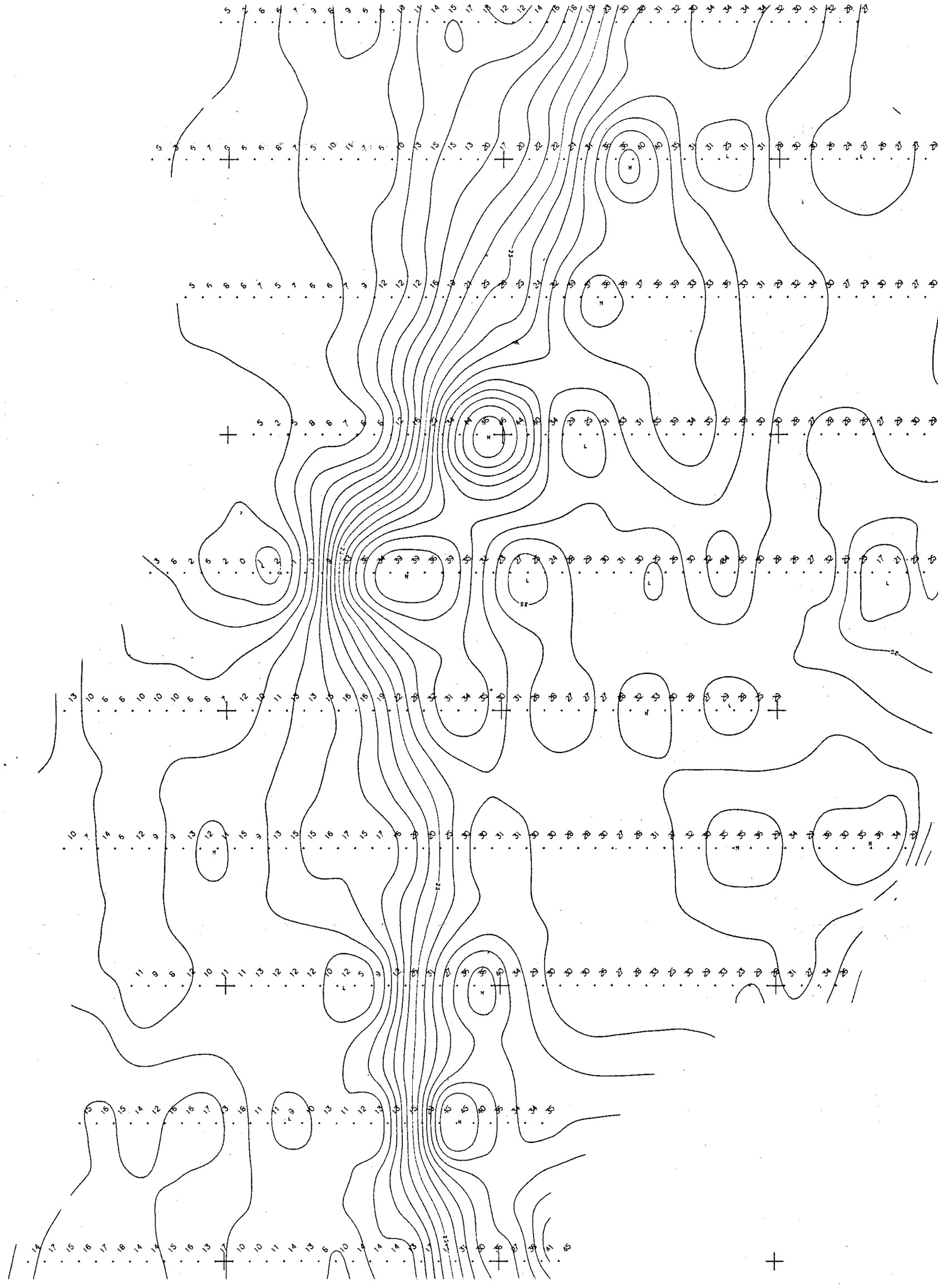
Date: 8/1/87	Geologist:
Checked:	Drawn: PRG
Revisions:	Plan No.: SK55-3-3305

10310

1612-1

800E 1200E 1600E 2000E 2400E

8000N
7600N
7200N
6800N
6400N



800E 1200E 1600E 2000E 2400E

Con. Int. = 5 m.radians

5 cm

Scale - 1:5000

PLACER 411099

BULGOBAC RIVER E.L. 39/85
I.P - CHARGEABILITY.

Date: 4/3/87.	Geologist:
Checked: P.R.G	Drawn: P.R.G
Revisions:	Plan No.: SK55-3-3306

10304

BRD01

BRD02

SHALE

PYROCLASTICS

VOLCANIC CONGLOMERATE

QUE RIVER SHALE

HELLYER

Ti/Zr=22-25

BASALT

Ti/Zr=32-37

EASTERN GROWTH FAULT

BRECCIA (EPICLASTIC) SEQUENCE

BASALT

DACITES LAVA & BRECCIAS

COARSE & FINE BANDED TUFFS

GREYWACKE

E O H 1133·0 M

E O H 676·0 M

0 40 80 120
METRES

7600 N 2300 E 2400 E 2500 E 7500 N 2600 E 2700 E 7400 N 2800 E 2900 E 7300 N

701222 - 701285	Geochemistry
701201 - 701221 701286 - 701299 701401 - 701407	Whole Rock
701505 - 701507	Thin Section
701501 - 701503	Pb Isotope

1600 2000 2400 2800

7600

7200

BRD01 BRD02 BRD02

411100

91-3214

PLACER EXPLORATION

DRAWN PDE	BULGOBAC RIVER
DATE	SECTION AB
SCALE 1:1000	NTS 93K 88.8 - 3307 PLATE

5 cm

10305

700 600 500 400 300 200 100 0 100

BRD05
7000 N / 2400 E

BRD01

SHALE

QUARTZ - FELDSPAR PORPHRY

SHALE

PYROCLASTICS

PYROCLASTICS

VOLCANIC CONGLOMERATE

QUE

QUE

RIVER

RIVER

SHALE

SHALE

POSSIBLE

FEEDER

PIPE

HELLYER BASALT

HELLYER BASALT

Zr/Ti=32.37

BRECCIA (EPICLASTIC) SEQUENCE

BASALT

LAVAS AND BRECCIAS - DACITES

700 600 500 400 300 200 100 0 -100 -200 -300 -400 -500

50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050 1100 1150 E.O.H

50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050 1100 1133 E.O.H

0 40 80 120
METRES

PLACER

EL 39/85 BULGOBAC RIVER
BRD 01 - BRD 05 SECTION

Date:	Geologist: P.D.E.
Checked:	Drawn:
Revisions:	Plan No.: SK 55.3-3312

411101

7600N

91-3214.

5 cm

~~193~~ 10311

15 mGal added to natural value of Bouguer Anomaly

CSR LTD

EL 39/85 BULGOBAC RIVER

QUE ROAD GRAVITY SURVEYS

1987 - 88

BOUGUER ANOMALY

2.67 t/cu m

CORRECTION, COMPILATION and REDUCTION by LEAMAN GEOPHYSICS, HOBART (April, 1988)

OBSERVATION SOLO GEOPHYSICS, ADELAIDE

411102

91-3214.

5 cm

094

411103

SK 55-3
PROJECT 258

PLACER EXPLORATION LIMITED

REPORT TAS 2/90
EXPLORATION LICENCE NO. 39/85

BULGOBAC RIVER, TASMANIA

CURRENT STATUS AT THE COMPLETION OF BRD 05

91-3214 Vol 3/6

VOLUME 2

HOBART
MARCH 1990

P.D. ELLIS

095

APPENDIX I

CSAMT RE-EVALUATION

PLACER PACIFIC LIMITED

DATE: 21 February 1990

TO: Peter Ellis

FROM: Keiran Logan

SUBJECT: **RE-INTERPRETATION OF 1986 CSAMT SURVEY**

The initial interpretation of CSAMT incorrectly inferred that the survey had detected the Mixed Layer Sequence Volcanics and that the low resistivities between 128 - 256 Hz corresponded with the depth limits of the Que River Shale. The drill-hole BRD01 quickly dissolved this interpretation prompting the need for a re-interpretation of the data in the light of new geological information.

Figure 1 shows an annotated plan of the stacked CSAMT traverses. On this plan the inferred boundaries of the Far, Transitional and Near field effects are also plotted. These boundaries were inferred from selected station plots on a resistivity v's frequency plot (Figure 2). The relevance of these boundaries is as follows:

1. Near field

   Data within this field is useless because of the complex nature of the electromagnetic field which makes the resistivity independent of frequency and hence not representing the apparent resistivities.

2. Transitional field

   Transitional field zone between the Near and Far fields which is displayed as a low resistivity "notch" on Figure 2 at frequencies 128 - 256 Hz.

3. Far field

   This is responsible for the data above 256 Hz. It displays the useful resistivity information at shallow depths.

The result of these boundary definitions is that most of the data below 256 Hz is un-interpretable. However, exceptions to this were discovered, for example station 2400E/7600N (Figure 3) which coincides with BRD01. Figure 3 shows the modelling results for this station which correspond with the geology in BRD01. Note that

...2/

SYDNEY OFFICE
G.P.O. BOX 4315 N.S.W., 2001
TEL (02) 241 1823

the bottom of the Que River Shale could not be seen in the data but the model suggests that it could be seen at lower frequencies (ie in the range of a Magnetotelluric survey). The model also suggests that the top of the Que River shale is very conductive (15ohm.m).

The transmitter location for the survey was 12km to the SE and this was considered (at the time) adequate to remove most of the Near field from the survey's lower frequencies. This did not work and suggests that the transmitter was in highly resistive geology permitting a "good" propagation of the field. The modelling of station 2400E/7600N infers that at places the Transitional zone overlaps with the conductive top of the Que River Shale, but it also infers that this conductive layer inhibits the depth penetration of CSAMT regardless of the absence of a Near field effect. Magnetotellurics in the frequency range of 0.025 - 16 Hz would have to be used to penetrate to depths of 1.6 - 2km but this would also have a decrease in resolvability of geologically units.

Keiran Logan
Geophysicist

encl. Figures 1 to 3

KL122

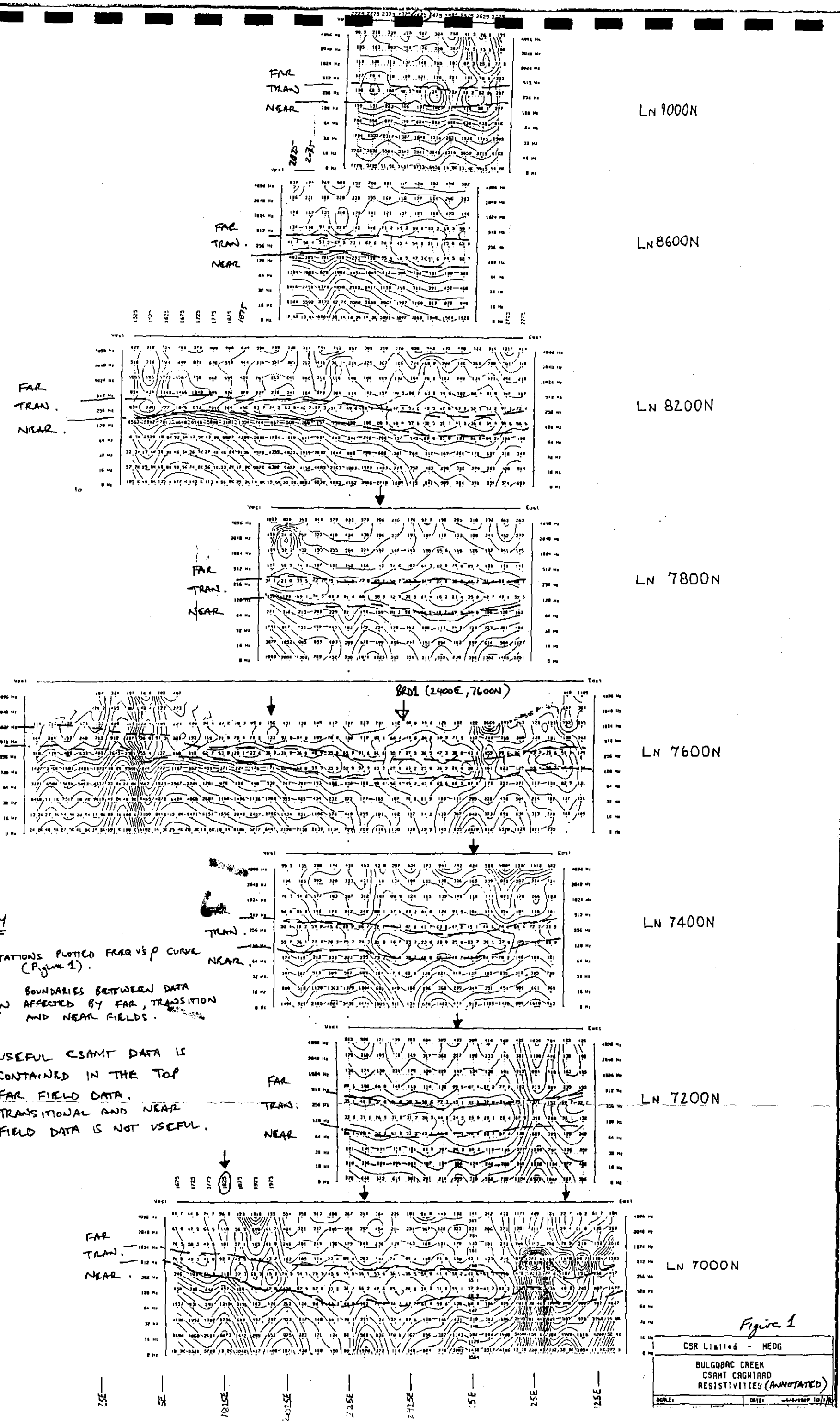
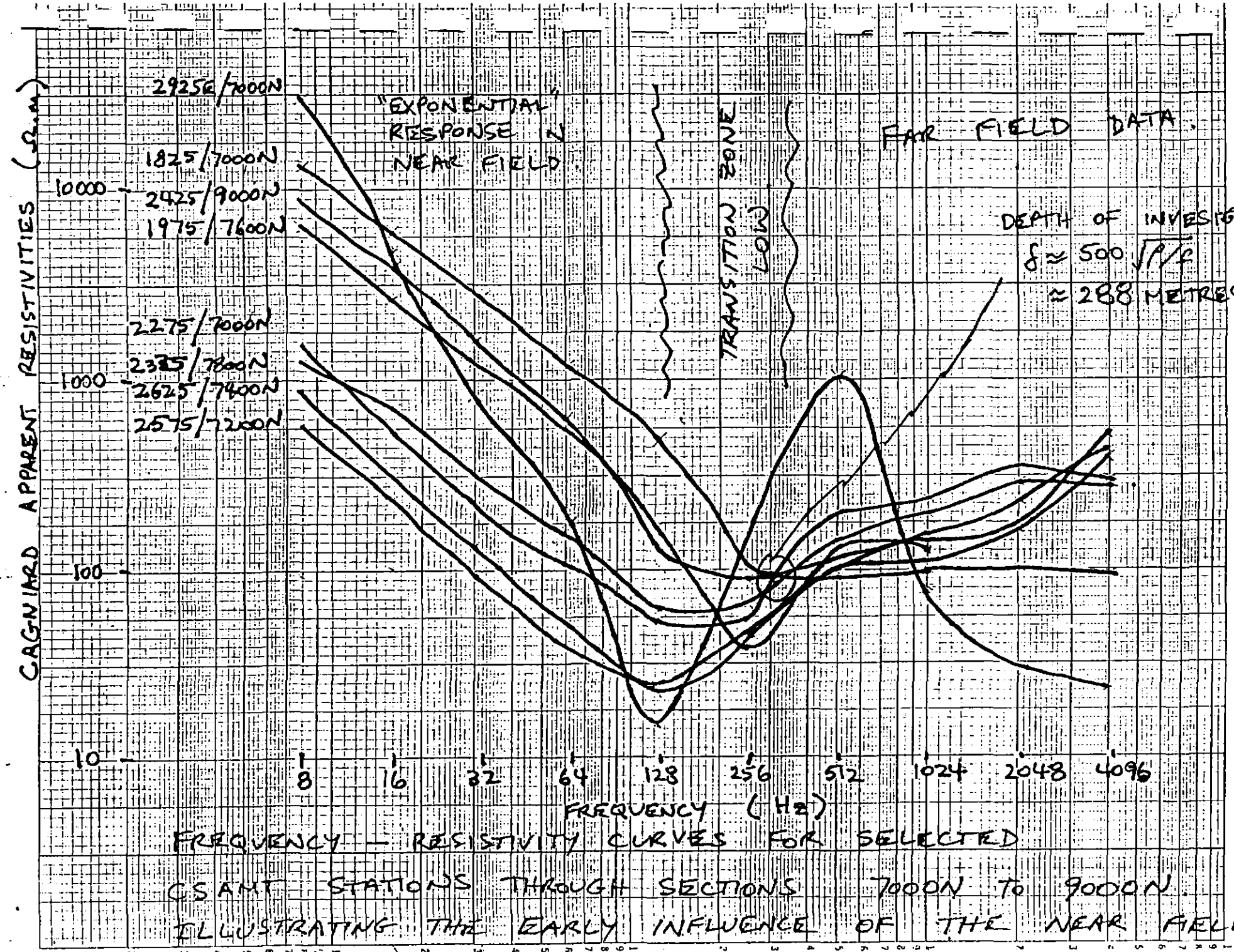


Figure 1

CSR Limited - MEDG

BULGOBAC CREEK
CSAMT CAGNIARD
RESISTIVITIES (ANNOTATED)

SCALE: DATE: 10/1/



FREQUENCY — RESISTIVITY CURVES FOR SELECTED CSAMT STATIONS THROUGH SECTIONS 7000N TO 9000N. ILLUSTRATING THE EARLY INFLUENCE OF THE NEAR FIELD EFFECT.

Figure 2

100

BULGOBAC RIVER.

PLACER EXPL. LTD.

411109

CSAMT MODELLING.

STATION 2400E/7600N

(BRD1).

KJL 10/1/90.

	Depth.	MODEL.
PYROCLASTICS	75	400 Ω-m
QUE RIVER SHALES.	145	15 Ω-m
		150 Ω-m
	535	
HELLYER BASALT.	∞	~300 Ω.

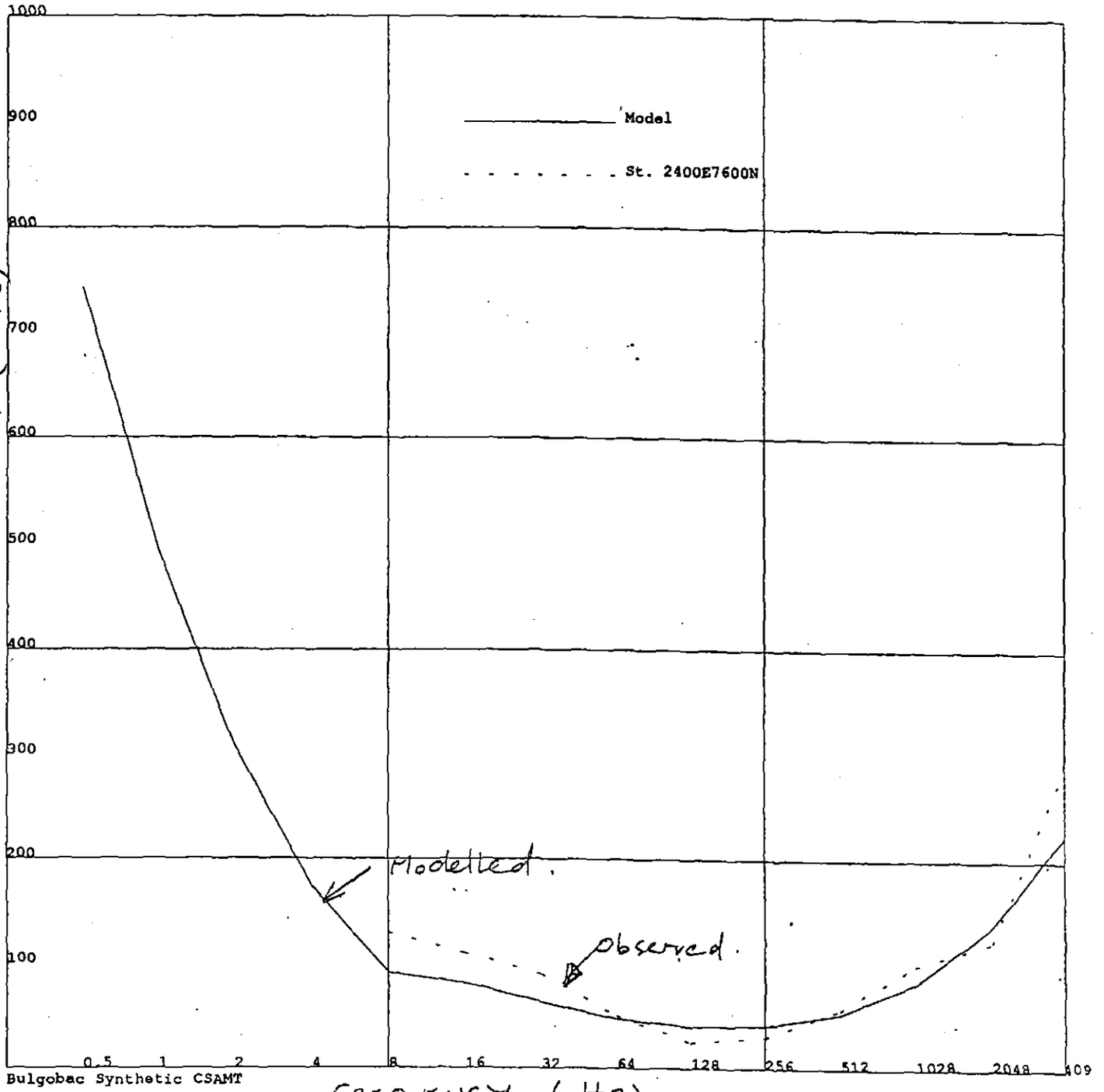
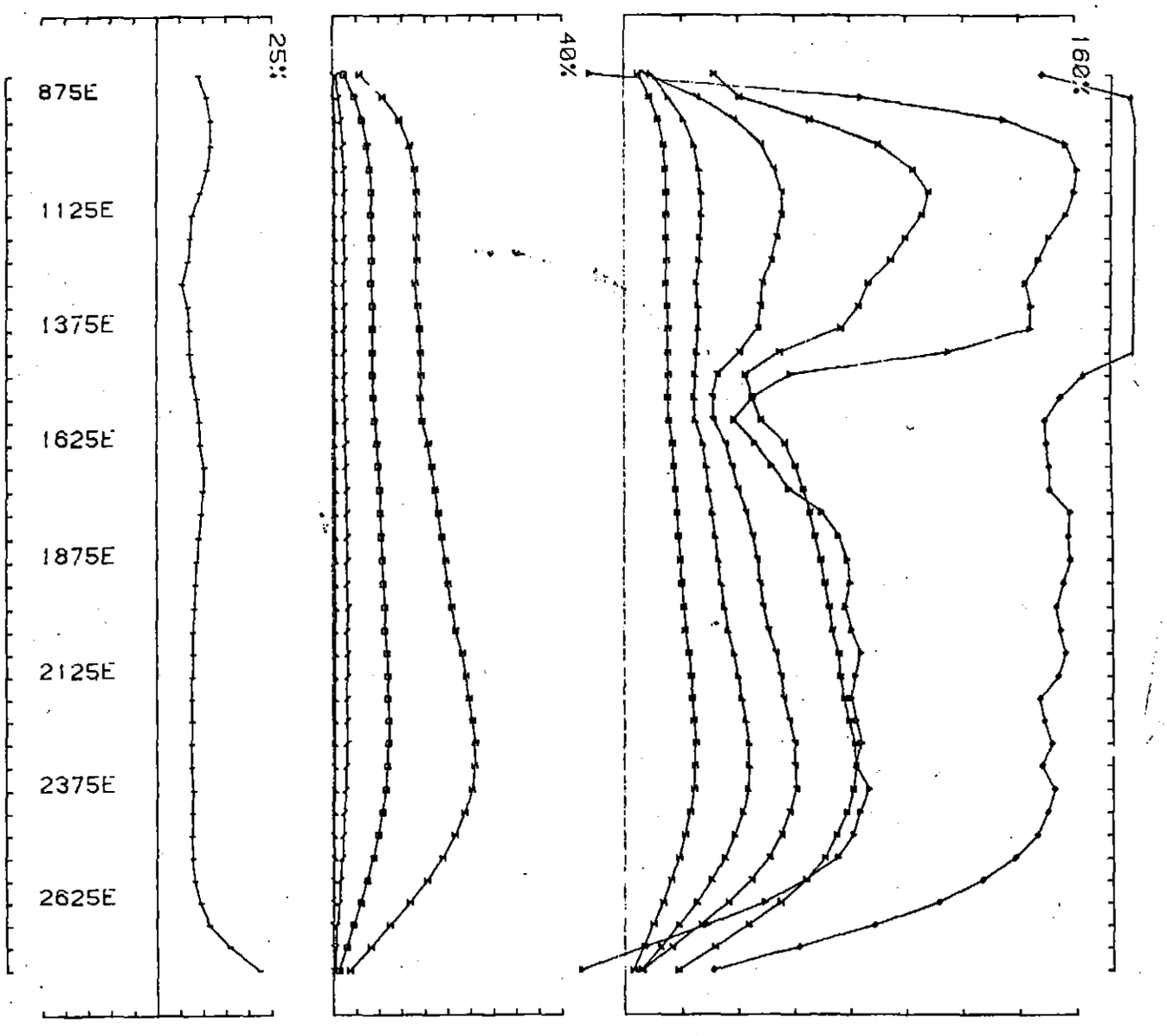


FIGURE 3

APPENDIX II

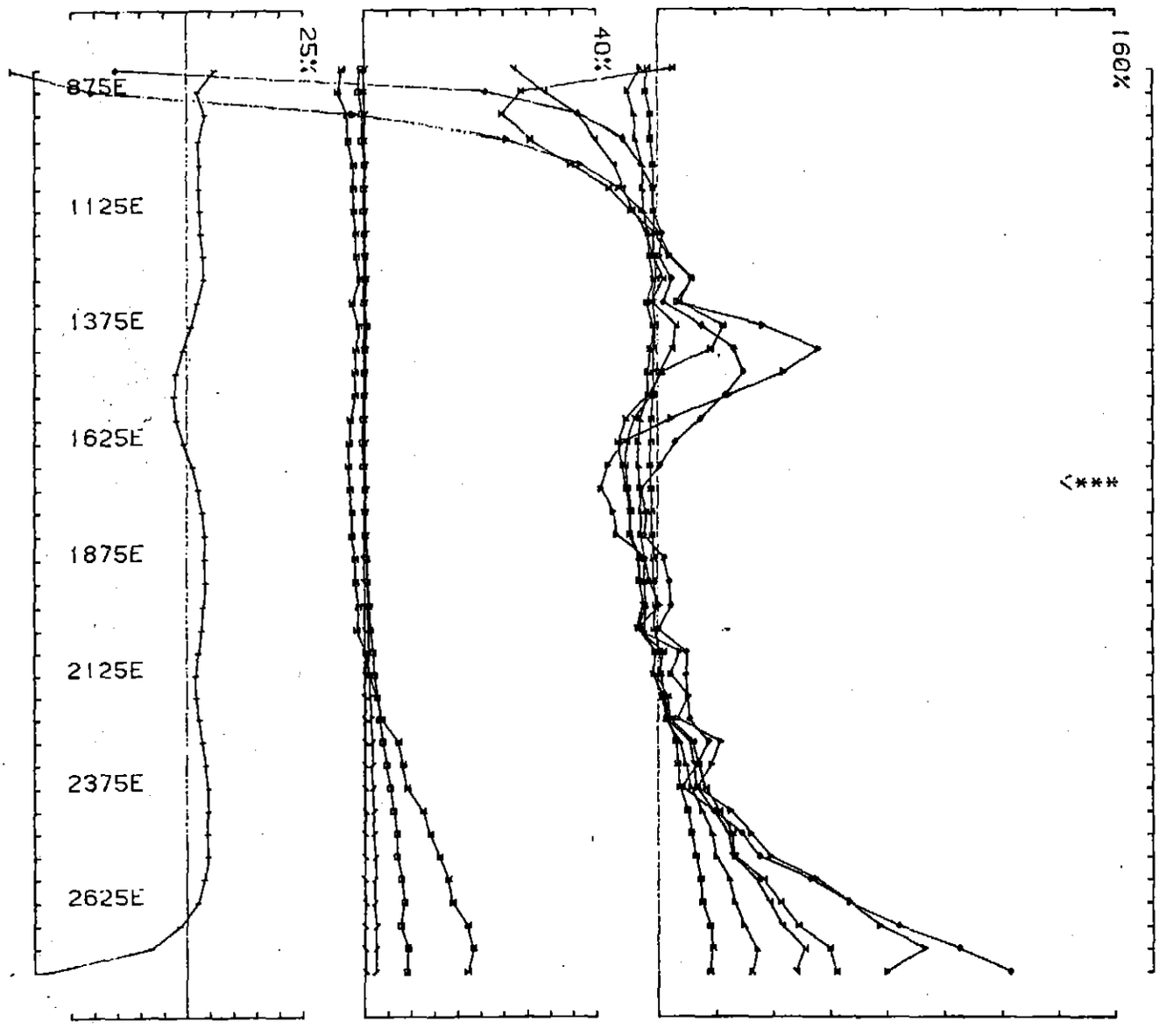
1987 UTEM SURVEY



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

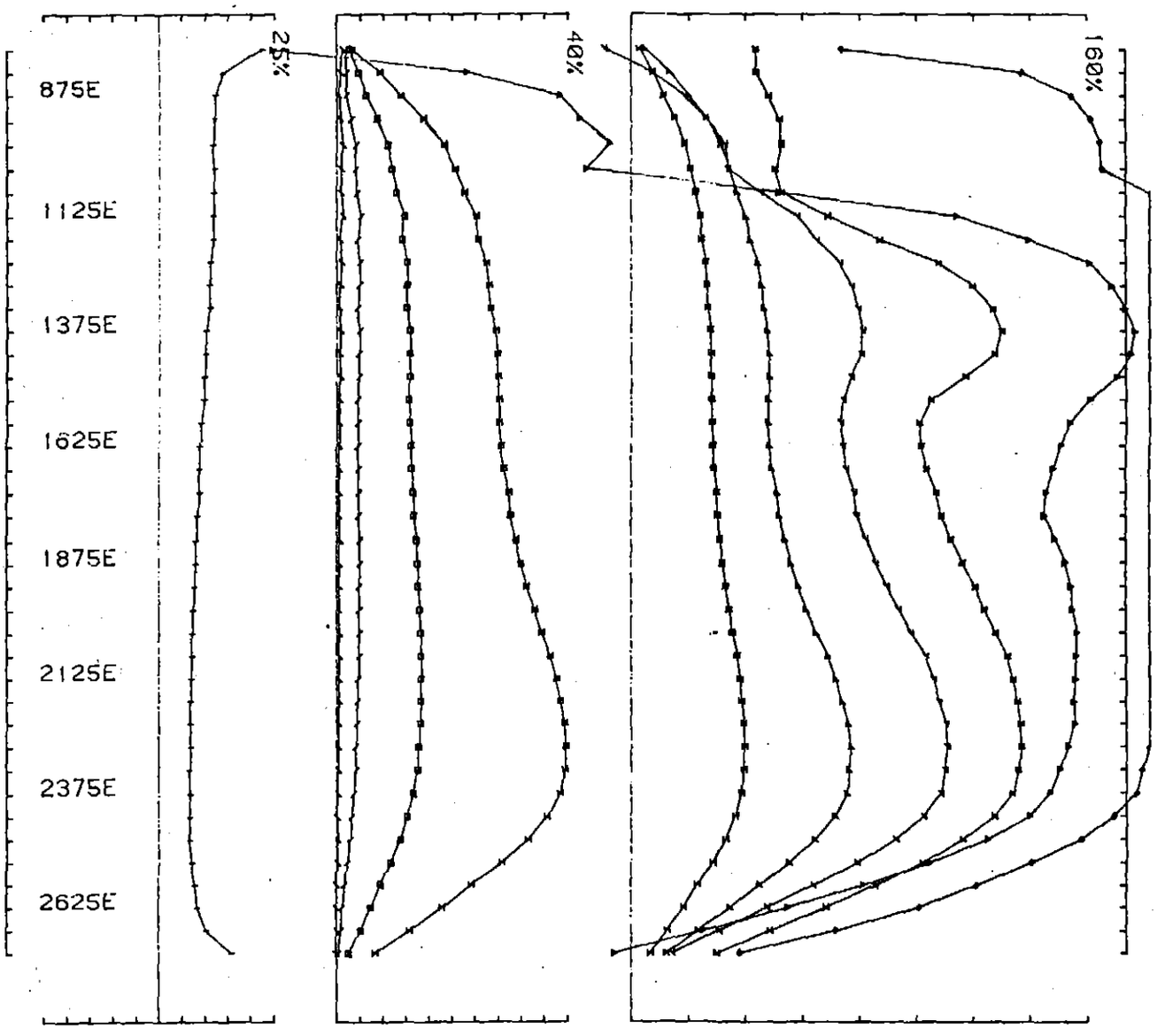
Loop 0001 line 8200N component Hz secondary field Ch 1 contin. norm. .



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

Loop 0001 line 8200N component Hx secondary field Ch 1 point norm.

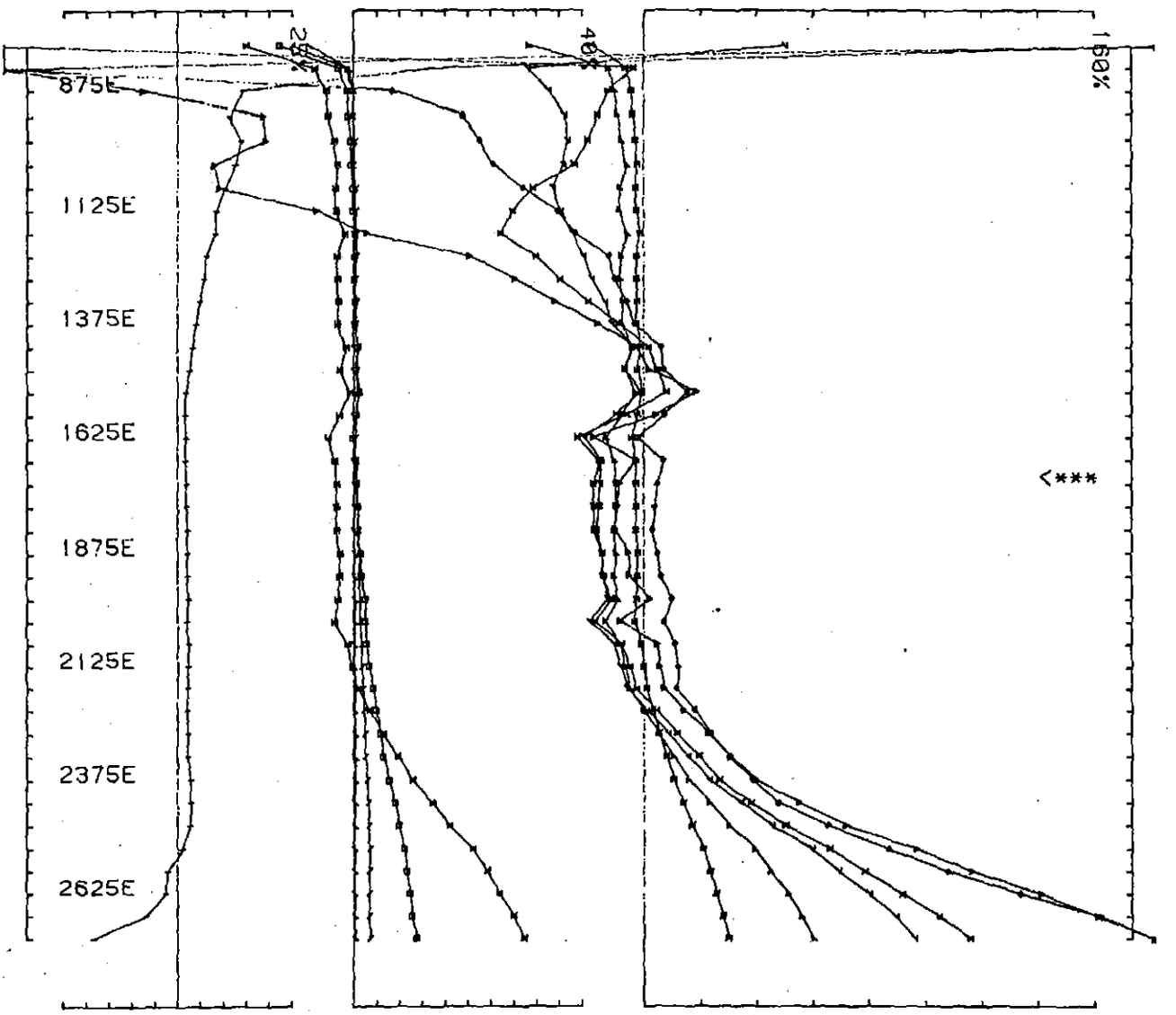


UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 9/12/87

Loop 0001 line 8400N component Hz secondary field Ch 1 contin. norm.

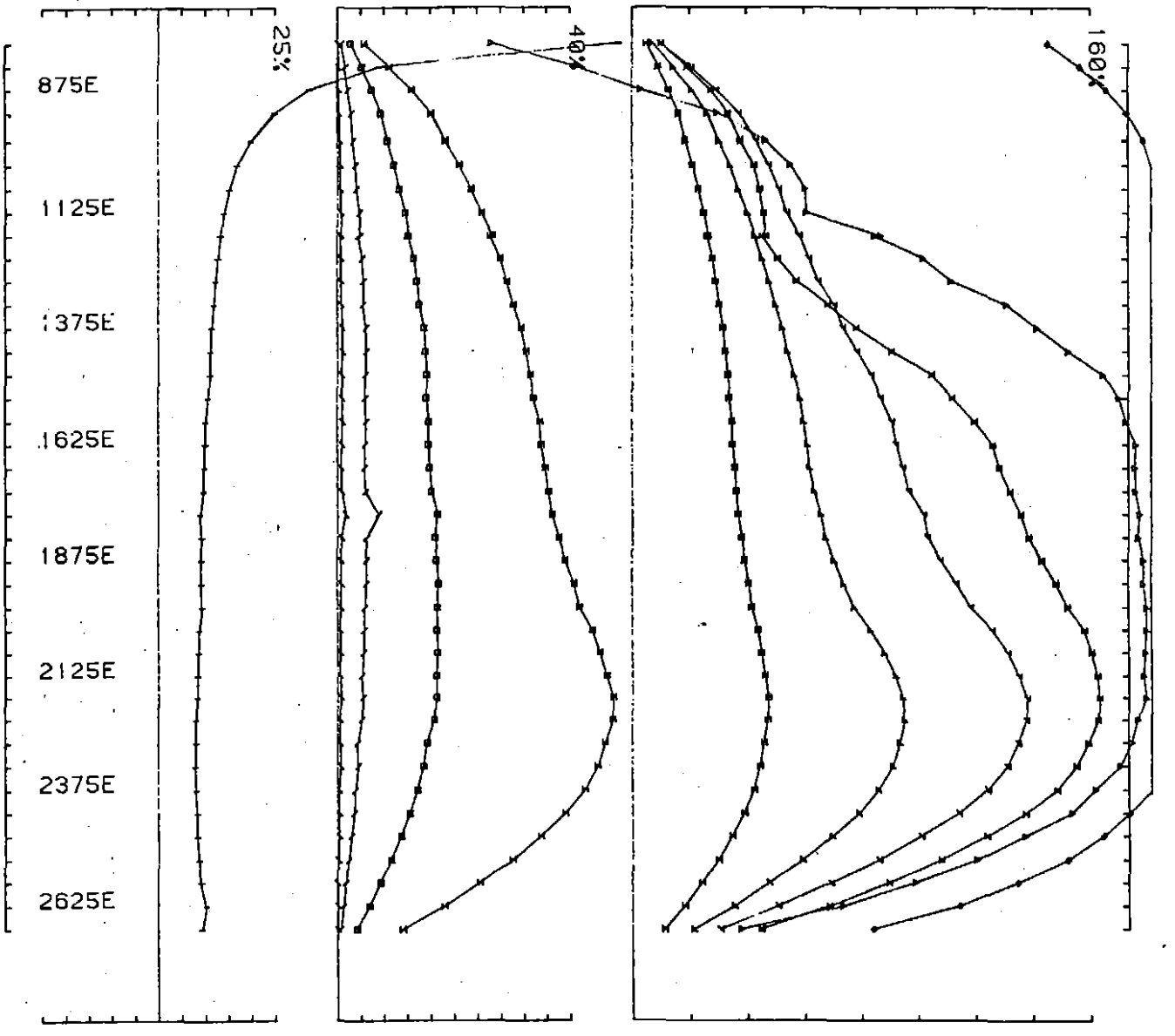
411114



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO Job 8726 base freq (hz) 26.230 9/12/87

Loop 0001 line 8400N component Hx secondary field Ch 1 point norm.

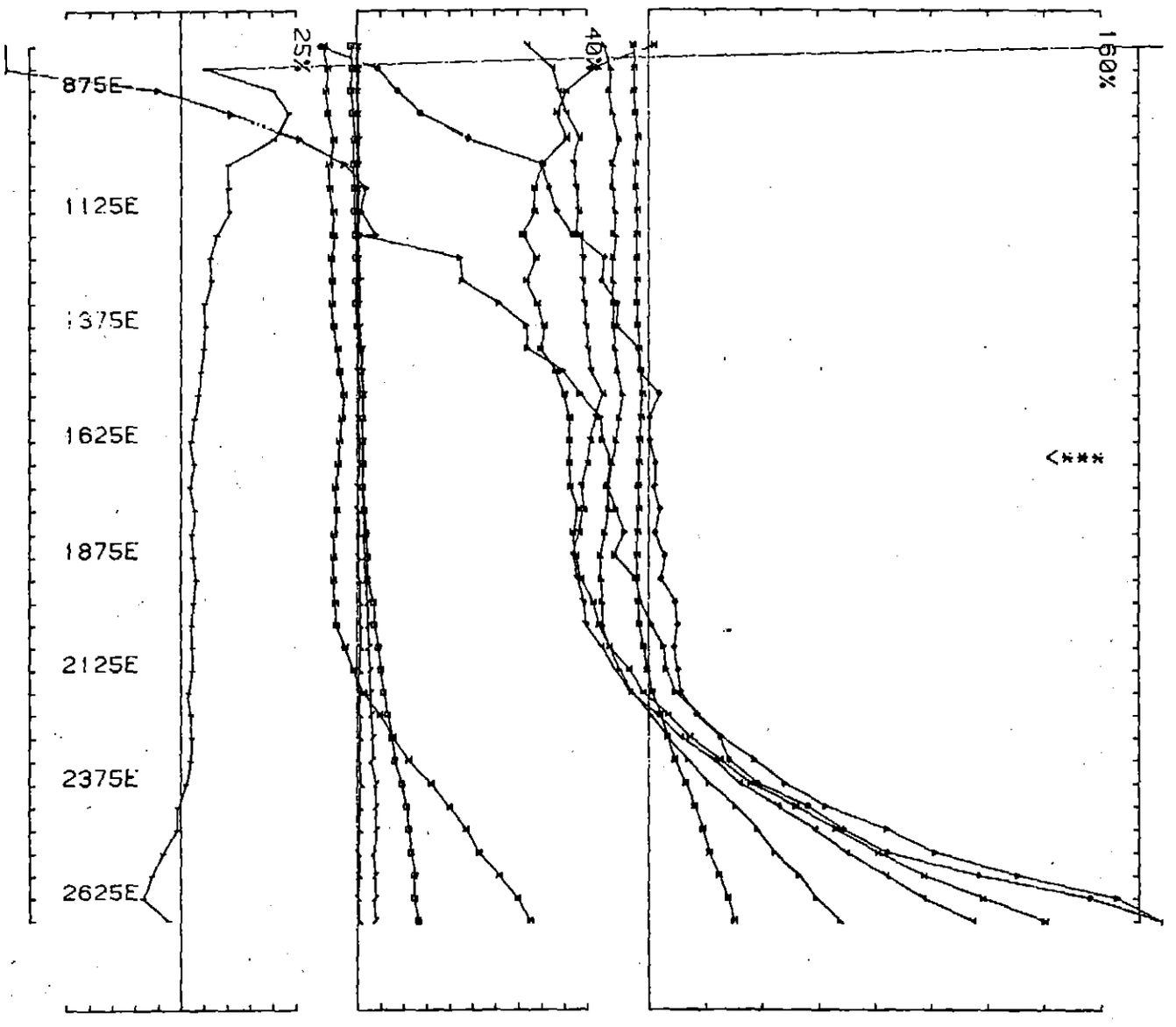


UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

Loop 0001 line 8600N component Hz secondary field Ch 1 contin. norm.

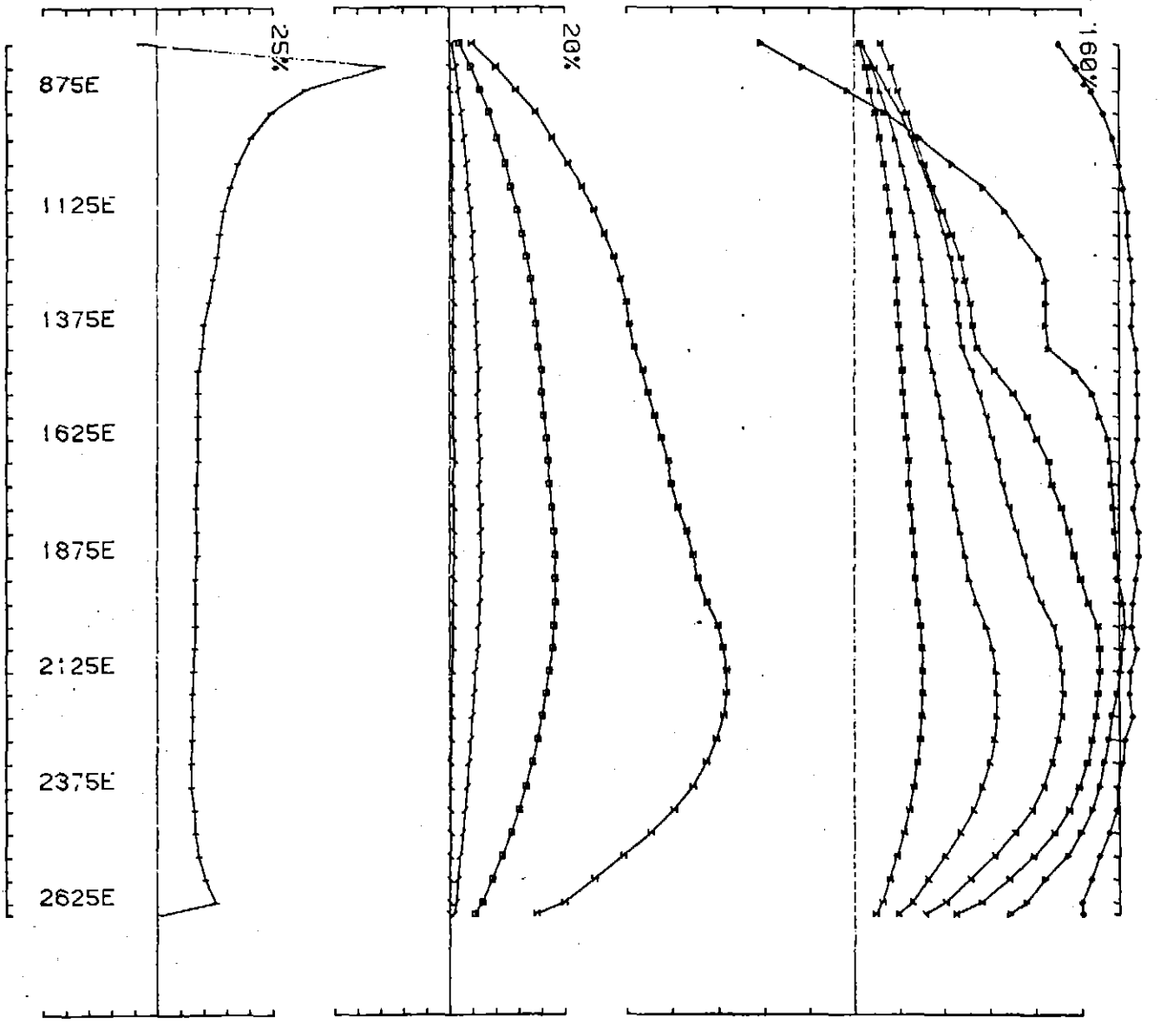
411116



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

Loop 0001 line 8600N component Hx secondary field Ch 1 point norm.

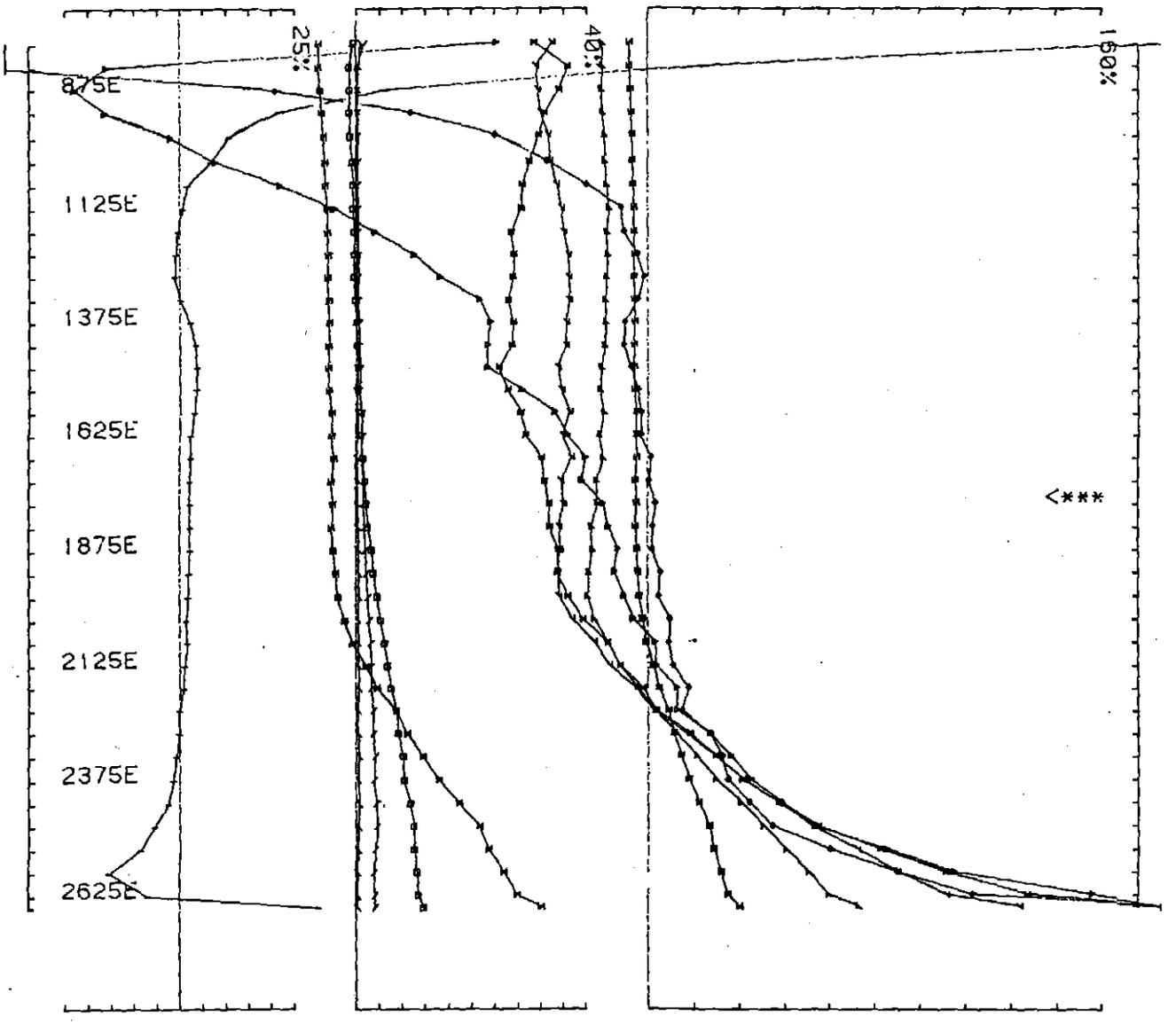


UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO Job 8726 base freq (hz) 26.230 10/12/87

Loop 0001 line 8800N component Hz secondary field Ch 1 contin. norm.

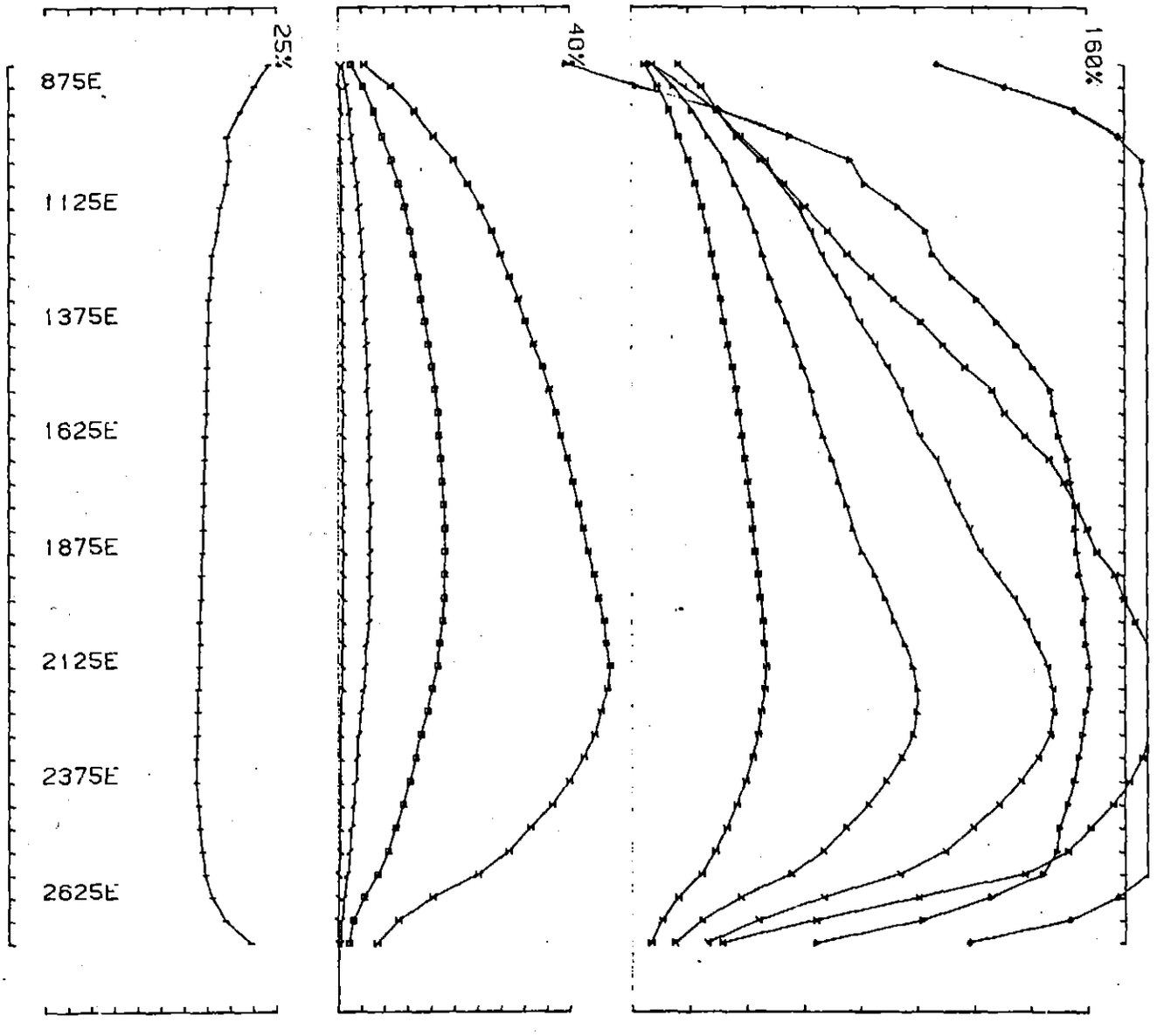
411118



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

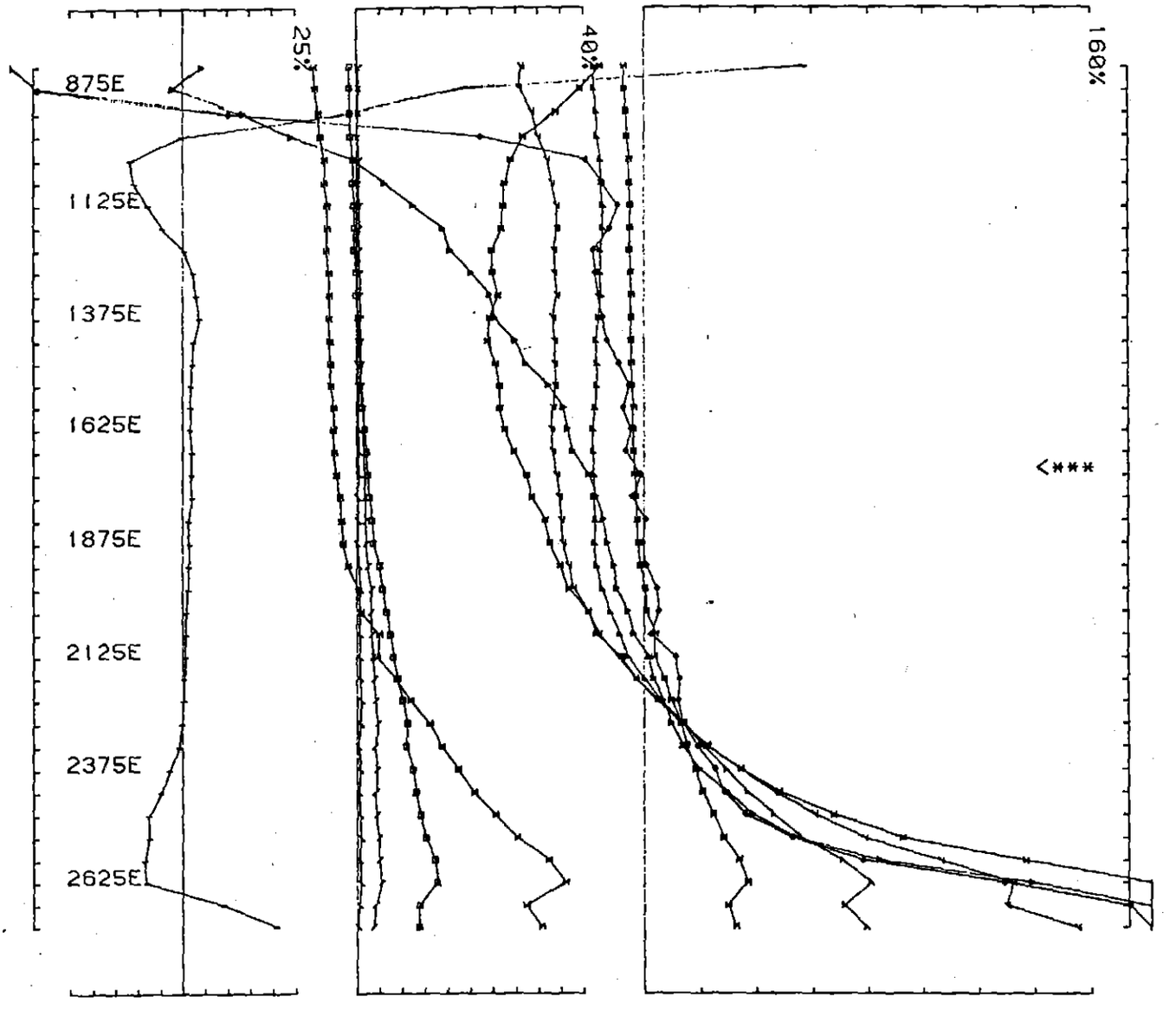
Loop 0001 line 8800N component Hx secondary field Ch 1 point norm.



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

Loop 0001 line 9000N component Hz secondary field Ch 1 contin. norm.

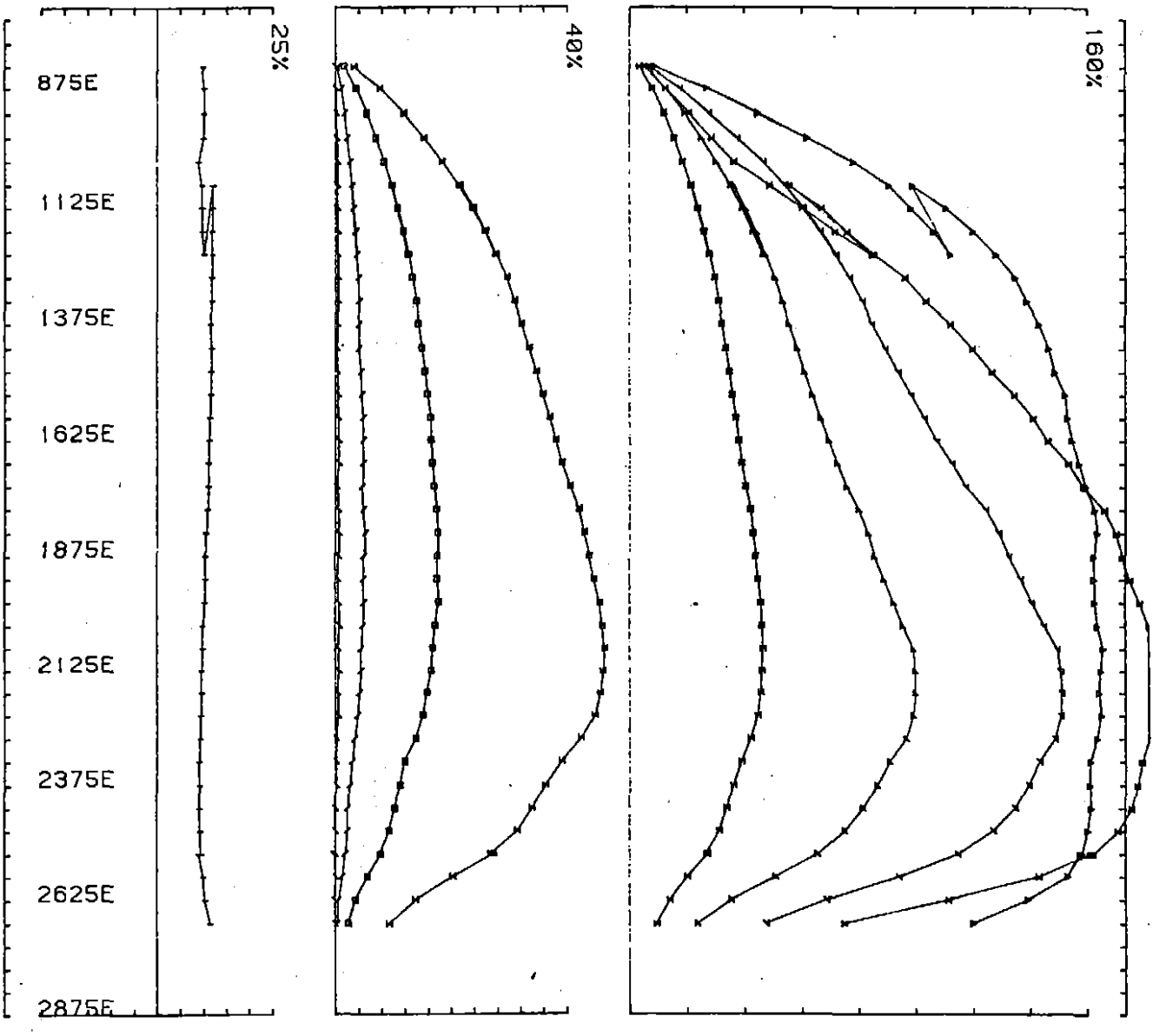


UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

Loop 0001 line 9000N component Hx secondary field , Ch 1 point norm.

411121

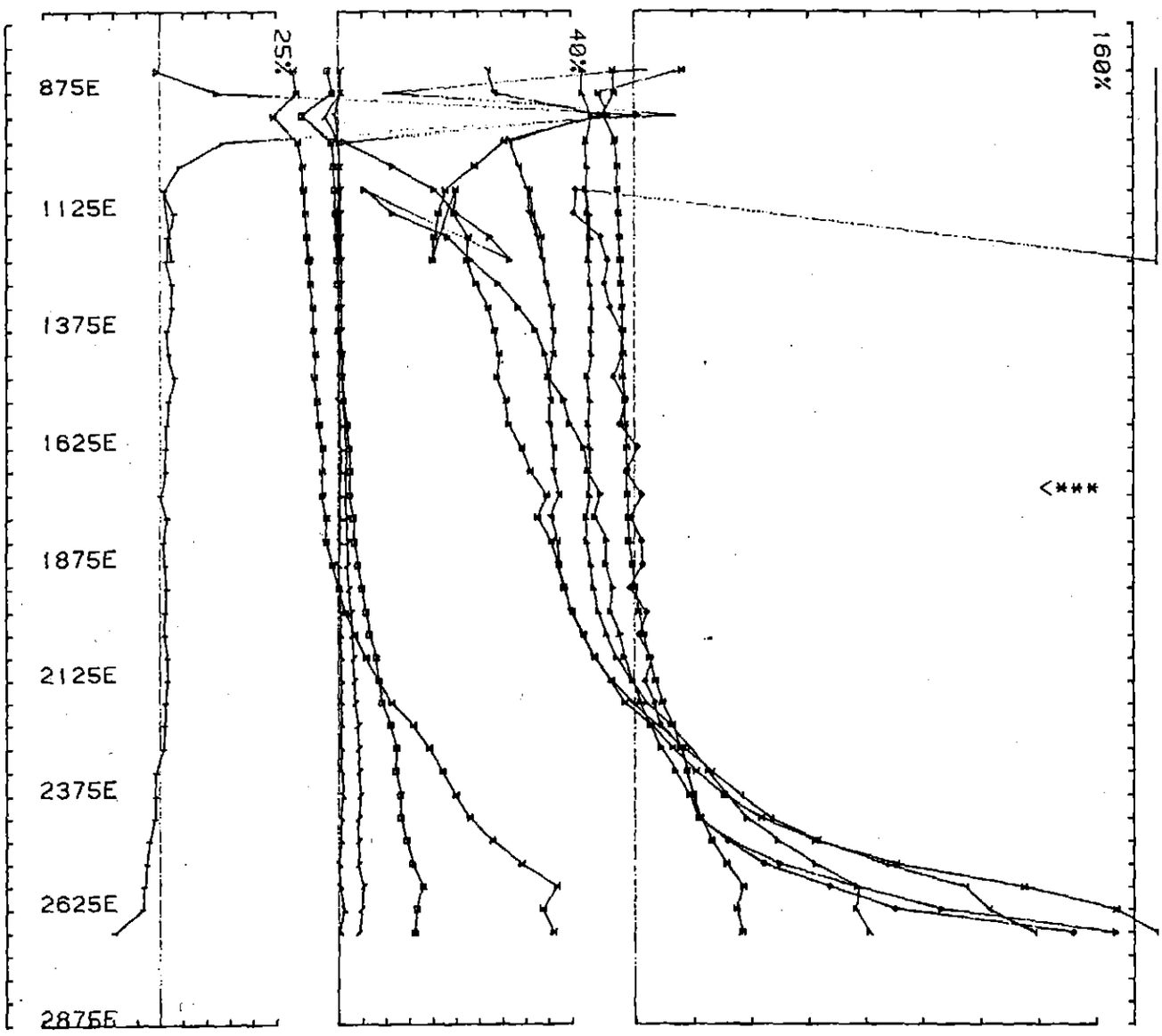


UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

Loop 0001 line 9200N component Hz secondary field Ch 1 contin. norm. .

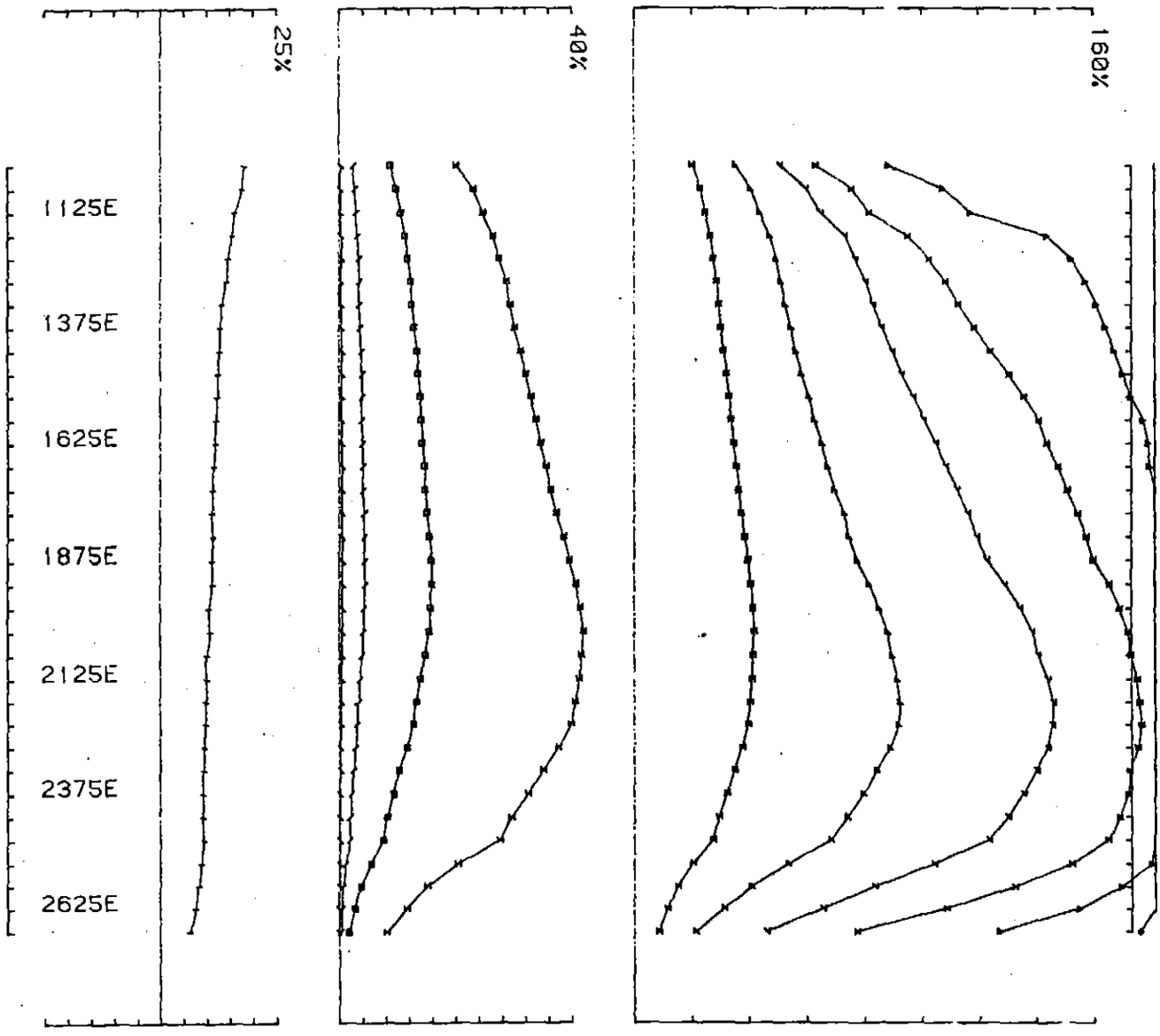
411122



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO Job 8726 base freq (hz) 26.230 10/12/87

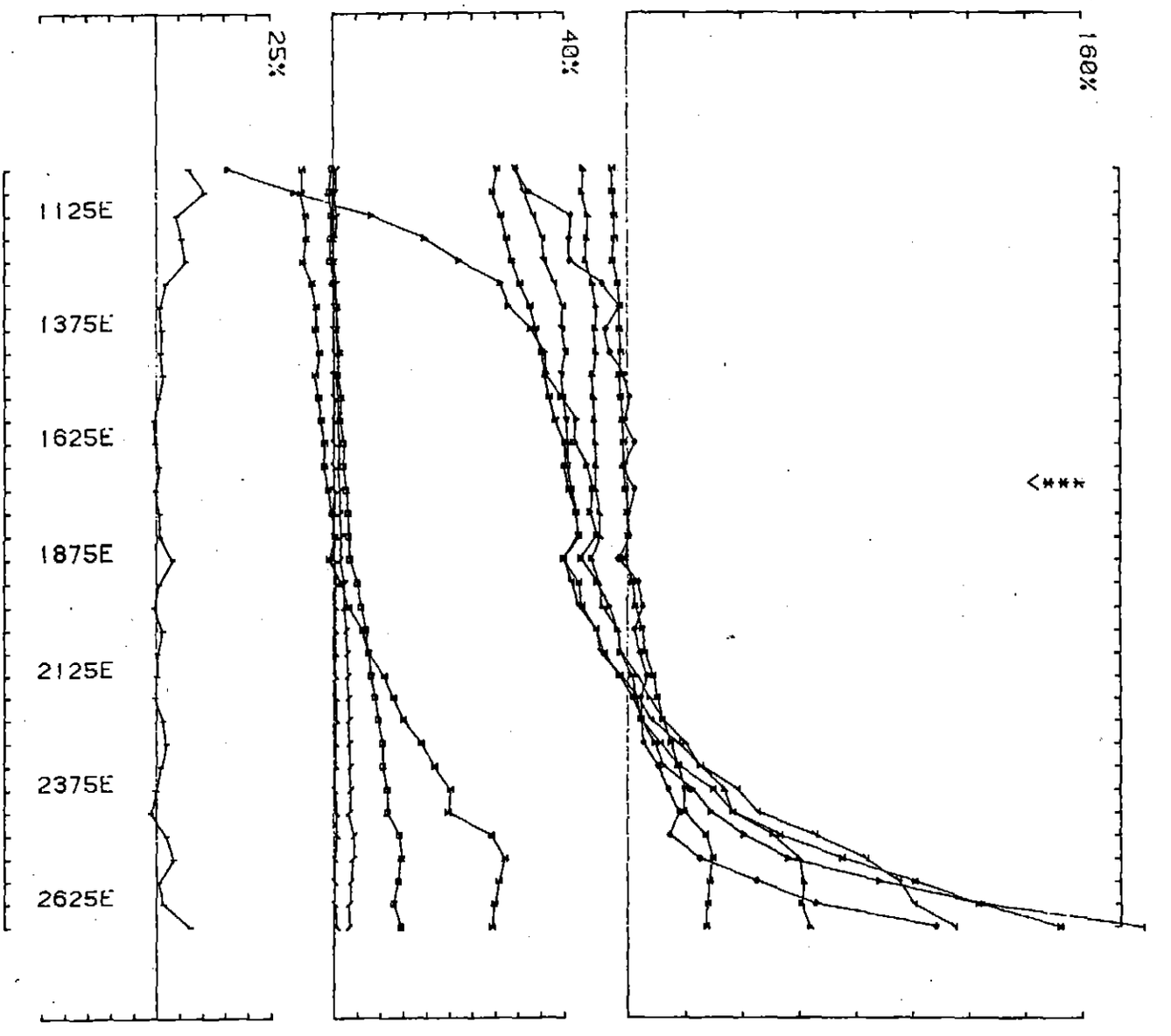
Loop 0001 line 9200N component Hx secondary field Ch 1 point norm.



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

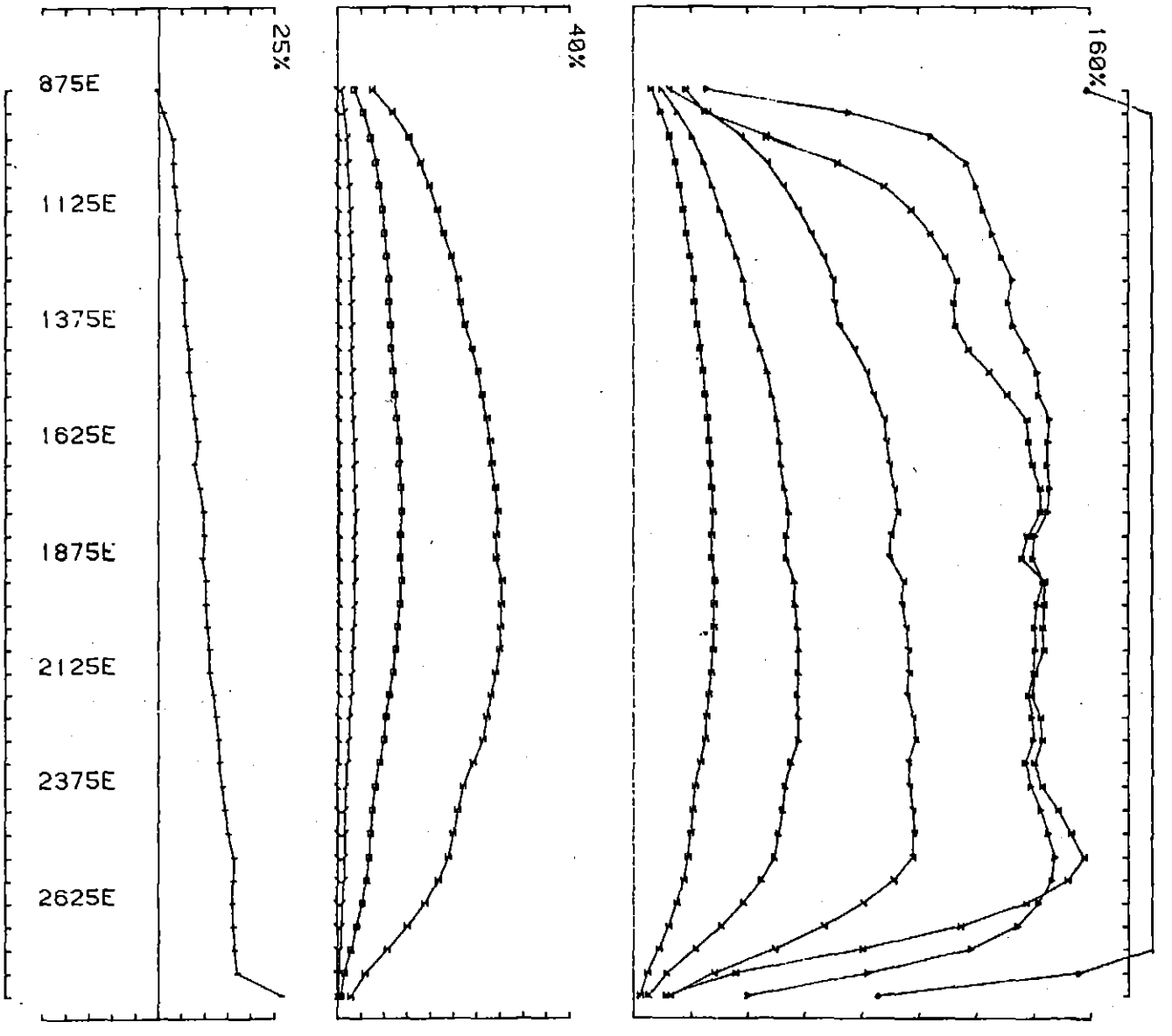
Loop 0001 line 9400N component Hz secondary field Ch 1 contin. norm.



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

Loop 0001 line 9400N component Hx secondary field Ch 1 point norm.



UTEM SURVEY at QUE ROAD for C.S.R.

conducted by PMM PAO job 8726 base freq (hz) 26.230 10/12/87

Loop 0001 line 9600N component Hz secondary field Ch 1 contin. norm.

APPENDIX III

1987/88 GRAVITY SURVEY

116 LEAMAN GEOPHYSICS
Survey Review, Specification, Reduction, Interpretation
Wide Experience Most Methods
Specialties:- Gravity, Magnetics, Seismic Methods

411127

Registered Office:
461 OCEANA DRIVE, HOWRAH, TAS. 7018
All Correspondence to:
G.P.O. BOX 320 D, HOBART, TAS. 7001.
TELEPHONE: (002) 47 8849

EL 39/85 BULGOBAC RIVER

QUE ROAD GRAVITY SURVEY
REDUCTION AND INTERPRETATION REPORT
for
CSR LTD MINERALS DIVISION
by
Dr. D.E. Leaman

April 1988

CSRQUERD

91-3214-C.

SUMMARY

An extensive gravity survey of most of EL 39/85, Bulgobac River in NW Tasmania has revealed that abnormal thicknesses of Que River Shale and underlying volcanics revealed by drilling are localised to a small block whose boundaries appear to have been growth faults during the deposition of the units.

Three dimensional modelling has established that the changes in thickness, of the order of 100 per cent, occur in short lateral distances and that the units are reasonably systematic and predictable away from controlling structures. The effect is less pronounced for the Que River Shale than for the underlying mafic and intermediate volcanics. More massive basalts and denser overall sections are restricted to the region immediately south or west of the marginal faults close to the Murchison Highway.

The general rise in Bouguer anomaly across EL 39/85 reflects the thickness and disposition of both Que River Shale and basalt. The anomalies are eroded by the influence of patchy Tertiary cover, largely sediment or thickened soils, and localised pockets of deep weathering of the exposed pyroclastic units. These effects, within a more limited survey, give the illusion of dense, localised masses no more than 250 m deep. The perspective of a broad survey, however, shows these effects to be artifacts of near surface alteration and that the anomalies are generated by units hundreds of metres thick and up to 800 m deep as is revealed by drilling.

Within this framework it is not possible to resolve any response which may be induced directly by mineralisation or an ore body. The value of the survey resides in its ability to permit development of a coherent geological and structural model for the units of the area whose correlates less than 5 km away contain both the Que River and Hellyer ore bodies.

Further evaluation and definition of the massive extrusive basalt piles and their magnetic properties may lead to recognition of the vent system and thus sources for mineralisation. These cannot be far removed from the growth faults, and massive volcanic piles, identified by the present work.

INTRODUCTION

The area surveyed lies within EL 39/85 held by CSR Limited and is located on the western side of the Murchison Highway adjacent to the mining leases held by Aberfoyle Ltd for the Que River Mine.

The gravity survey described in this report represents the work of two field seasons. The initial survey was reported by Leaman (1987). Although no comprehensive interpretation was undertaken it was felt that the anomaly pattern was sufficient to encourage drilling when coupled with other results (e.g. CSAMT) and the need to establish stratigraphy.

Four holes have now been completed (see Map 1). These have revealed unexpected thicknesses of Que River Shale and the underlying basaltic sequence. Apparent mass or conductor targets could not be explained.

The limited coverage of the primary survey led me to express concern that the anomaly suggested could be part of some larger feature and that the gradients assessed to suggest a maximum depth of 250 m to an ore density contrast could be induced by surface weathering or alteration - i.e., subtraction effects. The drilling results indicate that this was probably the case.

In view of the depth range to the predicted target section of volcanics - in excess of 600 m below surface - it became critical that some appreciation of structure and unit distribution be made. Few geophysical methods are suitable for such study; especially at the established depths.

The gravity survey was thus extended to cover most of the licence area with two objectives:-

- to place the previous survey and the drilling results in perspective, and
- to enable assessment of the area leading, if possible, to a coherent geological model of the area which might indicate prospective or critical areas.

THE GRAVITY SURVEY:

The initial observations were made by G.L. Rau of Solo Geophysics between January 30 and February 6, 1987. La Coste and Romberg meter number 561 with a scale constant of 1.00928 was used.
The survey was tied to Mines Department Que River alternate base; station 8551.9976, 980177.5 mGal.
The grid used was surveyed and levelled and the coverage was based on a station spacing of 50 m on lines 200 m apart. The base line was 2400 E. The grid was oriented to match the larger Aberfoyle grids in the region. The highway was used as a subsidiary base line.
Five tie points were used, each linked by drift controlled multiple observations.

1. Que River base
2. 2400E,8300N -3.1 divisions with respect to base
3. 2400E,7600N -0.19 divisions
4. 2400E,8800N -0.38 divisions
5. highway,9300N 7.7 divisions

The survey increments were also undertaken by G.L. Rau of Solo Geophysics between December 14, 1987 and February 11, 1988 using La Coste and Romberg meter 556 with a scale constant of 1.01387. The new work was ultimately tied to Que River base and tie points in the original survey. Some additional tie points were established.

1. station 312 -3.03 divisions with respect to base
2. station 456 25.27 divisions
3. station 688 -3.42 divisions
4. station 726 -8.85 divisions

Two variants from normal practice were noted.
1. Due to unstable surface conditions many stations were observed at tripod levels some 700 to 900 mm above ground level.
2. Some loops were not completed in balanced formats; i.e., they were terminated on a tie point different from the start point. Although all loops were referred to tie points and all differences were properly established this is not ideal practice and complicates corrections for loops affected. Some residual uncertainty is inevitable but is unavoidable in difficult terrain where opportunities for simple closes and short loop times are limited.

The reduction was completed using a density of 2.67 t/cu m and the old ellipsoid (for compatibility with the TASGRAV data base). Terrain corrections were applied up to Hammer zone M. Near station compensation was based on special notes of the conditions up to 50 m from the observation point for the initial survey and 30 m for the new survey.

Compensation for the raised meter levels at some stations was included within the terrain correction since the Free-Air effect can be directly applied to the height of the meter but the Bouguer correction is inadequate by an amount equal to the elevation of the meter above ground. This means that should the reduction density be changed any adjustment can be simply applied to the correction column as a scalar correction.

Note that the Bouguer anomaly value attaches to the position of the meter and this may have been up to 1 m above ground level.

The gravity observations were found to be reproducible within 0.02 mGal after loop and drift corrections in most cases; exceptions were always restricted to loops not closed to the starting point. Only two misclosures greater than 0.04 mGal were found.
Errors due to position or height errors are not believed to exceed 0.01 mGal. The terrain and, where necessary, Bouguer slab adjustment corrections range between 0.2 and 1.1 mGal for this relatively low relief area. Possible errors are considered to lie in the range 0.02 to 0.07 mGal.
The RMS error is thus of the order of 0.05 mGal or less and the values can be safely contoured with intervals of about 0.15 mGal.

Some problems may attach to precise location of certain line segments west of 1200E. These have not been fully resolved and were generated by confusing identification of stations, and their own reference points, by surveyors. A "best judgment" alignment is shown in Map 1 but some tens of metres may be involved along the central part of 800E. While of concern this error source is not significant in terms of this presentation or use of the reduced data since the elevations are reliable and the potential position error amounts to no more than 0.02 mGal.

Map 1 (folder) presents the distribution of stations, assigned station numbering and Bouguer values. The body of the number system is derived from surveyor loops rather than line references. This was done to avoid, or at least minimise, risk of confusion from any attempt to renumber or recode the coordinate or level information when combining it with the observed gravity and gravity correction information. It is recommended that future surveys be coded on a line basis and that surveyors note the peg numbers as a cross check on location. Confusion also arose during the survey extension when surveyors referred to their own, not the gravity, number system.

Contours in map 1 have been drawn with variable density but a contour interval of 0.125 mGal has been used for much of the survey area. Note that all values labelled and contoured include a scalar addition of 15 mGal and this value should be removed if the plot is to be compared with state datum maps.

Tables 1 and 2 (Appendix) contain the observations prepared for reduction and the reduced results of the Bouguer anomaly. The numbering system should be referred to the above comments and Map 1. The tables include the results for the entire survey (including corrections and omissions for the initial survey).

INTERPRETATION

Inspection of Map 1 reveals that the gravity field presents a number of features. Each of these is described below. The subsequent quantitative assessment was designed to evaluate the gross geological bases for them and determine which characters are anomalous.

The use of a 15 mGal shift to the Bouguer values has produced a central positive segment in the survey. The artificial creation of a zero enhances the recognition of this relatively positive zone which lies south of Que Road and west of the highway. This feature was partly defined by the original survey but the extended coverage shows the effect to cover an area of at least 1 km by 1 km. The peak value lies on line 7200N. The most obvious part of this feature arcs from 7800N/1600E to 7600N/2700E and then south to cross the highway. There is no direct geological explanation for this character and the southern extension of the feature is oblique to the exposure of several units (refer Komyshan (1986) and CSR mapping).
The relatively positive region is limited to the south and west by the Mt Charter Fault but Bouguer values near the fault are much less than near lines 7600 or 7800N. No other significant positive effects are evident in the survey.

Negative effects fall within two principal classes.
The largest negative anomalies can be directly correlated with the exposure of Tertiary basalts and associated, often concealed, sediments. These materials generate a moderate magnetic response but clearly possess a substantial negative density contrast. The combined gravity and magnetic responses would suggest that the basalt content is very minor and that the material is either wholly sediment with a coating of brown soil and occasional basalt fragments or very deeply and erratically weathered. Features of Tertiary origin occur near 800E and north of the Que River.
Lesser negative anomalies occur south and west of Que Road within the grossly positive region described above. There is no clear pattern to these features. Some might be considered to be due to unmapped portions of the Tertiary section but shales and pyroclastics or porphyries can often be found within the areas defined by these responses. Since such materials, even if surface weathered, do not produce extreme contrasts it must be presumed that pockets of deep weathering have been integrated. The most significant of these features, centred on 7200N/2400E, could be due to unmapped Tertiary sediment, deep weathering and a contribution from a porphyry. Only the first two options can produce the gradients and scale of effect observed. Such effects corrode the gross positive form of the gravity field south of Que Road.

North of Que Road, but south of Que River, the field is relatively smooth and plateau like. This character contrasts with the features described south of the road.

Limited data control exists in the south of the area but a negative contrast can be recognised across the Mt Charter Fault. This shows that the materials to the south west, the greywacke sequence, are less dense than the shale and pyroclastic sequence to the north east. This contrast could superficially explain the broad positive response south of Que Road but not the anomaly step near line 7800N. There is no surface evidence for any structure or compositional change which could account for the difference in the gravity field north and south of this northing.

Some of the features and apparent paradoxes are explained or complicated by the results of the initial drilling programme. Consider condensed logs for the four holes drilled to date.

1. 0-75 m pyroclastics
   -527 m Que River Shale
   -850 m basaltic sequence, volcanics
   -860 m mixed sequence, greywackes etc

2. 0-66 m pyroclastics
   -373 m Que River Shale
   -676+m basaltic sequence

3. 0-301 m Que River Shale
   -458 m basaltic sequence, volcanics
   -541 m greywacke etc

4. 0-86 m pyroclastics
   -205 m Que River Shale
   -209 m shear/fault
   -301 m greywacke etc

The drilling reveals that the Que River Shale thickens from about 300 m to more than 450 m between holes 3 and 1 and from 310 m to 450 m between holes 2 and 1. Yet, consideration of mapping and exposure to the immediate east of, and along, the Murchison Highway would suggest a maximum thickness of 200 m.
Similar variations can be quoted for the basaltic sequence; less than 100 m near the highway but more than 300 m in holes 1 and 2. A more consistent regional thickness was noted in hole 3. Review of Komyshan (1986) would indicate that the volcanic sequence is variable across the region between EL 39/85 and the Henty Fault Zone several kilometres to the east.

Some density determinations are available for the materials encountered in holes 1 and 2. The relatively acid pyroclastics

exposed over much of the area south of the Que River and north east of the Mt Charter Fault have a density of about 2.67 to 2.69 t/cu m. The Que River Shales have a densities of about 2.76 to 2.77 t/cu m in bulk. This value may be locally raised by additional pyrite content but most present determinations would suggest that the rock contains little pyrite. The basaltic sequence in holes 1 and 2 is distinctive and presents a bimodal density distribution. Part of each sequence is quite dense, averaging 2.90 t/cu m, while a large part is of the order of 2.80 t/cu m. The dense segment is discrete in each case. The basal sequence, mixed greywacke succession, considered representative of the material south of the Mt Charter Fault has a density of about 2.71 t/cu m.

Consideration of the drilling results and the implied contrasts suggested by the determinations described above suggests that the observed gravity field reflects the general changes in thickness of shale or volcanics or both. In each case there is a positive contrast with respect to the underlying mixed or greywacke sequence whether deep in the section or as exposed SW of the Mt Charter Fault. It is not immediately obvious that the scale of observed variations in the gravity field are consistent with these units and the implied thickness-contrast product or whether other influences are present. For example, there is no immediate explanation for the N-S extension of the positive axis near the highway and across it. Only shale is exposed.

A three dimensional model was attempted in order to evaluate the general structure and stratigraphic patterns in the area. This was initially controlled by the four drill holes and the established surface exposure distribution. The model was iterated until a consistent and geologically believable concept was attained.
There is no assurance that the model described below is valid across the entire area or that it is precise. Not all aspects of it have been tested and some ambiguity resides in the conclusions due to the presence of high contrast near surface effects. The model described is, however, internally consistent in so far as present work has evaluated it and it satisfies all current controls.

It should be considered an interim description.

The initial model was generated by inferring structure contours for upper pyroclastics, Que River Shale, mafic volcanics and mixed sequence from Komyshan (1986) and CSR detailed mapping. This was then varied to allow for the thicknesses observed in drill holes. This model was iterated and revised several times using a set of five control profiles. The profiles were chosen for convenience, interest or special character and are essentially random. Nothing was assumed. The profiles used were baseline 2400E, lines 7200, 7600 and 8400N and an arbitrary transverse from 387000E/5394000N to 390000E/5395000N.

The gravitational attraction of the model was calculated for each profile. Each of the four components was calculated separately and a resultant compared with the observed profile. The model was evaluated by the quality of profile match and the absolute level of that match. The latter factor is most critical. The coherence of the match is indicated in the top right hand corner of each profile figure (Figures 1 to 5). The shift differential between the calculated and observed profile must be the same for all profiles for the same model and contrasts for the model to be a valid solution. This aspect of the modelling process is not intuitive. Respect of it does expose deficiencies since it is not valid to force a fit by varying contrasts in different profile aspects. However a particular piece of geology is viewed it can only present a single effective contrast. Three dimensional models are sensitive to this factor since some response from each component modelled appears, with varying weight, on each profile. Separate calculation of the components allows, for any given geometry or iteration of the model, establishment of a response-contrast array and production of a set of possible resultants. Comparison of the requirements for the entire profile set enables geometric deficiencies and the relevant contrast ranges to be determined. Considerable fine detailing is possible by extended iteration but any coherent solution should be tested and then refined after test.

The unambiguous presence of near surface negative high contrast sources has led to use of the matching of the outer envelope of the anomalies observed. This has been done on the basis that wherever the rock mass is unaltered or unweathered or not covered by thick soils the Bouguer anomaly would be greatest for that lithology or part of the structure. Such a process may not precisely define the function for an unweathered rock mass but will approach it asymptotically.

The model has been divided into two parts; above 500 m ASL and below 500 m. 500 m represents the lowest point in the surveyed area. Above 500 m the model consists only of surface materials, including Tertiary rocks,and the upper pyroclastics and part of the Que River Shale. Since the pyroclastics have a mean density very close to the Bouguer density assumption and thus contribute nothing to the Bouguer anomaly they have been ignored. Their lower surface (the upper surface of the shales) is significant and the volume of shale between the contact and 500 m has been estimated and its attraction deducted from the Bouguer values along each of the profiles modelled. Thus each observed profile, as used below, is a compensated profile adjusted for the near surface parts of the model. The upper part of the model has not been varied throughout the iteration process since the shale contribution is relatively minor and no significant errors have been introduced by ignoring possible fine structure at the level of the base of the pyroclastics.

All extended modelling has been directed at the geology below 500 m ASL. This procedure removes high level broad effects, sharpens soil anomalies and increases resolution of deeper sources. The model elements and profiles shown in Figures 1 to 5 have a reference level of 500 m.

Consider now the primary coherent solution based on the five initial test profiles. All evolution of the current model was based on analysis of these profiles.

LINE 2400E (Figure 1)

There is a general increase in Bouguer anomaly from north to south with a relatively pronounced step midway. This feature is shown to be of regional impact in Map 1. The anomaly character south of it is much more erratic. The minima could be related to the values at the northern end which would imply that the elevated features represent positive contrasts of relatively local disposition. Consideration of the drill control and the overall requirement to derive a model with systematic stratigraphic or structural changes shows that the general characteristics are explained by a gross change in positive contrast from north to south which corresponds to changes in thickness of both shale and volcanics. The anomaly step, however, could be interpreted in two ways; either the units thicken rapidly over less than 300 m or there is a marked change in density in at least one of them. Since there is no evidence for variations in the shale of the magnitude required then the cause must lie in the volcanics.

This conclusion is consistent with the observations in holes 1 and 3. The volcanics in hole 3 and most of hole 1 are variable in type and character but there is a section in which massive basalts occur. Consideration of the thickness controls on both shale and volcanics provided by holes 1 and 3 shows that the variation in anomaly form can be directly related to the change in composition and thickness of the basalt section with only minor contribution from the shale member.

A minor deficiency in specification of the model produced the anomaly rise at the N end of the profile as suggested in the Figure and would be revised in the next iteration.

LINE 7200N (Figure 2)

The observed profile is irregular and was selected as a sample of the extreme character south of Que Road. The overall effect, however, is that of a broad positive and fragments of the crestal anomalies show features consistent with an "eroded", large anomaly. The strong gradients associated with the negative effects clearly demonstrate that the sources for these are very shallow and begin within the soil profile.

This profile confirms the need to match the extreme positive asymptote for the profiles and shows that the irregularity in the southern part of 2400E is related to surface alteration of some kind and that the solution offered is sound.

Modelling shows that the shale and volcanics generate the broad response. Each contributes about half the effect but the profile match depends on a proportion of about 20% massive basalt in the volcanic section. The shift differential is not satisfied in any other way. This is also consistent with line 2400E.
The Figure also presents an option providing for some variation in the position of the Mt Charter Fault. Other alternatives are possible including some thinning of the volcanic section or shale against the fault or thickening of the upper pyroclastic section.

LINE 7600N (Figure 3)

The solution offered is relatively poor but is consistent with the general thrust of other profiles, the match criteria and the implied geology.
The calculated profile is much too high in the region adjacent to the Mt Charter Fault. Inspection of the model components shows that the modelled thickness of both shale and volcanics may be excessive. It is probable that both units thin westward although a 20% reduction in bulk density contrast for the volcanics would produce much the same effect. This would also generate the moderate gradient from west to east. Such an option is not simply modelled but would imply an increase in the wedge of massive basalt from west to east much as occurs on line 2400E from north to south. (A similar inference is possible on line 7200N but the profile is too fragmental due to surface source effects) It should be noted that the basic contrast used for the volcanics of 0.13 t/cu m is equivalent to a section density of 2.80 t/cu m. The implied reduction is equivalent to removal of about 100 m of basalt of density 2.90 t/cu m such as known to exist in holes 1 and 2. Thus the character of these lines reflects the variation in composition of the volcanic section and that the most positive effects east of the Murchison Highway and south of Que Road indicate the localised presence of pods of massive basalt. Such material is not universal.

The alternatives presented in the Figure offer a viable solution; reduction in density rather than thickness in volcanics and a placement of the Mt Charter Fault some 250 m to the east of the current model (Figure 6) and as used in a previous iteration. Further iteration would restore this geometry.

Note that the form ascribed to the upper pyroclastic unit is based on mapped dips in surface exposure. The correlation between the form of this surface and those below it should not be taken too literally at this stage. It is possible, however, that the depression in observed values could reflect more consistent synclinal structuring as suggested by the broken line. A minimum lowering of the shale top of 70 m is implied. Such variation is not generally supported by surface implication of drilling but thickened pockets may exist in the short wavelength folds.

LINE 8400N (Figure 4)

The concept developed in previous lines may be tested at 8400N. The profile match is obtained without recourse to any density increase in the volcanic component and is consistent with 2400E. The present model, in fact, contains too much volcanics north of 7800N. This profile, when coupled with 2400E, suggests that the section as drilled in hole 3 persists for several hundred metres and is only varied near the E-W change in the anomaly pattern near line 7900N.

The profile variation included allows for use of lower density or thinner volcanics to the west. The materials may well be absent west of the inferred fault - a partial extension of an arm of the Mt Charter Fault (refer Figure 9)

LINE 9387 (Figure 5)

This line provides an alternative perspective on the southern part of the area. The overall effect of the model is as noted for lines 7200 and 7600N. The match is excellent east of 2000E but deficient to the west.
Some appraisal of the discrepancy has been attempted although the model requires some major revisions. The Figure shows the effect of reducing the volcanic contrast to normal background (equivalent to a unit bulk density of 2.80 t/cu m). This improves the fit but does not wholly satisfy the match requirements. It seems likely that both the volanics and shale thin to the south west by at least 10% in addition to the change in composition of the volcanics unless the inferred folded character of the upper surface of the shale is incorrect. Such problems were suggested for line 7600N and a variation of 50 m could account for the differences.

Much more work would be required to establish which of these factors is dominant.

The current model is shown in Figure 6. Figure 6A gives a complex plot of the structure contours as used in the current model. It is not possible to clearly label all of these at the scale presented but their sectional transformation is given for all profiles. In order to relate the model to a geological basemap these contours have been overprinted in Figure 6B. Note that the placement of the NE-trending arm of the Mt Charter Fault is not correct in this iteration (discussed above) and should be revised back to its position in the previous iteration.
Various suggestions for modifications have been indicated above with respect to the sample profiles. More detailed assessment is not justified without at least one more drill hole SW of holes 1 and 2 or a further test of the basalt pile concept.

The basic model evolved was tested by modelling two additional random profiles and applying the contrast and matching factors implied by the reference profiles. The results are shown in Figures 7 and 8 for lines 1600E and an oblique NW-trending line (8306) which tests much of the positive feature south of Que Road. The latter profile, from 388/5396 to 390000 mE/5393000 mN, also samples the exposed up dip segments of most units as exposed near or east of the highway.

LINE 1600E (Figure 7): This difficult profile shows that the central anomaly is related to the basalt pile at depth but that the volcanics thin or reduce in density southward consistent with other profiles. Most other effects are related to Tertiary and other shallow sources.

LINE 8603 (Figure 8): This profile demonstrates the general veracity of the model as presently evolved. Most features are reflected. Deficiencies relate to the precise character of the exposed units but this is not especially relevant to this study and could be refined in further iterations, and to a possibly more emphatic surface syncline involving the pyroclastics and upper surface of the shale. The sustainability of this option is hazarded by the intersections in holes 1, 2 and 4. Some surface change is more likely.

The model has resolved a number of issues. The gross anomaly character is deeply sourced and related directly to the thickness of the shale and underlying volcanics. The nature of the marginal gradients and their location is directly related to the composition of the volcanics and in particular the proportion of massive basalt. The anomaly distribution thus indicates localised piles of massive volcanics along two axes within the area, axes along which the thickness of the shale and especially volcanics changes abruptly. Growth faults are implied with peak activity during deposition of the volcanic sequence and tapering activity during the deposition of part of the shale. The piles of massive volcanics do not extend far to the south west and it seems probable that the section also thins in this direction which might suggest that the Mt Charter Fault, as mapped, represents a rejuvenated growth fault system itself and is the western half of a small extensional block system.
This is suggested in Figure 9 where the relationship between the implied near E-W structure near 7900N and the N-S structure a little west of the highway are essentially subparallel to the interpreted and mapped forms for the Mt Charter Fault. The gravity data and model would suggest that igneous activity was concentrated near the NE corner of this fault system. This area must be considered prospective since active vent systems were involved.

A NNE-trending arm for the Mt Charter Fault is indicated in Figure 6 and, although its position is not precisely determined by the present study, may have exercised some control on Tertiary deposition or topography.

The model also explains the principal anomaly paradox - why the relatively positive axis trends N-S near the highway in an area where the shale is exposed and virtually E-W south of Que Road. The gravity field reflects the abrupt changes in unit thickness and composition (shale and volcanics) which occur locally and thus pinpoints the hidden structure which has stimulated the change in unit character.

An evaluation of the limits of resolution of an orebody were also attempted within the framework of the basic model. Figure 10 provides a comparison of the attraction of a single massive body with contrast of 1 t/cu m at differing depths. The target volume translates into an equivalent of 80 million tonnes of anomalous mass and could thus include both ore and gangue. Tests show that such a mass might be resolved at the depths involved only in certain parts of the area and only where the data set is not overly disrupted by surface source effects. It must be stated that the essential value of the survey and this interpretation is not related to direct location of an ore body but the geological understanding of a peculiar structural and sedimentological environment and the focus on that part of it which is geologically anomalous and which might contain ore deposits. Thus the identification of the zones containing massive lavas and the implication of vent systems is relevant to the overall goals of the exploration.

REFERENCES

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

Leaman, D.E., 1987. Que Road Gravity Survey. Reduction and Appraisal report. For CSR Ltd, by Leaman Geophysics.

APPENDIX

Table 1: File CSRQUERD gravity data prepared for reduction

incl station number, coordinates, elevation, gravity difference with respect to base station, combined terrain correction and Bouguer adjustment for raised meter.

Table 2: File CSRQUEBA reduced gravity values at density 2.67

incl number, coordinates, elevation, gravity values, correction and Bouguer anomaly.

GRAVITY DATA

CSR QUE ROAD GRAVITY SURVEY FEB 1987
980177.50 8551.9976 1.00928 561 10187
0 1 0 1 1 1 8700

1	1	389951	5395964	626.47	5.30	0.36
2	2	389748	5395572	661.69	-1.22	0.35
3	3	389921	5395924	630.19	4.51	0.36
4	4	389758	5395618	658.72	-0.83	0.36
5	5	389890	5395886	634.32	3.71	0.37
6	6	389770	5395668	655.33	-0.14	0.36
7	7	389859	5395846	638.37	2.96	0.38
8	8	389784	5395716	651.48	0.60	0.38
9	9	389830	5395805	642.66	2.20	0.39
10	10	389804	5395762	647.21	1.38	0.39
11	11	389738	5395523	664.32	-1.70	0.31
12	12	389730	5395474	666.72	-2.12	0.30
13	13	389716	5395425	669.07	-2.52	0.29
14	14	389707	5395375	672.30	-3.16	0.28
15	15	389699	5395327	674.51	-3.58	0.28
16	16	389634	5394973	681.25	-4.96	0.28
17	17	389640	5395026	681.40	-4.88	0.28
18	18	389681	5395280	679.52	-4.57	0.27
19	19	389648	5395075	680.85	-4.73	0.29
20	20	389674	5395230	677.81	-4.21	0.27
21	21	389658	5395125	680.00	-4.69	0.29
22	22	389668	5395175	678.74	-4.47	0.29
23	23	389676	5394571	666.15	-1.27	0.36
24	24	389631	5394923	680.68	-4.65	0.28
25	25	389666	5394620	669.01	-1.87	0.33
26	26	389635	5394872	679.63	-4.38	0.29
27	27	389659	5394672	672.01	-2.65	0.33
28	28	389640	5394822	678.43	-3.95	0.30
29	29	389651	5394726	676.01	-3.56	0.32
30	30	389645	5394776	678.28	-3.91	0.30
31	31	389674	5394222	657.05	0.60	0.32
32	32	389684	5394522	662.55	-0.33	0.36
33	33	389684	5394271	655.55	1.16	0.33
34	34	389690	5394472	658.82	0.45	0.37
35	35	389690	5394320	653.64	1.64	0.33
36	36	389692	5394421	656.12	1.05	0.33
37	37	389694	5394371	653.89	1.50	0.33
38	38	389622	5394081	660.09	0.11	0.30
39	39	389644	5394126	658.97	0.17	0.31
40	40	389660	5394174	658.15	0.46	0.32
41	41	389595	5394037	659.94	0.27	0.30
42	42	389983	5396004	623.01	5.99	0.37
43	43	390011	5396045	619.48	6.58	0.35
44	44	390035	5396089	615.83	7.20	0.34
45	45	390058	5396134	612.87	7.66	0.31
46	46	390086	5396230	612.69	7.68	0.31
47	47	390112	5396271	614.74	7.23	0.32
48	48	390130	5396321	617.49	6.54	0.36
49	49	389341	5395520	670.35	-3.15	0.39
50	50	389360	5395567	665.09	-2.08	0.39
51	51	389379	5395613	665.44	-2.11	0.41

52	52	389398	5395659	666.98	-2.52	0.42
53	53	389417	5395705	668.61	-2.92	0.44
54	54	389435	5395752	667.57	-2.72	0.43
55	55	389454	5395798	664.05	-2.11	0.41
56	56	389472	5395844	662.96	-1.91	0.38
57	57	389490	5395891	660.46	-1.46	0.37
58	58	389545	5396030	652.23	0.08	0.37
59	59	389582	5396122	648.91	0.48	0.41
60	60	389125	5395876	648.49	0.73	0.40
61	61	389169	5395858	649.82	0.57	0.39
62	62	389214	5395840	647.62	1.19	0.37
63	63	389259	5395822	650.12	0.73	0.38
64	64	389303	5395804	652.17	0.31	0.38
65	65	389347	5395787	657.22	-0.74	0.40
66	66	389480	5395734	670.79	-3.35	0.43
67	67	389391	5395769	662.66	-1.76	0.42
68	68	389525	5395716	671.30	-3.39	0.41
69	69	389314	5395585	663.28	-1.70	0.39
70	70	389268	5395605	667.08	-2.42	0.39
71	71	389222	5395624	666.32	-2.33	0.39
72	72	390175	5395643	665.10	-2.09	0.39
73	73	389129	5395661	663.83	-1.89	0.38
74	74	389083	5395680	659.81	-1.22	0.37
75	75	389570	5395699	669.61	-3.02	0.41
76	76	389614	5395681	666.78	-2.41	0.41
77	77	389508	5395937	654.99	-0.38	0.28
78	78	389643	5395885	661.21	-1.61	0.38
79	79	389553	5395919	657.41	-0.83	0.37
80	80	389464	5395955	656.54	-0.76	0.35
81	81	389419	5395972	655.72	-0.78	0.36
82	82	389374	5395990	654.99	-0.67	0.36
83	83	389598	5395902	659.88	-1.38	0.37
84	84	389626	5396102	652.04	-0.85	0.44
85	85	389536	5396139	644.83	1.33	0.40
86	86	389489	5396156	640.06	2.20	0.40
87	87	389442	5396172	640.23	1.99	0.39
88	88	389527	5395983	653.74	-0.13	0.37
89	89	389600	5396169	650.37	0.18	0.42
90	90	389563	5396076	648.65	0.66	0.40
91	91	389330	5396007	652.06	-0.06	0.38
92	92	389079	5394873	663.62	-0.57	0.30
93	93	389097	5394919	664.49	-0.81	0.38
94	94	389116	5394966	664.12	-0.87	0.38
95	95	389135	5395012	664.08	-0.84	0.38
96	96	389090	5395030	661.75	-0.61	0.31
97	97	389044	5395049	659.70	-0.23	0.38
98	98	388998	5395067	658.07	0.16	0.37
99	99	388952	5395086	657.35	0.19	0.34
100	100	388907	5395105	658.04	-0.01	0.40
101	101	389153	5395058	663.40	-0.82	0.38
102	102	389172	5395104	662.83	-0.85	0.36
103	103	389191	5395150	663.51	-1.11	0.35
104	104	389210	5395197	663.56	-1.28	0.36
105	105	389165	5395216	661.96	-1.05	0.36
106	106	389229	5395243	661.23	-0.88	0.37
107	107	389120	5395234	657.40	-0.08	0.36

108	108	389248	5395289	658.55	-0.37	0.39
109	109	389074	5395252	654.97	0.30	0.39
110	110	389267	5395335	658.97	-0.52	0.38
111	111	389030	5395270	651.04	1.08	0.38
112	112	389285	5395382	665.72	-1.93	0.37
113	113	388986	5395288	653.97	0.35	0.38
114	114	389333	5395363	669.26	-2.71	0.37
115	115	389379	5395344	672.54	-3.34	0.38
116	116	389239	5395400	661.20	-0.89	0.36
117	117	389194	5395419	659.80	-0.76	0.35
118	118	389148	5395437	661.91	-1.33	0.34
119	119	389102	5395455	663.03	-1.60	0.35
120	120	389008	5395493	658.80	-0.81	0.36
121	121	389056	5395474	661.97	-1.48	0.37
122	122	389226	5394974	669.59	-2.05	0.38
123	123	389181	5394993	666.85	-1.44	0.38
124	124	389243	5394752	658.88	0.30	0.40
125	125	389197	5394772	659.25	0.25	0.40
126	126	389152	5394790	659.59	0.18	0.41
127	127	389105	5394810	660.29	0.00	0.40
128	128	389060	5394827	661.03	-0.19	0.39
129	129	389014	5394846	662.46	-0.53	0.39
130	130	388968	5394866	665.60	-1.25	0.40
131	131	388923	5394885	667.43	-1.48	0.41
132	132	389289	5394733	658.16	0.47	0.42
133	133	389380	5394697	661.31	-0.17	0.41
134	134	389610	5394602	673.96	-3.32	0.41
135	135	389426	5394678	665.23	-1.00	0.41
136	136	389564	5394621	673.35	-2.85	0.40
137	137	389472	5394659	667.81	-1.54	0.39
138	138	389518	5394640	671.13	-2.24	0.41
139	139	389347	5394487	647.38	2.75	0.46
140	140	389392	5394466	653.48	1.57	0.45
141	141	389438	5394446	655.28	1.07	0.44
142	142	389229	5394331	628.16	6.53	0.56
143	143	389275	5394310	630.90	6.03	0.50
144	144	389364	5394275	649.42	2.45	0.46
145	145	389410	5394256	654.29	1.80	0.44
146	146	389457	5394237	654.40	1.28	0.43
147	147	389297	5394089	647.80	2.88	0.45
148	148	389484	5394016	655.99	1.35	0.41
149	149	389344	5394072	650.19	2.76	0.44
150	150	389437	5394034	654.02	1.90	0.41
151	151	389390	5394053	652.48	2.26	0.42
152	152	389407	5395548	665.62	-2.13	0.39
153	153	389453	5395529	670.80	-3.15	0.38
154	154	389499	5395511	676.87	-4.33	0.38
155	155	389545	5395492	676.11	-4.08	0.37
156	156	389591	5395473	674.55	-3.71	0.37
157	157	389637	5395454	672.19	-3.24	0.38
158	158	389953	5396407	610.28	7.78	0.44
159	159	389906	5396424	609.97	7.79	0.47
160	160	389859	5396441	608.43	8.03	0.48
161	161	389765	5396051	636.81	3.00	0.42
162	162	389811	5396033	629.68	4.39	0.43
163	163	389789	5396255	622.91	5.50	0.46

164	164	389857	5396016	620.80	6.15	0.43
165	165	389835	5396237	620.32	6.11	0.45
166	166	389882	5396220	619.12	6.39	0.43
167	167	389928	5396202	622.17	6.03	0.44
168	168	388132	5395436	639.14	-0.72	0.49
169	169	389042	5394785	656.99	0.54	0.45
170	170	389023	5394738	654.52	0.94	0.49
171	171	389003	5394692	655.24	0.82	0.55
172	172	388984	5394648	659.91	-0.34	0.56
173	173	388965	5394603	667.28	-1.57	0.57
174	174	388947	5394556	668.42	-2.17	0.59
175	175	388927	5394510	667.24	-1.83	0.61
176	176	388908	5394464	671.23	-2.74	0.60
177	177	388889	5394415	671.53	-2.93	0.66
178	178	388871	5394368	667.04	-2.02	0.74
179	179	388852	5394321	661.55	-0.86	0.79
180	180	388834	5394272	653.06	0.85	0.81
181	181	388878	5394254	640.80	3.50	0.73
182	182	388926	5394235	626.48	6.70	0.70
183	183	388972	5394217	619.65	8.16	0.64
184	184	389018	5394198	625.78	7.11	0.60
185	185	389064	5394180	631.28	6.06	0.54
186	186	389111	5394163	634.67	5.47	0.50
187	187	389158	5394144	635.81	5.35	0.49
188	188	389203	5394126	639.82	4.58	0.46
189	189	389250	5394108	644.87	3.66	0.47
190	190	388953	5394444	672.34	-2.95	0.62
191	191	388999	5394426	668.80	-2.30	0.64
192	192	389045	5394407	660.77	-0.51	0.64
193	193	389091	5394388	650.86	1.49	0.62
194	194	389137	5394369	637.21	4.36	0.59
195	195	389183	5394351	629.99	5.98	0.58
196	196	388529	5394850	653.96	-0.24	0.64
197	197	388574	5394830	648.01	1.49	0.61
198	198	388619	5394810	643.46	2.66	0.60
199	199	388664	5394790	642.78	2.93	0.58
200	200	388710	5394770	643.53	2.97	0.57
201	201	388755	5394750	646.59	2.41	0.55
202	202	388802	5394729	649.31	1.92	0.47
203	203	388848	5394708	651.50	1.62	0.54
204	204	388893	5394688	655.35	0.77	0.53
205	205	388940	5394668	659.58	-0.24	0.56
206	206	388876	5394905	663.25	-0.96	0.43
207	207	388831	5394924	660.89	-0.52	0.42
208	208	388784	5394945	659.84	-0.29	0.43
209	209	388740	5394964	657.56	0.06	0.45
210	210	388692	5394984	653.08	0.91	0.49
211	211	388646	5395003	645.70	2.26	0.49
212	212	388600	5395023	635.42	4.48	0.51
213	213	388555	5395043	631.29	5.25	0.50
214	214	388508	5395063	630.51	5.29	0.49
215	215	388463	5395083	628.02	5.72	0.54
216	216	388408	5395103	624.67	6.19	0.58
217	217	388363	5395123	617.57	7.50	0.61
218	218	388318	5395143	606.10	9.71	0.61
219	219	388267	5395163	585.57	13.39	0.68

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220	220	388222	5395183	584.04	13.54	0.70
221	221	388177	5395203	597.67	10.62	0.67
222	222	388132	5395223	608.80	8.16	0.68
223	223	388087	5395243	621.11	5.52	0.73
224	224	388042	5395263	629.18	3.69	0.72
225	225	387997	5395283	630.23	3.53	0.61
226	226	387952	5395303	628.60	3.74	0.67
227	227	388862	5395123	653.86	0.74	0.40
228	228	388815	5395142	643.81	2.71	0.43
229	229	388768	5395162	637.00	4.09	0.44
230	230	388722	5395181	640.84	3.23	0.46
231	231	388676	5395199	639.69	3.42	0.47
232	232	388630	5395208	633.85	4.54	0.47
233	233	388584	5395239	622.86	6.69	0.48
234	234	388537	5395258	618.72	7.57	0.57
235	235	388492	5395276	617.79	7.64	0.57
236	236	388447	5395296	609.81	9.02	0.58
237	237	388402	5395316	611.17	8.50	0.59
238	238	388357	5395336	622.28	5.91	0.60
239	239	388312	5395356	634.39	3.27	0.59
240	240	388267	5395376	649.84	-0.55	0.61
241	241	389272	5394955	674.72	-3.25	0.38
242	242	389319	5394936	673.87	-3.17	0.42
243	243	389366	5394917	665.12	-1.18	0.39
244	244	389412	5394898	663.62	-0.85	0.38
245	245	389258	5395178	667.34	-2.09	0.36
246	246	389304	5395161	671.38	-2.96	0.37
247	247	389350	5395142	674.64	-3.75	0.37
248	248	389396	5395123	677.62	-4.35	0.36
249	249	389442	5395104	678.90	-4.55	0.37
250	250	389489	5395086	679.45	-4.57	0.36
251	251	389535	5395066	680.09	-4.72	0.37
252	252	389426	5395324	675.66	-3.88	0.38
253	253	389518	5395287	682.26	-5.32	0.37
254	254	389564	5395267	683.89	-5.77	0.39
255	255	389610	5395248	685.56	-5.89	0.38
256	256	389656	5395229	680.81	-4.83	0.37
257	257	389672	5396086	649.94	0.27	0.46
258	258	389719	5396068	640.84	2.13	0.48
259	259	389530	5396558	637.62	1.11	0.61
260	260	389576	5396543	634.57	1.82	0.65
261	261	389623	5396525	630.60	2.75	0.64
262	262	389670	5396508	624.89	4.20	0.62
263	263	389718	5396492	614.52	6.45	0.62
264	264	389765	5396475	606.85	8.11	0.58
265	265	389813	5396458	606.80	8.16	0.53

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GRAVITY DATA

CSR QUE ROAD GRAVITY SURVEY FEB 1987 ADDENDUM
980177.50 8551.9976 1.00928 561 10187
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1	266	389031	5394625	656.81	0.42	0.55
2	267	389076	5394607	658.16	0.21	0.52
3	268	389121	5394586	657.41	0.34	0.50
4	269	389167	5394565	654.64	0.99	0.51
5	270	389212	5394546	648.83	2.31	0.51
6	271	389259	5394527	645.02	3.22	0.48
7	272	389305	5394506	640.99	4.05	0.49
8	273	388484	5394870	656.93	-1.20	0.82
9	274	388439	5394890	652.03	-0.35	0.70
10	275	388394	5394910	644.49	1.23	0.79
11	276	388349	5394930	636.08	2.78	0.83
12	277	388304	5394950	630.39	4.00	0.82
13	278	388259	5394970	618.46	6.58	0.76
14	279	388214	5394990	604.12	9.68	0.67
15	280	388169	5395010	587.95	12.60	0.67
16	281	388124	5395030	580.23	14.30	0.72
17	282	388079	5395050	571.14	16.06	0.77
18	283	388034	5395070	575.00	14.80	0.66
19	284	387989	5395090	588.51	12.14	0.62
20	285	387944	5395110	597.21	9.87	0.61
21	286	387899	5395130	591.87	10.87	0.59
22	287	389834	5394716	654.40	1.36	0.41
23	288	389458	5394880	664.79	-1.09	0.39
24	289	389504	5394862	666.60	-1.45	0.41
25	290	388941	5395308	661.54	-1.14	0.42
26	291	388896	5395327	660.82	-1.02	0.43
27	292	388851	5395347	655.57	0.00	0.42
28	293	388962	5395513	655.66	-0.15	0.37
29	294	388914	5395533	652.09	0.63	0.38
30	295	388868	5395552	647.97	1.49	0.37
31	296	388823	5395572	644.93	2.06	0.34
32	297	388777	5395591	645.42	2.62	0.33
33	298	388732	5395610	643.63	2.16	0.34
34	299	389472	5395306	678.69	-4.53	0.37
35	300	389038	5395699	655.70	-0.41	0.39
36	301	388992	5395718	658.93	-1.16	0.40
37	302	389080	5395895	643.57	1.68	0.41
38	303	389398	5396191	640.77	1.90	0.43
39	304	389744	5396275	625.48	4.93	0.48
40	305	389698	5396295	628.34	4.23	0.51
41	306	389653	5396314	626.51	4.54	0.49
42	307	389608	5396334	630.29	3.62	0.49
43	308	389563	5396353	627.45	4.32	0.48
44	309	389517	5396372	621.45	5.64	0.49
45	310	389472	5396391	617.37	6.38	0.49
46	311	389303	5395428	669.97	-2.86	0.36
47	312	389322	5395474	671.95	-3.09	0.28
48	313	389618	5396215	650.27	0.12	0.48
49	314	389636	5396261	638.35	2.24	0.49
50	315	389671	5396360	617.47	6.39	0.52
51	316	389689	5396404	605.27	8.75	0.54
52	317	389707	5396450	607.89	8.15	0.56

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GRAVITY DATA

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CSR QUE ROAD GRAVITY SURVEY JAN 1988
980177.50 8551.9976 1.01387 556 10188
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1	400	389323	5395474	671.89	-2.62	0.28
2	401	389120	5395584	665.78	-2.04	0.29
3	402	389028	5395626	657.82	-0.55	0.28
4	403	388949	5395671	657.29	-0.60	0.28
5	404	388854	5395721	653.45	0.15	0.28
6	405	388765	5395768	649.57	0.68	0.29
7	406	388741	5395865	652.96	-0.14	0.31
8	407	388674	5395925	654.96	-1.27	0.33
9	408	388581	5395932	660.96	-3.12	0.36
10	409	388480	5395932	660.41	-3.14	0.40
11	410	388369	5395938	655.27	-2.12	0.45
12	411	388280	5395911	650.65	-1.12	0.38
13	412	388192	5395854	645.09	-0.01	0.35
14	413	388118	5395796	641.13	0.54	0.36
15	414	388024	5395749	640.17	0.65	0.37
16	415	387942	5395699	642.03	0.09	0.39
17	416	387846	5395671	647.95	-1.39	0.40
18	417	387764	5395715	654.90	-3.15	0.46
19	418	387667	5395731	653.14	-2.98	0.45
20	419	387571	5395724	650.51	-2.65	0.44
21	420	387460	5395704	650.23	-2.51	0.38
22	421	387357	5395709	650.28	-2.65	0.35
23	422	387265	5395744	647.21	-2.03	0.36
24	423	387190	5395798	645.14	-1.40	0.37
25	424	387102	5395854	643.84	-0.95	0.36
26	425	387003	5395882	643.01	-1.23	0.36
27	426	386907	5395889	643.11	-1.42	0.38
28	427	386813	5395893	645.05	-1.86	0.39
29	428	386710	5395893	642.91	-1.55	0.41
30	429	386607	5395912	643.00	-1.68	0.41
31	430	386535	5395935	643.86	-1.89	0.42
32	431	386526	5396064	636.59	-0.48	0.43
33	432	386525	5396165	634.27	0.14	0.44
34	433	386533	5396263	635.98	-0.07	0.44
35	434	386542	5396355	640.25	-0.63	0.45
36	435	386542	5396468	644.70	-1.20	0.46
37	436	386536	5396563	645.57	-1.49	0.48
38	437	386532	5396668	640.55	-0.50	0.50
39	438	386527	5396765	638.35	-0.07	0.52
40	439	389575	5394083	659.16	0.34	0.30
41	440	388973	5393634	643.32	4.05	0.35
42	441	388898	5393629	630.81	6.60	0.44
43	442	389042	5393640	638.45	4.91	0.46
44	443	389086	5393641	635.48	5.84	0.45
45	444	388963	5393509	648.47	3.59	0.45
46	445	389029	5393508	642.29	4.71	0.46
47	446	388951	5393690	628.61	6.97	0.45
48	447	388904	5393749	614.28	9.56	0.46
49	448	388863	5393451	649.58	3.05	0.43
50	450	388788	5393279	661.20	0.79	0.40
51	451	388834	5393198	662.50	0.57	0.46

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52	452	388894	5393113	666.39	-0.20	0.50
53	453	388865	5393078	665.83	-0.05	0.50
54	454	388778	5393005	664.28	0.24	0.47
55	455	388801	5392931	660.22	1.21	0.44
56	456	386895	5393821	527.24	25.27	0.87
57	457	386873	5393774	539.63	23.02	0.69
58	458	386865	5393727	549.04	21.26	0.69
59	459	386881	5393678	559.39	19.27	0.65
60	460	386899	5393614	561.57	18.95	0.71
61	461	386930	5393592	566.60	17.82	0.68
62	462	386968	5393558	576.94	15.69	0.67
63	463	386993	5393513	588.37	13.52	0.63
64	464	387025	5393471	593.87	12.59	0.62
65	465	387063	5393445	596.39	12.33	0.59
66	466	387096	5393405	596.68	12.26	0.57
67	467	387129	5393367	599.87	11.69	0.55
68	468	387149	5393320	602.52	11.17	0.53
69	469	387149	5393274	604.11	10.82	0.50
70	470	387142	5393225	607.68	9.92	0.48
71	471	387124	5393176	613.55	8.76	0.52
72	472	387106	5393131	618.02	7.81	0.50
73	473	387086	5393087	623.16	6.90	0.48
74	474	387099	5393033	631.49	5.34	0.46
75	475	387132	5392993	639.59	3.79	0.48
76	476	387156	5392957	645.59	2.62	0.50
77	477	387148	5392905	651.25	1.63	0.56
78	478	387150	5392857	652.96	1.45	0.44
79	479	387172	5392809	652.05	1.62	0.39
80	480	387182	5392758	651.11	2.04	0.39
81	481	387208	5392723	649.79	2.23	0.38
82	482	387247	5392689	644.80	3.57	0.36
83	483	387285	5392661	642.74	4.02	0.35
84	484	388807	5393513	644.55	4.02	0.44
85	485	388791	5393584	644.67	3.97	0.46
86	486	388773	5393630	647.07	3.35	0.48
87	487	388821	5393631	640.35	4.74	0.48
88	488	388711	5393633	649.48	2.74	0.49
89	489	388637	5393703	651.30	2.15	0.46
90	491	388826	5393738	645.23	3.55	0.51
91	492	388770	5393730	647.83	3.08	0.53
92	493	388802	5393704	646.69	3.28	0.49
93	495	386893	5393885	542.85	22.19	0.87
94	496	386911	5393931	560.05	18.84	0.85
95	497	386931	5393977	560.24	18.61	0.83
96	498	386950	5394022	552.24	20.23	0.82
97	499	386966	5394069	558.59	18.97	0.85
98	500	386984	5394114	543.93	21.75	0.71
99	501	387001	5394160	564.84	17.59	0.63
100	502	387019	5394206	580.35	14.60	0.63
101	503	387038	5394253	587.64	13.12	0.68
102	504	387055	5394299	587.42	13.42	0.67
103	505	387073	5394346	585.19	13.70	0.66
104	506	387000	5394434	587.19	13.26	0.61
105	507	386954	5394455	592.97	12.16	0.63
106	508	386908	5394476	596.19	11.52	0.68
107	509	386864	5394497	596.87	11.42	0.69

411152

108	510	386818	5394518	596.51	11.47	0.66
109	511	386772	5394539	594.33	11.94	0.62
110	512	386726	5394560	606.48	9.36	0.60
111	513	386680	5394581	617.54	7.07	0.59
112	514	386634	5394602	627.41	5.13	0.53
113	515	386588	5394623	629.42	4.91	0.51
114	516	386542	5394644	630.59	4.65	0.48
115	517	386496	5394665	635.85	3.36	0.51
116	518	386450	5394686	641.22	2.02	0.54
117	519	386404	5394707	646.08	0.63	0.62
118	520	386358	5394728	642.45	1.45	0.65
119	521	386318	5394520	610.99	8.21	0.86
120	522	386374	5394500	614.53	7.49	0.83
121	523	386420	5394479	616.77	7.05	0.79
122	524	386466	5394458	615.84	7.32	0.81
123	525	386510	5394437	617.31	7.14	0.82
124	526	386556	5394416	619.38	6.73	0.83
125	527	386602	5394395	621.24	6.36	0.84
126	529	386694	5394353	596.93	11.47	0.83
127	530	386742	5394332	582.57	14.31	0.91
128	531	386788	5394311	576.30	15.63	0.96
129	532	386834	5394290	561.91	18.37	1.02
130	533	386880	5394269	568.27	17.24	1.10
131	534	386926	5394248	570.25	16.71	1.00
132	535	386972	5394227	554.71	19.52	0.96
133	536	387090	5394390	576.68	15.09	0.61
134	537	387136	5394369	571.85	16.13	0.57
135	538	387181	5394348	568.65	16.82	0.63
136	539	387227	5394327	562.83	17.94	0.68
137	540	387262	5394306	552.73	20.04	0.68
138	541	387307	5394285	550.36	20.36	0.69
139	542	387353	5394264	554.54	19.37	0.63
140	543	387398	5394243	556.15	19.24	0.58
141	544	387444	5394222	543.34	21.78	0.56
142	545	387489	5394201	544.16	21.62	0.52
143	546	387534	5394180	554.65	19.55	0.54
144	547	387579	5394159	565.71	17.54	0.55
145	548	387624	5394138	563.84	18.12	0.58
146	549	387669	5394117	568.45	17.12	0.59
147	550	387711	5394096	575.47	15.76	0.60
148	551	387757	5394075	585.38	14.05	0.63
149	552	387802	5394054	596.94	11.84	0.64
150	553	387848	5394033	609.37	9.49	0.68
151	554	387894	5394012	621.87	6.96	0.67
152	555	387940	5393991	627.72	5.79	0.63
153	556	387990	5393970	634.72	4.42	0.60
154	557	388037	5393949	645.00	2.35	0.58
155	558	388083	5393928	648.16	1.65	0.57
156	559	388130	5393907	647.69	2.11	0.56
157	560	387940	5393991	630.89	5.22	0.63
158	561	387930	5393950	639.64	3.33	0.78
159	562	387913	5393903	643.34	2.66	0.86
160	563	387896	5393855	641.45	3.27	0.80
161	564	387879	5393807	633.10	5.02	0.75
162	565	387933	5393786	639.16	3.89	0.74
163	566	387978	5393765	645.83	2.57	0.73

164	567	387090	5393714	649.86	1.21	0.70
165	568	388069	5393723	659.39	0.05	0.71
166	569	387834	5393828	627.09	6.10	0.74
167	570	387789	5393849	617.32	7.95	0.76
168	571	387743	5393870	611.97	8.93	0.77
169	572	387698	5393891	597.17	11.84	0.79
170	573	387653	5393912	588.93	13.47	0.78
171	574	387607	5393933	581.09	14.77	0.79
172	575	387562	5393954	595.49	11.73	0.80
173	576	387527	5393975	602.88	10.26	0.79
174	577	387471	5393996	599.60	10.88	0.78
175	578	387426	5394017	601.75	10.33	0.79
176	579	387381	5394038	590.17	12.54	0.81
177	580	387336	5394059	578.44	14.71	0.87
178	581	387290	5394080	562.68	17.66	0.88
179	582	387245	5394101	540.53	21.86	0.90
180	583	387200	5394122	529.41	23.90	0.95
181	584	387155	5394143	529.97	23.98	0.96
182	585	387109	5394164	536.98	22.68	0.96
183	586	387064	5394185	543.85	21.51	0.98
184	587	387091	5394392	575.90	15.72	0.65
185	588	387109	5394438	580.78	14.60	0.67
186	589	387127	5394485	579.00	14.65	0.69
187	590	387144	5394531	583.26	13.25	0.73
188	591	387098	5394548	597.97	10.16	0.65
189	592	387050	5394565	611.47	7.22	0.62
190	593	387003	5394582	621.70	5.08	0.60
191	594	386956	5394599	625.17	4.64	0.59
192	595	386910	5394616	626.95	4.46	0.56
193	596	386864	5394632	626.38	4.89	0.55
194	597	386818	5394649	622.04	6.06	0.54
195	598	386772	5394666	618.18	7.08	0.51
196	599	386726	5394683	632.07	4.06	0.51
197	600	386680	5394700	638.55	2.66	0.49
198	601	386634	5394717	643.56	1.33	0.50
199	602	386586	5394735	646.07	0.66	0.52
200	604	389519	5393920	657.32	1.10	0.31
201	605	389488	5393880	655.43	1.69	0.35
202	606	389456	5393845	653.31	2.18	0.39
203	607	389417	5393811	650.96	2.69	0.42
204	608	389377	5393780	648.71	3.16	0.43
205	609	389341	5393743	643.12	4.37	0.41
206	610	389308	5393693	637.80	5.50	0.39
207	611	389284	5393664	635.18	6.03	0.40
208	612	389250	5393620	633.13	6.39	0.40
209	613	389195	5393533	637.85	5.54	0.41
210	614	389149	5393454	642.16	4.76	0.40
211	615	389131	5393402	643.00	4.62	0.41
212	616	389112	5393353	644.22	4.40	0.39
213	617	389093	5393299	645.72	4.10	0.38
214	618	389074	5393248	647.08	3.99	0.39
215	619	389068	5393195	646.66	4.03	0.38
216	620	389050	5393151	647.44	3.95	0.39
217	621	389007	5393091	651.29	3.19	0.39
218	622	388963	5393048	652.88	2.80	0.42
219	623	388841	5392959	656.64	1.72	0.45

220	624	388760	5392894	661.41	1.00	0.47
221	625	388676	5392810	666.10	-0.08	0.49
222	626	388603	5392722	671.51	-1.18	0.50
223	627	388557	5392651	674.13	-1.72	0.50
224	628	388462	5392495	678.50	-2.41	0.51
225	629	388395	5392378	683.54	-3.72	0.53
226	630	388315	5392244	688.20	-4.91	0.55
227	631	387392	5392595	647.15	3.08	0.40
228	632	387447	5392512	652.22	1.43	0.38
229	633	387500	5392434	662.20	-0.81	0.36
230	634	387583	5392384	665.41	-1.49	0.35
231	635	387678	5392322	673.79	-3.16	0.35
232	636	387758	5392263	684.31	-5.14	0.38
233	637	387843	5392226	678.33	-3.77	0.40
234	638	387891	5392209	677.40	-3.49	0.41
235	639	387929	5392183	677.80	-3.48	0.43
236	640	387974	5392174	679.62	-3.83	0.45
237	641	388022	5392184	681.96	-4.08	0.48
238	642	388068	5392217	685.17	-4.89	0.48
239	643	388109	5392244	688.85	-5.53	0.49
240	644	388154	5392265	690.79	-5.87	0.50
241	645	388208	5392280	692.60	-6.19	0.50
242	646	388258	5392261	689.16	-5.40	0.52
243	647	389668	5398101	698.69	-12.64	0.25
244	648	389694	5398061	697.72	-12.23	0.25
245	649	389726	5398011	692.37	-11.51	0.26
246	650	389756	5397959	686.89	-10.29	0.28
247	651	389784	5397915	684.76	-9.84	0.29
248	652	389816	5397868	683.27	-9.49	0.28
249	653	389843	5397825	681.07	-9.07	0.27
250	654	389873	5397776	677.56	-8.48	0.27
251	655	389902	5397731	673.92	-7.86	0.26
252	656	389935	5397680	672.19	-7.60	0.27
253	657	389963	5397635	673.41	-7.77	0.27
254	658	389993	5397586	676.26	-8.18	0.28
255	659	390007	5397549	676.28	-8.48	0.28
256	660	390034	5397508	678.74	-8.33	0.27
257	661	390061	5397444	679.63	-8.27	0.29
258	662	390079	5397396	680.02	-8.29	0.30
259	663	390103	5397339	680.76	-8.05	0.29
260	664	390122	5397284	680.91	-8.05	0.29
261	665	390150	5397221	681.26	-8.05	0.27
262	666	390179	5397145	678.70	-7.43	0.27
263	667	390191	5397100	676.62	-7.01	0.28
264	668	390216	5397051	674.13	-6.55	0.29
265	669	390237	5396997	669.62	-5.71	0.31
266	670	390251	5396957	665.90	-4.98	0.32
267	671	390270	5396904	660.86	-3.98	0.35
268	672	390284	5396842	655.14	-2.78	0.38
269	673	390292	5396770	651.92	-2.08	0.40
270	674	390289	5396723	649.33	-1.48	0.40
271	675	390282	5396671	646.11	-0.68	0.40
272	676	390257	5396592	640.58	0.53	0.36
273	677	390229	5396540	634.99	1.72	0.37
274	678	390204	5396484	628.72	3.29	0.36
275	679	390178	5396432	622.81	4.83	0.35

276	680	390158	5396385	618.68	6.03	0.35
277	681	387331	5395760	647.91	-2.15	0.36
278	682	387302	5395809	646.42	-1.74	0.27
279	683	387294	5395854	644.99	-1.27	0.39
280	684	387272	5395903	644.53	-0.99	0.40
281	685	387248	5395955	645.69	-1.06	0.42
282	686	387229	5396017	648.12	-1.53	0.43
283	687	387228	5396061	651.19	-2.30	0.44
284	688	387703	5396736	655.24	-3.42	0.42
285	689	387681	5395694	669.95	-5.47	0.58
286	690	387660	5395650	671.03	-7.03	0.62
287	691	387639	5395605	677.06	-8.45	0.66
288	692	387617	5395560	679.18	-8.84	0.63
289	693	387595	5395516	681.82	-9.33	0.62
290	694	387574	5395472	683.30	-9.65	0.63
291	695	387552	5395427	680.97	-9.12	0.63
292	696	387532	5395382	674.70	-7.80	0.60
293	697	387512	5395338	669.15	-6.61	0.60
294	698	387489	5395293	662.93	-5.40	0.57
295	699	387444	5395312	659.31	-4.51	0.56

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GRAVITY DATA

QUEOBS 2

411156

CSR QUE ROAD GRAVITY SURVEY JAN 1988 (2)
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1	700	387489	5395293	650.47	-2.30	0.57
2	701	387579	5395245	642.46	-0.24	0.58
3	702	387629	5395226	635.80	1.34	0.59
4	703	387679	5395207	628.04	3.10	0.62
5	704	387729	5395188	620.08	4.85	0.61
6	705	387779	5395169	614.88	6.05	0.61
7	706	387829	5395150	598.83	9.52	0.60
8	707	387899	5395130	591.87	10.99	0.59
9	708	387944	5395306	628.60	3.82	0.57
10	709	387899	5395326	628.05	3.81	0.60
11	710	387854	5395347	630.76	3.09	0.66
12	711	387809	5395368	639.26	0.99	0.70
13	712	387754	5395389	645.48	-0.76	0.70
14	713	387709	5395410	654.10	-2.98	0.68
15	714	387664	5395430	670.33	-6.68	0.65
16	715	387619	5395451	682.03	-9.37	0.60
17	716	387574	5395472	684.14	-9.71	0.58
18	717	387240	5396115	647.89	-1.49	0.46
19	718	387271	5396156	645.83	-1.15	0.47
20	719	387275	5396218	646.26	-1.35	0.48
21	720	387266	5396288	644.33	-1.03	0.48
22	721	387263	5396343	643.57	-0.99	0.49
23	722	387240	5396391	638.78	0.08	0.50
24	723	387192	5396429	635.58	0.68	0.50
25	724	387148	5396462	630.94	1.58	0.51
26	727	386780	5395804	649.19	-2.46	0.39
27	728	386790	5395722	645.66	-1.71	0.39
28	729	386776	5395662	643.57	-1.23	0.38
29	730	386765	5395593	643.20	-1.17	0.38
30	731	386750	5395531	643.10	-1.02	0.37
31	732	386716	5395507	643.30	-1.02	0.37
32	733	387171	5394592	570.03	15.85	0.68
33	734	387221	5394569	565.15	16.92	0.72
34	735	387267	5394546	559.13	18.23	0.70
35	736	387313	5394523	553.10	19.55	0.68
36	737	387358	5394500	551.04	20.12	0.63
37	738	387403	5394477	548.11	20.68	0.61
38	739	387450	5394453	546.79	21.06	0.65
39	740	387495	5394430	545.47	21.46	0.62
40	741	387542	5394407	543.61	21.83	0.68
41	742	387589	5394384	544.94	21.66	0.71
42	743	387634	5394361	546.95	21.11	0.73
43	744	387678	5394338	551.82	20.13	0.75
44	745	387723	5394315	557.44	19.04	0.76
45	746	387767	5394292	563.85	17.98	0.78
46	747	387812	5394269	571.13	16.70	0.74
47	748	387857	5394246	582.20	14.62	0.70
48	749	387900	5394223	594.44	12.18	0.64
49	750	387940	5394200	602.54	10.70	0.60
50	751	387942	5394195	599.59	11.43	0.43
51	752	387961	5394241	593.19	12.82	0.44

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52	753	387980	5394287	589.79	13.84	0.46
53	754	387999	5394333	587.84	14.04	0.47
54	755	388107	5394349	582.23	14.88	0.49
55	756	388061	5394368	584.74	14.34	0.48
56	758	387978	5394406	571.43	17.07	0.50
57	759	387932	5394425	568.99	17.37	0.50
58	760	387885	5394444	560.01	18.97	0.49
59	761	387838	5394463	552.03	20.54	0.48
60	762	387792	5394482	550.12	20.66	0.52
61	763	387745	5394501	548.74	20.86	0.55
62	764	387699	5394520	548.23	20.83	0.57
63	765	387652	5394539	547.41	20.88	0.59
64	766	387606	5394558	550.13	20.13	0.60
65	767	387559	5394577	550.47	20.08	0.63
66	768	387493	5394596	552.00	19.88	0.65
67	769	387447	5394615	555.47	19.27	0.64
68	770	387401	5394634	557.72	18.41	0.62
69	771	387354	5394653	570.53	15.42	0.61
70	772	387308	5394672	570.11	15.36	0.60
71	773	387261	5394691	577.32	13.66	0.58
72	774	387215	5394710	593.62	10.26	0.57
73	775	387216	5394715	597.18	9.51	0.60
74	776	387660	5395650	677.22	-8.54	0.51
75	777	387705	5395628	683.69	-10.04	0.51
76	779	387795	5395584	658.83	-4.23	0.50
77	780	387840	5395562	648.72	-1.71	0.49
78	781	387885	5395540	642.99	-0.28	0.48
79	782	387930	5395518	641.43	0.30	0.49
80	783	387975	5395496	640.56	0.66	0.50
81	784	388020	5395474	641.65	0.72	0.50
82	785	388065	5395452	645.96	0.02	0.53
83	786	388110	5395430	650.25	-0.66	0.56
84	787	388155	5395408	655.89	-1.79	0.58
85	788	388200	5395386	657.94	-2.14	0.60
86	789	388245	5395364	649.84	-0.46	0.61
87	790	387390	5395076	634.87	0.77	0.62
88	791	387394	5395073	633.34	1.18	0.62
89	792	387440	5395055	630.23	2.01	0.66
90	793	387486	5395037	625.98	3.07	0.70
91	794	387532	5395019	618.01	4.97	0.73
92	795	387578	5395001	612.49	6.30	0.76
93	797	387670	5394965	597.15	9.20	0.85
94	798	387716	5394946	590.86	10.79	0.88
95	799	387762	5394927	581.94	12.72	0.91
96	800	387908	5395692	642.85	0.02	0.47
97	801	387861	5395709	643.70	-0.37	0.44
98	802	387814	5395726	644.43	-0.65	0.45
99	803	387767	5395743	645.66	-1.10	0.45
100	804	387720	5395760	645.20	-1.02	0.46
101	805	387731	5395799	645.35	-1.15	0.54
102	806	387744	5395877	635.11	1.47	0.59
103	807	387758	5395877	635.11	1.32	0.62
104	808	387769	5395920	631.40	2.10	0.63
105	809	387780	5395930	631.33	2.11	0.56
106	810	387827	5395914	629.44	2.64	0.56
107	811	387874	5395898	633.88	1.80	0.58

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108	812	387920	5395002	634.06	1.85	0.57
109	813	387967	5395866	635.18	1.62	0.54
110	814	388014	5395850	637.98	1.10	0.53
111	815	388061	5395834	639.61	0.76	0.50
112	816	388107	5395818	642.33	0.30	0.48
113	817	388154	5395802	645.63	-0.14	0.46
114	818	388200	5395786	648.32	-0.60	0.45
115	819	388247	5395770	649.73	-0.78	0.44
116	820	388294	5395754	651.69	-1.00	0.44
117	821	388341	5395738	655.15	-1.63	0.45
118	822	388387	5395722	651.36	-0.75	0.44
119	823	388434	5395706	645.62	0.85	0.45
120	824	388481	5395690	641.38	2.02	0.45
121	825	388528	5395674	637.69	2.74	0.44
122	829	388472	5395488	631.73	4.58	0.48
123	830	388425	5395505	637.54	3.25	0.48
124	831	388378	5395572	646.15	1.10	0.48
125	832	388331	5395539	657.33	-1.85	0.45
126	833	388284	5395556	661.96	-2.78	0.46
127	834	388237	5395573	660.81	-2.60	0.47
128	835	388190	5395590	654.83	-1.46	0.45
129	836	388143	5395607	648.12	-0.33	0.46
130	837	388096	5395624	644.17	0.22	0.46
131	838	388049	5395641	642.11	0.49	0.43
132	839	388002	5395658	641.86	0.33	0.47
133	840	387955	5395675	642.41	0.04	0.46
134	841	388485	5395914	660.08	-3.31	0.51
135	842	387804	5394908	569.92	15.42	0.89
136	843	387846	5394890	559.50	17.96	0.93
137	844	387890	5394872	562.04	17.73	0.91
138	845	387932	5394853	571.24	16.07	0.90
139	846	387974	5394834	576.72	15.08	0.91
140	847	388135	5394805	602.93	9.57	0.89
141	848	388177	5394770	635.03	2.54	0.92
142	849	388220	5394787	623.04	5.41	0.91
143	852	388100	5394567	561.78	18.26	0.65
144	853	388054	5394583	554.78	19.64	0.63
145	854	388008	5394600	553.65	19.83	0.62
146	855	387960	5394619	552.67	19.86	0.61
147	856	387908	5394637	551.62	19.93	0.60
148	857	387866	5394654	550.65	19.99	0.58
149	858	387818	5394673	550.26	19.89	0.55
150	859	387770	5394692	551.19	19.71	0.53
151	860	387722	5394711	551.97	19.37	0.51
152	861	387674	5394730	554.84	18.52	0.52
153	862	387626	5394749	563.83	16.58	0.54
154	863	387580	5394767	570.68	15.13	0.55
155	864	387533	5394785	581.22	12.81	0.55
156	865	387487	5394803	591.61	10.42	0.52
157	866	387440	5394822	604.30	7.64	0.51
158	867	387393	5394841	610.70	6.49	0.50
159	868	387346	5394860	612.15	6.09	0.49
160	869	387297	5394878	610.43	6.46	0.46
161	870	387280	5394840	608.50	6.65	0.50
162	871	388527	5395897	659.42	-3.10	0.50
163	872	388574	5395879	656.53	-2.18	0.47

164	873	388620	5395861	651.19	-0.67	0.46
165	874	388665	5395843	649.35	0.00	0.43
166	875	388710	5395824	650.71	0.03	0.43
167	876	388755	5395806	652.84	-0.40	0.41
168	877	388802	5395797	647.10	0.96	0.39
169	878	388847	5395778	650.09	0.42	0.39
170	879	388892	5395760	652.12	0.11	0.38
171	880	388937	5395740	654.89	-0.42	0.39
172	881	388985	5395718	655.06	-0.37	0.39
173	882	389123	5395882	643.57	1.69	0.42
174	883	389077	5395900	636.28	3.11	0.45
175	884	389031	5395918	633.18	3.62	0.44
176	885	388985	5395936	642.76	1.75	0.43
177	886	388938	5395954	643.29	1.72	0.43
178	887	388892	5395972	642.68	1.77	0.43
179	888	388845	5395990	651.14	-0.92	0.46
180	889	388799	5396006	645.26	1.21	0.46
181	890	388752	5396024	648.79	0.11	0.48
182	891	388760	5396076	650.52	-0.27	0.48
183	894	388769	5396220	632.50	3.33	0.55
184	895	388816	5396203	624.30	5.14	0.54
185	896	388863	5396186	631.07	3.72	0.52
186	897	388910	5396169	633.00	3.36	0.48
187	898	388957	5396152	624.37	5.37	0.44
188	899	389004	5396135	629.88	4.27	0.45
189	900	389051	5396118	634.17	3.51	0.44
190	901	389098	5396101	634.66	3.49	0.40
191	902	389145	5396084	635.21	3.56	0.39
192	903	389192	5396067	639.03	2.73	0.39
193	904	389239	5396050	645.17	1.40	0.37
194	905	389286	5396033	649.74	0.47	0.36
195	906	389333	5396016	652.06	-0.02	0.38
196	907	388706	5396042	663.25	-3.77	0.49
197	908	388659	5396060	665.74	-4.50	0.51
198	909	388613	5396078	662.37	-4.05	0.55
199	911	388520	5396114	645.81	-0.85	0.61
200	912	388473	5396132	640.68	-0.02	0.68
201	913	388426	5396150	625.54	3.37	0.72
202	914	388380	5396168	616.31	5.45	0.73
203	915	388333	5396186	611.11	6.66	0.75
204	916	388287	5396204	609.88	6.65	0.77
205	918	388194	5396240	591.77	10.04	0.78
206	919	388150	5394556	567.27	16.38	0.60
207	920	388102	5396276	590.18	10.25	0.81
208	921	388055	5396294	588.94	10.52	0.82
209	922	388009	5396312	576.00	12.99	0.90
210	923	387962	5396328	567.75	14.61	0.94
211	924	387916	5396346	568.89	14.33	0.66
212	925	387890	5396163	611.45	6.18	0.69
213	926	387935	5396144	612.03	6.44	0.62
214	927	387981	5396125	614.46	6.09	0.54
215	928	388026	5396106	613.98	6.23	0.51
216	929	388072	5396087	618.41	5.35	0.50
217	930	388117	5396068	626.20	3.59	0.50
218	931	388162	5396049	631.56	2.39	0.51
219	932	388908	5394464	671.23	-2.73	0.70

220	933	388252	5396011	642.79	0.11	0.49
221	934	388297	5395992	649.37	-1.25	0.48
222	935	388345	5395976	654.30	-2.33	0.48
223	936	388391	5395957	658.86	-3.20	0.49
224	937	388427	5395938	660.16	-3.36	0.48
225	938	389298	5394521	642.40	3.80	0.45
226	939	389313	5394570	651.61	2.03	0.43
227	940	389296	5394629	651.02	2.08	0.43
228	941	389229	5394682	654.24	1.40	0.41
229	942	389171	5394729	655.58	1.13	0.39
230	943	389089	5394767	656.77	0.79	0.40
231	944	389015	5394846	662.22	-0.41	0.39
232	945	388943	5394853	667.00	-1.49	0.40
233	946	389092	5394567	662.82	-0.73	0.58
234	947	389037	5394575	661.62	-0.43	0.55
235	948	388985	5394630	662.15	-0.67	0.55
236	949	388963	5394698	657.62	0.52	0.42
237	950	388949	5394777	662.21	-0.36	0.47
238	951	388888	5394925	662.53	-0.66	0.32
239	952	388810	5394967	660.02	-0.26	0.42
240	953	388752	5395015	658.61	-0.06	0.42
241	954	388676	5395089	647.52	1.90	0.48
242	955	388629	5395169	638.85	3.59	0.48
243	956	388574	5395232	622.49	6.92	0.47
244	957	388499	5395284	615.88	8.11	0.54
245	958	388729	5395648	647.65	1.31	0.42
246	959	388650	5395545	637.10	3.52	0.45
247	960	388521	5395471	626.13	5.87	0.46
248	961	388568	5395454	630.15	5.15	0.45
249	962	388615	5395437	636.99	3.62	0.47
250	963	388662	5395420	642.27	2.66	0.45
251	964	388709	5395403	647.09	1.73	0.44
252	965	388756	5395386	649.78	1.26	0.43
253	966	388803	5395368	652.80	0.50	0.43
254	967	388851	5395347	655.57	0.12	0.42
255	968	388579	5395360	628.68	5.57	0.48
256	969	388620	5395642	646.25	1.38	0.42
257	970	388689	5395623	644.85	1.78	0.45
258	971	388735	5395604	643.59	2.23	0.36
259	972	388848	5394487	666.38	-1.81	0.58
260	973	388803	5394505	657.65	0.05	0.59
261	974	388756	5394525	650.27	2.14	0.61
262	975	388709	5394545	639.15	4.50	0.65
263	976	388672	5394565	630.54	6.15	0.67
264	977	388627	5394582	625.40	7.11	0.69
265	978	388582	5394600	620.97	7.84	0.73
266	979	388537	5394617	638.45	3.59	0.77
267	980	388492	5394639	652.74	-0.08	0.77
268	981	388446	5394661	660.42	-2.28	0.79
269	982	388302	5394683	658.98	-1.79	0.78
270	983	388356	5394705	652.04	-0.33	0.76
271	984	388311	5394727	646.74	0.75	0.84
272	985	388266	5394750	642.83	1.21	0.84
273	986	388196	5394537	575.32	15.81	0.57
274	987	388243	5394518	580.57	14.80	0.53
275	988	388290	5394499	579.06	15.17	0.48

276	990	388373	5394461	568.67	17.59	0.50
277	991	388419	5394442	574.44	16.52	0.53
278	992	388466	5394423	575.87	16.40	0.55
279	993	388508	5394404	585.05	14.58	0.59
280	994	388555	5394385	595.74	12.46	0.63
281	995	388602	5394367	610.18	9.54	0.72
282	997	388696	5394329	644.91	2.46	0.63
283	998	388742	5394310	652.11	1.03	0.72
284	999	388788	5394291	654.48	0.58	0.77

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GRAVITY DATA

QUEOBS3

CSR QUE ROAD GRAVITY SURVEY JAN 1988 (3)
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1	1000	388834	5394272	653.06	0.91	0.81
2	1001	389097	5394919	664.49	-0.93	0.38
3	1002	389052	5394938	662.81	-0.61	0.38
4	1003	389009	5394960	660.48	-0.18	0.39
5	1004	388966	5394979	657.97	0.32	0.40
6	1005	388922	5394998	657.29	0.49	0.40
7	1006	388876	5395017	656.64	0.35	0.41
8	1007	388831	5395036	658.96	-0.06	0.43
9	1008	388787	5395055	658.60	-0.13	0.45
10	1009	388771	5394125	600.79	11.63	0.72
11	1010	388792	5394175	621.92	7.62	0.66
12	1011	388752	5394080	610.00	9.97	0.60
13	1012	388730	5394100	588.34	13.87	0.63
14	1014	388637	5394140	592.14	13.36	0.61
15	1015	388591	5394159	580.10	15.66	0.63
16	1016	388545	5394178	581.50	15.09	0.61
17	1017	388478	5394197	588.75	13.67	0.57
18	1018	388432	5394216	577.54	15.84	0.54
19	1019	388386	5394235	577.25	15.84	0.54
20	1020	388339	5394254	578.25	15.63	0.50
21	1021	388293	5394273	579.32	15.34	0.47
22	1022	388238	5397057	636.90	1.16	0.90
23	1023	388200	5394311	577.45	15.72	0.44
24	1024	388153	5394330	574.89	16.27	0.45
25	1025	388023	5394349	568.67	17.24	0.49
26	1026	388038	5394157	602.25	11.26	0.50
27	1027	388085	5394136	602.50	11.33	0.48
28	1028	388131	5394119	606.96	10.60	0.49
29	1029	388177	5394100	616.17	8.72	0.49
30	1030	388223	5394082	626.41	6.51	0.48
31	1031	388270	5394064	627.09	6.55	0.47
32	1032	388316	5394046	629.88	5.99	0.47
33	1033	388363	5394027	622.37	7.59	0.46
34	1034	388409	5394008	610.51	9.94	0.44
35	1035	389755	5397101	667.26	-5.90	0.45
36	1036	388502	5393971	614.31	9.13	0.42
37	1037	388549	5393953	626.71	6.43	0.43
38	1038	388595	5393934	633.89	4.97	0.41
39	1039	388640	5393916	638.23	4.08	0.41
40	1040	388685	5393898	636.72	4.61	0.42
41	1041	389704	5394944	585.44	14.27	0.45
42	1042	388798	5394061	623.93	7.47	0.63
43	1043	388844	5394042	628.38	6.80	0.53
44	1044	388890	5394023	630.96	6.30	0.47
45	1045	388936	5394004	636.49	5.10	0.41
46	1046	388982	5393985	643.83	3.84	0.43
47	1047	389028	5393966	650.40	2.55	0.41
48	1048	389074	5393947	655.22	1.52	0.40
49	1049	389120	5393928	654.72	1.51	0.43
50	1050	390004	5397237	679.23	-8.01	0.37
51	1051	389959	5397256	678.82	-8.13	0.38

52	1052	389914	5397275	677.23	-8.04	0.40
53	1053	389869	5397294	673.91	-7.47	0.40
54	1054	389823	5397314	670.56	-6.73	0.42
55	1055	389778	5397333	665.11	-5.93	0.43
56	1056	389733	5397352	657.62	-4.62	0.40
57	1057	389688	5397371	657.58	-4.68	0.40
58	1058	389643	5397390	661.59	-5.46	0.42
59	1059	389598	5397409	668.82	-6.97	0.40
60	1060	389552	5397429	675.81	-8.45	0.39
61	1061	389507	5397448	678.71	-9.08	0.37
62	1062	389462	5397467	680.07	-9.32	0.38
63	1063	389417	5397486	682.27	-10.02	0.35
64	1064	389372	5397505	686.98	-11.11	0.36
65	1065	389327	5397525	691.78	-11.47	0.35
66	1066	389280	5397545	693.17	-10.87	0.34
67	1067	389229	5397384	680.88	-9.06	0.41
68	1068	389204	5397334	679.46	-8.75	0.42
69	1069	389158	5397353	677.78	-8.27	0.42
70	1070	389112	5397372	677.65	-8.39	0.42
71	1071	389066	5397391	678.29	-8.66	0.41
72	1072	389020	5397410	680.23	-8.92	0.42
73	1073	388975	5397430	683.64	-9.69	0.43
74	1074	388929	5397449	684.06	-9.86	0.45
75	1075	388883	5397468	682.86	-9.64	0.46
76	1076	388837	5397487	679.48	-9.05	0.47
77	1077	388792	5397506	677.77	-8.52	0.50
78	1078	388746	5397526	674.71	-8.11	0.53
79	1079	389220	5397327	680.13	-8.86	0.42
80	1080	389250	5397315	679.91	-8.85	0.40
81	1081	389296	5397295	679.82	-8.64	0.42
82	1082	389342	5397276	678.88	-8.41	0.45
83	1083	389388	5397257	672.97	-7.23	0.45
84	1084	389434	5397238	665.21	-5.62	0.46
85	1085	389480	5397219	659.14	-4.45	0.48
86	1086	389526	5397200	656.99	-3.97	0.49
87	1087	389572	5397180	654.04	-3.39	0.51
88	1088	389617	5397161	652.61	-3.24	0.50
89	1089	389663	5397142	655.79	-3.86	0.49
90	1090	389709	5397123	660.39	-4.66	0.47
91	1091	389801	5397083	672.43	-6.86	0.45
92	1092	389847	5397064	676.47	-7.78	0.45
93	1093	389893	5397045	678.43	-7.98	0.44
94	1094	389939	5397026	679.23	-7.98	0.43
95	1095	389985	5397007	679.93	-8.05	0.43
96	1096	390031	5397988	680.64	-9.10	0.42
97	1097	390077	5396970	680.19	-8.09	0.42
98	1100	389865	5396880	677.73	-7.73	0.43
99	1101	389911	5396861	676.86	-7.69	0.47
100	1102	389947	5396842	671.18	-6.62	0.47
101	1103	389993	5396823	665.65	-5.33	0.47
102	1104	390039	5396804	663.33	-4.75	0.46
103	1105	390085	5396785	664.78	-5.03	0.48
104	1106	390131	5396766	664.82	-5.01	0.49
105	1107	389814	5396895	677.62	-7.83	0.48
106	1108	389767	5396914	677.55	-7.95	0.49
107	1109	389722	5396933	678.37	-8.19	0.52

108	1110	389673	5396950	678.24	-8.12	0.53
109	1111	389626	5396971	672.41	-7.08	0.50
110	1112	389579	5396990	663.84	-5.45	0.49
111	1113	389534	5397007	655.96	-3.77	0.48
112	1114	389485	5397028	650.58	-2.74	0.46
113	1115	389433	5397049	648.66	-2.10	0.47
114	1116	389390	5397066	651.14	-2.52	0.47
115	1117	389343	5397088	656.54	-3.75	0.45
116	1118	389296	5397107	663.37	-5.18	0.46
117	1119	389252	5397128	666.88	-5.79	0.45
118	1120	389204	5397145	665.69	-5.40	0.43
119	1121	389157	5397164	663.05	-4.86	0.42
120	1122	389116	5397181	659.61	-4.01	0.44
121	1123	389073	5397197	657.15	-3.46	0.43
122	1124	389027	5397216	660.38	-4.31	0.44
123	1125	388981	5397234	668.59	-6.01	0.42
124	1126	388935	5397254	673.91	-7.13	0.42
125	1127	388889	5397275	676.27	-7.70	0.40
126	1128	388843	5397293	676.44	-7.93	0.42
127	1129	388797	5397311	673.91	-7.51	0.43
128	1130	388752	5397329	671.44	-7.25	0.44
129	1131	388704	5397348	668.73	-6.82	0.45
130	1132	388658	5397366	666.39	-6.13	0.47
131	1133	388612	5397385	664.43	-5.78	0.49
132	1134	388563	5397404	661.28	-4.96	0.51
133	1135	388519	5397423	659.10	-4.43	0.48
134	1136	388472	5397441	658.64	-4.41	0.48
135	1137	388426	5397460	658.54	-4.39	0.46
136	1138	388379	5397479	657.49	-4.23	0.48
137	1139	388366	5397399	663.77	-5.31	0.49
138	1140	388327	5397306	656.91	-3.81	0.50
139	1141	388325	5397300	656.17	-3.64	0.51
140	1142	389009	5396988	645.65	-0.91	0.42
141	1143	389055	5396970	643.36	-0.01	0.44
142	1144	389101	5396952	644.36	-0.30	0.44
143	1145	389148	5396934	645.31	-0.62	0.45
144	1146	389194	5396916	646.00	-0.79	0.46
145	1147	389240	5396898	647.23	-1.11	0.48
146	1148	389286	5396880	648.63	-1.17	0.48
147	1149	389332	5396862	645.49	-0.82	0.49
148	1150	389378	5396844	646.45	-1.09	0.44
149	1151	389424	5396826	649.89	-1.66	0.44
150	1152	389470	5396808	655.41	-2.93	0.48
151	1153	389517	5396790	661.93	-4.41	0.53
152	1154	389564	5396772	669.11	-6.01	0.55
153	1155	389610	5396754	670.78	-6.20	0.60
154	1156	389656	5396736	666.32	-5.31	0.58
155	1157	389702	5396718	666.07	-5.09	0.56
156	1158	389748	5396700	666.57	-5.42	0.53
157	1159	389795	5396682	657.35	-3.67	0.50
158	1160	389530	5396558	637.42	1.15	0.61
159	1161	389484	5396576	639.78	0.57	0.60
160	1162	389438	5396594	638.23	0.81	0.57
161	1163	389392	5396612	634.82	1.55	0.56
162	1164	389346	5396631	629.77	2.65	0.54
163	1165	389300	5396649	620.50	4.67	0.55

164	1166	389253	5396667	611.68	6.61	0.52
165	1167	389207	5396685	610.22	7.08	0.48
166	1168	389161	5396703	621.35	5.03	0.48
167	1169	389115	5396721	630.25	3.22	0.47
168	1170	389069	5396739	633.48	2.57	0.50
169	1171	389023	5396758	638.62	1.52	0.51
170	1172	388977	5396776	640.70	1.10	0.49
171	1173	388931	5396794	639.87	1.21	0.51
172	1174	388885	5396803	642.16	0.68	0.52
173	1175	388838	5396822	647.87	-0.75	0.54
174	1177	388746	5396858	653.31	-1.82	0.57
175	1178	388700	5396876	652.47	-1.57	0.59
176	1179	388654	5396894	653.69	-1.83	0.63
177	1180	388608	5396913	656.68	-2.82	0.64
178	1181	388561	5396931	659.36	-3.57	0.73
179	1182	388515	5396949	661.65	-4.17	0.79
180	1183	388469	5396967	658.07	-3.17	0.87
181	1184	388422	5396985	651.16	-1.66	0.88
182	1185	388376	5397003	645.19	-0.46	0.87
183	1186	388330	5397021	640.93	0.41	0.87
184	1187	388284	5397039	634.20	1.56	0.85
185	1188	388192	5397077	636.46	1.04	0.92
186	1189	388146	5397095	634.47	1.18	0.95
187	1190	388100	5397114	629.48	1.70	0.99
188	1191	388052	5397133	622.82	3.28	1.05
189	1192	389475	5396389	617.37	6.48	0.49
190	1193	389428	5396406	617.01	6.38	0.50
191	1194	389380	5396424	612.68	7.25	0.48
192	1195	389333	5396442	612.55	7.17	0.49
193	1196	389239	5396478	610.25	7.63	0.48
194	1197	389192	5396496	613.21	7.00	0.50
195	1198	389145	5396514	607.30	8.13	0.52
196	1199	389098	5396532	602.47	8.98	0.51
197	1200	389051	5396550	607.66	7.94	0.48
198	1201	389004	5396568	625.29	4.49	0.50
199	1202	388910	5396604	631.36	3.35	0.53
200	1203	388863	5396622	627.54	4.21	0.52
201	1204	388816	5396640	634.03	2.49	0.54
202	1205	388769	5396658	633.59	2.57	0.53
203	1206	388722	5396676	630.43	3.20	0.55
204	1207	388675	5396694	630.20	3.10	0.53
205	1208	388628	5396712	630.09	3.06	0.58
206	1209	388581	5396730	623.17	4.65	0.60
207	1210	388534	5396748	617.65	5.64	0.65
208	1211	388487	5396766	618.51	5.34	0.67
209	1212	388440	5396784	616.25	5.69	0.68
210	1213	388393	5396802	621.76	4.55	0.69
211	1214	388346	5396820	633.19	2.15	0.69
212	1215	388299	5396838	641.44	0.29	0.72
213	1216	388252	5396856	638.50	1.09	0.73
214	1217	388205	5396874	631.93	2.43	0.75
215	1218	388158	5396892	624.62	3.75	0.80
216	1220	389398	5396191	640.77	2.03	0.44
217	1221	389351	5396209	639.52	1.35	0.43
218	1222	389304	5396227	635.61	3.09	0.44
219	1223	389257	5396245	636.39	2.78	0.42

220	1224	389210	5396263	640.15	1.92	0.44
221	1225	389163	5396281	637.64	2.25	0.42
222	1226	389116	5396299	634.58	3.05	0.44
223	1227	389069	5396317	626.39	4.62	0.42
224	1228	389022	5396335	623.62	5.05	0.41
225	1229	388975	5396353	623.69	4.94	0.43
226	1230	388928	5396371	620.97	5.37	0.42
227	1231	388881	5396389	611.03	7.41	0.46
228	1232	388834	5396407	596.70	10.14	0.48
229	1233	388787	5396425	596.20	10.34	0.51
230	1234	388740	5396443	594.76	10.46	0.55
231	1235	388693	5396461	605.91	8.29	0.60
232	1236	388646	5396479	612.99	6.83	0.75
233	1237	388600	5396497	612.74	6.79	0.72
234	1238	388553	5396515	600.57	9.09	0.68
235	1239	388506	5396533	583.93	12.10	0.66
236	1240	388459	5396551	562.73	15.70	0.62
237	1241	388412	5396569	547.86	18.34	0.67
238	1242	388365	5396587	546.62	18.62	0.73
239	1243	388318	5396605	546.13	18.60	0.76
240	1244	388271	5396623	565.50	15.07	0.75
241	1245	388224	5396641	593.90	9.79	0.83
242	1246	388177	5396659	609.69	6.60	1.02
243	1247	388130	5396677	605.93	7.27	1.10
244	1248	388083	5396696	594.80	9.47	1.13
245	1249	388002	5396394	582.49	11.87	0.92
246	1251	387970	5396499	539.15	19.78	0.90
247	1252	388017	5396482	554.40	17.12	0.88
248	1253	387964	5396465	557.12	16.55	0.83
249	1255	388158	5396431	555.66	16.98	0.71
250	1256	388205	5396414	559.30	16.45	0.80
251	1257	388252	5396397	555.61	17.08	0.73
252	1258	388299	5396380	549.86	17.95	0.72
253	1259	388346	5396363	549.04	17.98	0.80
254	1260	388393	5396356	539.24	19.36	0.83
255	1262	388487	5396322	533.01	19.43	0.73
256	1263	388534	5396305	569.33	13.71	0.76
257	1264	388581	5396288	602.50	8.34	0.73
258	1265	388628	5396271	620.95	5.31	0.71
259	1266	388675	5396254	633.15	3.00	0.65
260	1267	388722	5396237	638.60	2.05	0.62
261	1268	389140	5394900	665.40	-1.09	0.37
262	1269	389186	5394891	665.31	-1.09	0.38
263	1270	389230	5394872	664.28	-0.88	0.39
264	1271	389277	5394853	662.51	-0.60	0.39
265	1272	389320	5394834	660.49	-0.08	0.39
266	1273	389366	5394815	660.13	0.01	0.39
267	1274	389314	5394796	659.97	0.04	0.40
268	1275	389461	5394777	662.90	-0.52	0.39
269	1276	389508	5394758	665.75	-1.16	0.40
270	1277	389554	5394739	667.98	-1.63	0.40
271	1278	389600	5394720	672.11	-2.55	0.41
272	1279	389647	5394700	676.13	-3.55	0.42
273	1280	389361	5394752	657.88	0.61	0.40
274	1281	389340	5394716	654.23	1.43	0.41
275	1282	389572	5394495	663.37	-0.51	0.40

276	1283	389525	5394514	662.52	-0.41	0.41
277	1284	389480	5394533	661.25	-0.68	0.40
278	1285	389435	5394552	659.88	0.24	0.40
279	1286	389392	5394571	656.99	0.87	0.41
280	1287	389347	5394590	655.43	1.24	0.41
281	1288	389302	5394609	650.04	2.23	0.42
282	1289	389282	5394566	644.31	3.38	0.46
283	1290	389259	5394527	645.07	3.21	0.49
284	1291	389245	5394480	643.39	3.39	0.49
285	1292	389226	5394432	644.94	2.95	0.51
286	1293	389207	5394390	638.21	4.29	0.54
287	1295	389023	5394738	654.52	1.02	0.49
288	1296	388078	5394757	658.82	-0.02	0.47
289	1297	388933	5394776	661.30	-0.32	0.46
290	1298	388888	5394795	662.42	-0.60	0.46
291	1299	388843	5394814	662.03	-0.59	0.44
292	1300	388798	5394833	656.30	0.46	0.50
293	1301	388754	5394852	650.59	1.42	0.53
294	1302	388709	5394871	643.95	2.74	0.57
295	1311	388273	5397721	653.11	-3.17	0.64
296	1312	388181	5397759	643.63	-1.37	0.66
297	1313	388135	5397777	639.48	-0.52	0.71
298	1314	388090	5397795	636.96	-0.17	0.76
299	1315	388045	5397813	631.65	0.53	0.83
300	1316	387998	5397831	621.79	2.46	0.87
301	1317	387952	5397849	613.01	4.35	0.90
302	1318	387906	5397867	602.68	6.38	0.98
303	1319	388365	5397240	656.43	-3.66	0.60
304	1320	388411	5397222	654.52	-3.21	0.57
305	1321	388458	5397204	653.63	-2.84	0.55
306	1322	388504	5397186	653.98	-3.00	0.52
307	1323	388550	5397168	656.01	-3.38	0.50
308	1324	388596	5397150	660.74	-4.37	0.47
309	1325	388643	5397132	666.54	-5.51	0.44
310	1326	388689	5397114	671.46	-6.48	0.43
311	1327	388735	5397096	673.28	-6.84	0.42
312	1328	388781	5397078	672.69	-6.60	0.40
313	1329	388827	5397060	672.56	-6.53	0.38
314	1330	388873	5397042	669.53	-6.05	0.39
315	1331	388919	5397024	659.01	-3.70	0.41
316	1332	388966	5397006	652.03	-1.82	0.41

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LEAMAN GEOPHYSICS GRAVITY REDUCTION

CSR QUE ROAD GRAVITY SURVEY FEB 1987

BASE VALUE	BASE NUMBER	METER	CAL DATE	SCALE	DENSITY	ELEV DATUM
980177.50	8551.9976	561	10187	1.0093	2.67	0.00

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8700.0001	389951.0	5395964.0	626.47	980182.85	980321.49	0.36	-15.06
8700.0002	389749.0	5395572.0	661.69	980176.27	980321.80	0.35	-15.03
8700.0003	389921.0	5395924.0	630.19	980182.05	980321.52	0.36	-15.15
8700.0004	389758.0	5395618.0	658.72	980176.66	980321.77	0.36	-15.17
8700.0005	389890.0	5395886.0	634.32	980181.24	980321.55	0.37	-15.17
8700.0006	389770.0	5395668.0	655.33	980177.36	980321.73	0.36	-15.11
8700.0007	389859.0	5395846.0	638.37	980180.49	980321.59	0.38	-15.15
8700.0008	389784.0	5395716.0	651.48	980178.11	980321.69	0.38	-15.06
8700.0009	389830.0	5395805.0	642.66	980179.72	980321.62	0.39	-15.10
8700.0010	389804.0	5395762.0	647.21	980178.89	980321.65	0.39	-15.06
8700.0011	389738.0	5395523.0	664.32	980175.78	980321.84	0.31	-15.08
8700.0012	389730.0	5395474.0	666.72	980175.36	980321.88	0.30	-15.08
8700.0013	389716.0	5395425.0	669.07	980174.96	980321.92	0.29	-15.07
8700.0014	389707.0	5395375.0	672.30	980174.31	980321.96	0.28	-15.13
8700.0015	389699.0	5395327.0	674.51	980173.89	980322.00	0.28	-15.16
8700.0016	389634.0	5394973.0	681.25	980172.49	980322.29	0.28	-15.51
8700.0017	389640.0	5395026.0	681.40	980172.57	980322.24	0.28	-15.36
8700.0018	389681.0	5395280.0	679.52	980172.89	980322.04	0.27	-15.22
8700.0019	389648.0	5395075.0	680.85	980172.73	980322.20	0.29	-15.26
8700.0020	389674.0	5395230.0	677.81	980173.25	980322.08	0.27	-15.23
8700.0021	389658.0	5395125.0	680.00	980172.77	980322.16	0.29	-15.35
8700.0022	389668.0	5395175.0	678.74	980172.99	980322.12	0.29	-15.34
8700.0023	389676.0	5394571.0	666.15	980176.22	980322.61	0.36	-15.00
8700.0024	389631.0	5394923.0	680.68	980172.81	980322.33	0.28	-15.35
8700.0025	389666.0	5394620.0	669.01	980175.61	980322.57	0.33	-15.03
8700.0026	389635.0	5394872.0	679.63	980173.08	980322.37	0.29	-15.32
8700.0027	389659.0	5394672.0	672.01	980174.83	980322.53	0.33	-15.19
8700.0028	389640.0	5394822.0	678.43	980173.51	980322.41	0.30	-15.15
8700.0029	389651.0	5394726.0	676.01	980173.91	980322.49	0.32	-15.29
8700.0030	389645.0	5394776.0	678.28	980173.55	980322.45	0.30	-15.17
8700.0031	389674.0	5394222.0	657.05	980178.31	980322.89	0.32	-15.02
8700.0032	389684.0	5394522.0	662.55	980177.17	980322.65	0.36	-14.80
8700.0033	389684.0	5394271.0	655.55	980178.67	980322.85	0.33	-14.91
8700.0034	389690.0	5394472.0	658.82	980177.95	980322.69	0.37	-14.78
8700.0035	389690.0	5394320.0	653.64	980179.16	980322.81	0.33	-14.76
8700.0036	389692.0	5394421.0	656.12	980178.56	980322.73	0.33	-14.78
8700.0037	389694.0	5394371.0	653.89	980179.01	980322.77	0.33	-14.81
8700.0038	389622.0	5394081.0	660.09	980177.61	980323.01	0.30	-15.25
8700.0039	389644.0	5394126.0	658.97	980177.67	980322.97	0.31	-15.37
8700.0040	389660.0	5394174.0	658.15	980177.96	980322.93	0.32	-15.19
8700.0041	389595.0	5394037.0	659.94	980177.77	980323.04	0.30	-15.16
8700.0042	389983.0	5396004.0	623.01	980183.55	980321.46	0.37	-15.00
8700.0043	390011.0	5396045.0	619.48	980184.14	980321.43	0.35	-15.08
8700.0044	390035.0	5396089.0	615.83	980184.77	980321.39	0.34	-15.15
8700.0045	390058.0	5396134.0	612.87	980185.23	980321.35	0.31	-15.26
8700.0046	390086.0	5396230.0	612.69	980185.25	980321.28	0.31	-15.20
8700.0047	390112.0	5396271.0	614.74	980184.80	980321.25	0.32	-15.21
8700.0048	390130.0	5396321.0	617.49	980184.10	980321.20	0.36	-15.28

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8700.0049	389341.0	5395520.0	670.35	980174.32	980321.84	0.39	-15.27
8700.0050	389360.0	5395567.0	665.09	980175.40	980321.80	0.39	-15.19
8700.0051	389379.0	5395613.0	665.44	980175.37	980321.77	0.41	-15.09
8700.0052	389398.0	5395659.0	666.98	980174.96	980321.73	0.42	-15.16
8700.0053	389417.0	5395705.0	668.61	980174.55	980321.69	0.44	-15.18
8700.0054	389435.0	5395752.0	667.57	980174.75	980321.66	0.43	-15.16
8700.0055	389454.0	5395798.0	664.05	980175.37	980321.62	0.41	-15.22
8700.0056	389472.0	5395844.0	662.96	980175.57	980321.58	0.38	-15.23
8700.0057	389490.0	5395891.0	660.46	980176.03	980321.54	0.37	-15.24
8700.0058	389545.0	5396030.0	652.23	980177.58	980321.43	0.37	-15.19
8700.0059	389582.0	5396122.0	648.91	980177.98	980321.36	0.41	-15.32
8700.0060	389125.0	5395876.0	648.49	980178.24	980321.55	0.40	-15.36
8700.0061	389169.0	5395858.0	649.82	980178.08	980321.57	0.39	-15.28
8700.0062	389214.0	5395840.0	647.62	980178.70	980321.58	0.37	-15.12
8700.0063	389259.0	5395822.0	650.12	980178.24	980321.60	0.38	-15.10
8700.0064	389303.0	5395804.0	652.17	980177.81	980321.61	0.38	-15.14
8700.0065	389347.0	5395787.0	657.22	980176.75	980321.63	0.40	-15.20
8700.0066	389480.0	5395734.0	670.79	980174.12	980321.67	0.43	-15.18
8700.0067	389391.0	5395769.0	662.66	980175.72	980321.64	0.42	-15.15
8700.0068	389525.0	5395716.0	671.30	980174.08	980321.69	0.41	-15.15
8700.0069	389314.0	5395585.0	663.28	980175.78	980321.79	0.39	-15.15
8700.0070	389268.0	5395605.0	667.08	980175.06	980321.77	0.39	-15.11
8700.0071	389222.0	5395624.0	666.32	980175.15	980321.76	0.39	-15.15
8700.0072	389175.0	5395643.0	665.10	980175.39	980321.75	0.39	-15.15
8700.0073	389129.0	5395661.0	663.83	980175.59	980321.73	0.38	-15.18
8700.0074	389083.0	5395680.0	659.81	980176.27	980321.71	0.37	-15.29
8700.0075	389570.0	5395699.0	669.61	980174.45	980321.70	0.41	-15.13
8700.0076	389614.0	5395681.0	666.78	980175.07	980321.71	0.41	-15.08
8700.0077	389508.0	5395937.0	654.99	980177.12	980321.51	0.28	-15.27
8700.0078	389643.0	5395885.0	661.21	980175.88	980321.55	0.38	-15.24
8700.0079	389553.0	5395919.0	657.41	980176.66	980321.52	0.37	-15.18
8700.0080	389464.0	5395955.0	656.54	980176.73	980321.49	0.35	-15.27
8700.0081	389419.0	5395972.0	655.72	980176.71	980321.48	0.36	-15.42
8700.0082	389374.0	5395990.0	654.99	980176.82	980321.46	0.36	-15.44
8700.0083	389598.0	5395902.0	659.88	980176.11	980321.54	0.37	-15.26
8700.0084	389626.0	5396102.0	652.04	980177.45	980321.38	0.44	-15.23
8700.0085	389536.0	5396139.0	644.83	980178.84	980321.34	0.40	-15.26
8700.0086	389489.0	5396156.0	640.06	980179.72	980321.33	0.40	-15.31
8700.0087	389442.0	5396172.0	640.23	980179.51	980321.32	0.39	-15.48
8700.0088	389527.0	5395983.0	653.74	980177.37	980321.47	0.37	-15.14
8700.0089	389600.0	5396169.0	650.37	980177.68	980321.32	0.42	-15.29
8700.0090	389563.0	5396076.0	648.65	980178.17	980321.40	0.40	-15.24
8700.0091	389330.0	5396007.0	652.06	980177.44	980321.45	0.38	-15.37
8700.0092	389079.0	5394873.0	663.62	980176.92	980322.36	0.30	-14.60
8700.0093	389097.0	5394919.0	664.49	980176.68	980322.32	0.38	-14.56
8700.0094	389116.0	5394966.0	664.12	980176.62	980322.29	0.38	-14.65
8700.0095	389135.0	5395012.0	664.08	980176.65	980322.25	0.38	-14.59
8700.0096	389090.0	5395030.0	661.75	980176.88	980322.23	0.31	-14.87
8700.0097	389044.0	5395049.0	659.70	980177.27	980322.22	0.38	-14.81
8700.0098	388998.0	5395067.0	658.07	980177.66	980322.20	0.37	-14.73
8700.0099	388952.0	5395086.0	657.35	980177.69	980322.19	0.34	-14.85
8700.0100	388907.0	5395105.0	658.04	980177.49	980322.17	0.40	-14.84
8700.0101	389153.0	5395058.0	663.40	980176.67	980322.21	0.38	-14.67
8700.0102	389172.0	5395104.0	662.83	980176.64	980322.18	0.36	-14.79

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NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8700.0103	389191.0	5395150.0	663.51	980176.38	980322.14	0.35	-14.90
8700.0104	389210.0	5395197.0	663.56	980176.21	980322.10	0.36	-15.01
8700.0105	389165.0	5395216.0	661.96	980176.44	980322.08	0.36	-15.08
8700.0106	389229.0	5395243.0	661.23	980176.61	980322.06	0.37	-15.02
8700.0107	389120.0	5395234.0	657.40	980177.42	980322.07	0.36	-14.98
8700.0108	389248.0	5395289.0	658.55	980177.13	980322.03	0.39	-14.97
8700.0109	389074.0	5395252.0	654.97	980177.86	980322.05	0.39	-15.03
8700.0110	389267.0	5395335.0	658.97	980176.98	980321.99	0.38	-15.02
8700.0111	389030.0	5395270.0	651.04	980178.59	980322.04	0.38	-15.01
8700.0112	389285.0	5395382.0	665.72	980175.55	980321.95	0.37	-15.08
8700.0113	388986.0	5395288.0	653.97	980177.85	980322.02	0.38	-15.15
8700.0114	389333.0	5395363.0	669.26	980174.76	980321.97	0.37	-15.19
8700.0115	389379.0	5395344.0	672.54	980174.13	980321.98	0.38	-15.19
8700.0116	389239.0	5395400.0	661.20	980176.60	980321.94	0.36	-14.92
8700.0117	389194.0	5395419.0	659.80	980176.73	980321.92	0.35	-15.06
8700.0118	389148.0	5395437.0	661.91	980176.16	980321.91	0.34	-15.21
8700.0119	389102.0	5395455.0	663.03	980175.89	980321.89	0.35	-15.24
8700.0120	389008.0	5395493.0	658.80	980176.68	980321.86	0.36	-15.23
8700.0121	389056.0	5395474.0	661.97	980176.01	980321.88	0.37	-15.29
8700.0122	389226.0	5394974.0	669.59	980175.43	980322.20	0.38	-14.76
8700.0123	389181.0	5394993.0	666.85	980176.05	980322.26	0.38	-14.67
8700.0124	389243.0	5394752.0	658.88	980177.80	980322.46	0.40	-14.66
8700.0125	389197.0	5394772.0	659.25	980177.75	980322.44	0.40	-14.62
8700.0126	389152.0	5394790.0	659.59	980177.68	980322.43	0.41	-14.60
8700.0127	389105.0	5394810.0	660.29	980177.50	980322.41	0.40	-14.63
8700.0128	389060.0	5394827.0	661.03	980177.31	980322.40	0.39	-14.67
8700.0129	389014.0	5394846.0	662.46	980176.97	980322.38	0.39	-14.72
8700.0130	388968.0	5394866.0	665.60	980176.24	980322.36	0.40	-14.80
8700.0131	388923.0	5394885.0	667.43	980176.01	980322.35	0.41	-14.65
8700.0132	389289.0	5394733.0	658.16	980177.97	980322.48	0.42	-14.62
8700.0133	389380.0	5394697.0	661.31	980177.33	980322.51	0.41	-14.69
8700.0134	389610.0	5394602.0	673.96	980174.15	980322.59	0.41	-15.46
8700.0135	389426.0	5394678.0	665.23	980176.49	980322.52	0.41	-14.77
8700.0136	389564.0	5394621.0	673.35	980174.62	980322.57	0.40	-15.10
8700.0137	389472.0	5394659.0	667.81	980175.95	980322.54	0.39	-14.84
8700.0138	389518.0	5394640.0	671.13	980175.24	980322.55	0.41	-14.89
8700.0139	389347.0	5394487.0	647.38	980180.28	980322.67	0.46	-14.60
8700.0140	389392.0	5394466.0	653.48	980179.08	980322.69	0.45	-14.62
8700.0141	389438.0	5394446.0	655.28	980178.58	980322.71	0.44	-14.80
8700.0142	389229.0	5394331.0	638.16	980184.09	980322.80	0.56	-14.59
8700.0143	389275.0	5394310.0	640.90	980183.59	980322.82	0.50	-14.63
8700.0144	389364.0	5394275.0	649.42	980179.97	980322.85	0.46	-14.67
8700.0145	389410.0	5394256.0	654.29	980179.32	980322.86	0.44	-14.41
8700.0146	389457.0	5394237.0	654.40	980178.79	980322.88	0.43	-14.93
8700.0147	389297.0	5394089.0	647.80	980180.41	980323.00	0.45	-14.72
8700.0148	389484.0	5394016.0	655.99	980178.86	980323.06	0.41	-14.75
8700.0149	389344.0	5394072.0	650.19	980180.29	980323.01	0.44	-14.39
8700.0150	389437.0	5394034.0	654.02	980179.42	980323.04	0.41	-14.57
8700.0151	389390.0	5394053.0	652.48	980179.78	980323.03	0.42	-14.48
8700.0152	389407.0	5395548.0	665.62	980175.35	980321.82	0.39	-15.15
8700.0153	389453.0	5395529.0	670.80	980174.32	980321.84	0.38	-15.19
8700.0154	389499.0	5395511.0	676.87	980173.13	980321.85	0.38	-15.20
8700.0155	389545.0	5395492.0	676.11	980173.38	980321.87	0.37	-15.12
8700.0156	389591.0	5395473.0	674.55	980173.76	980321.88	0.37	-15.07

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8700.0157	389637.0	5395454.0	672.19	980174.23	980321.90	0.38	-15.07
8700.0158	389953.0	5396407.0	610.28	980185.35	980321.13	0.44	-15.30
8700.0159	389906.0	5396424.0	609.97	980185.36	980321.12	0.47	-15.31
8700.0160	389859.0	5396441.0	608.43	980185.60	980321.11	0.48	-15.34
8700.0161	389765.0	5396051.0	636.81	980180.53	980321.42	0.42	-15.21
8700.0162	389811.0	5396033.0	629.68	980181.93	980321.43	0.43	-15.21
8700.0163	389789.0	5396255.0	622.91	980183.05	980321.25	0.46	-15.22
8700.0164	389857.0	5396016.0	620.80	980183.71	980321.45	0.43	-15.20
8700.0165	389835.0	5396237.0	620.32	980183.67	980321.27	0.45	-15.14
8700.0166	389882.0	5396220.0	619.12	980183.95	980321.28	0.43	-15.12
8700.0167	389928.0	5396202.0	622.17	980183.59	980321.30	0.44	-14.89
8700.0168	388132.0	5395436.0	639.14	980176.77	980321.89	0.49	-18.91
8700.0169	389042.0	5394785.0	656.99	980178.05	980322.43	0.45	-14.71
8700.0170	389023.0	5394738.0	654.52	980178.45	980322.47	0.49	-14.79
8700.0171	389003.0	5394692.0	655.24	980178.33	980322.51	0.55	-14.74
8700.0172	388984.0	5394648.0	659.91	980177.16	980322.54	0.56	-15.02
8700.0173	388965.0	5394603.0	667.28	980175.92	980322.58	0.57	-14.84
8700.0174	388947.0	5394556.0	668.42	980175.31	980322.61	0.59	-15.24
8700.0175	388927.0	5394510.0	667.24	980175.65	980322.65	0.61	-15.14
8700.0176	388908.0	5394464.0	671.23	980174.73	980322.69	0.60	-15.32
8700.0177	388889.0	5394415.0	671.53	980174.54	980322.73	0.66	-15.43
8700.0178	388871.0	5394368.0	667.04	980175.46	980322.77	0.74	-15.36
8700.0179	388852.0	5394321.0	661.55	980176.63	980322.80	0.79	-15.25
8700.0180	388834.0	5394272.0	653.06	980178.36	980322.84	0.81	-15.22
8700.0181	388878.0	5394254.0	640.80	980181.03	980322.86	0.73	-15.05
8700.0182	388926.0	5394235.0	626.48	980184.26	980322.87	0.70	-14.68
8700.0183	388972.0	5394217.0	619.65	980185.74	980322.89	0.64	-14.63
8700.0184	389018.0	5394198.0	625.78	980184.68	980322.90	0.60	-14.54
8700.0185	389064.0	5394180.0	631.28	980183.62	980322.92	0.54	-14.59
8700.0186	389111.0	5394163.0	634.67	980183.02	980322.93	0.50	-14.57
8700.0187	389158.0	5394144.0	635.81	980182.90	980322.95	0.49	-14.50
8700.0188	389203.0	5394126.0	639.82	980182.12	980322.96	0.46	-14.53
8700.0189	389250.0	5394108.0	644.87	980181.19	980322.98	0.47	-14.47
8700.0190	388953.0	5394444.0	672.34	980174.52	980322.70	0.62	-15.31
8700.0191	388999.0	5394426.0	668.80	980175.18	980322.72	0.64	-15.35
8700.0192	389045.0	5394407.0	660.77	980176.99	980322.74	0.64	-15.14
8700.0193	389091.0	5394388.0	650.86	980179.00	980322.75	0.62	-15.10
8700.0194	389137.0	5394369.0	637.21	980181.90	980322.77	0.59	-14.94
8700.0195	389183.0	5394351.0	629.99	980183.54	980322.78	0.58	-14.75
8700.0196	388529.0	5394850.0	653.96	980177.26	980322.37	0.64	-15.84
8700.0197	388574.0	5394830.0	648.01	980179.00	980322.39	0.61	-15.31
8700.0198	388619.0	5394810.0	643.46	980180.18	980322.41	0.60	-15.05
8700.0199	388664.0	5394790.0	642.78	980180.46	980322.42	0.58	-14.95
8700.0200	388710.0	5394770.0	643.53	980180.50	980322.44	0.57	-14.79
8700.0201	388755.0	5394750.0	646.59	980179.93	980322.46	0.55	-14.79
8700.0202	388802.0	5394729.0	649.31	980179.44	980322.47	0.47	-14.85
8700.0203	388848.0	5394708.0	651.50	980179.14	980322.49	0.54	-14.67
8700.0204	388893.0	5394688.0	655.35	980178.28	980322.51	0.53	-14.79
8700.0205	388940.0	5394668.0	659.58	980177.26	980322.52	0.56	-14.97
8700.0206	388876.0	5394905.0	663.25	980176.53	980322.33	0.43	-14.91
8700.0207	388831.0	5394924.0	660.89	980176.98	980322.32	0.42	-14.92
8700.0208	388784.0	5394945.0	659.84	980177.21	980322.30	0.43	-14.87
8700.0209	388740.0	5394964.0	657.56	980177.56	980322.28	0.45	-14.93
8700.0210	388692.0	5394984.0	653.08	980178.42	980322.27	0.49	-14.90

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NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8700.0211	388646.0	5395003.0	645.70	980179.78	980322.25	0.49	-14.97
8700.0212	388600.0	5395023.0	635.42	980182.02	980322.23	0.51	-14.71
8700.0213	388555.0	5395043.0	631.29	980182.80	980322.22	0.50	-14.74
8700.0214	388508.0	5395063.0	630.51	980182.84	980322.20	0.49	-14.85
8700.0215	388463.0	5395083.0	628.02	980183.27	980322.18	0.54	-14.84
8700.0216	388408.0	5395103.0	624.67	980183.75	980322.17	0.58	-14.97
8700.0217	388363.0	5395123.0	617.57	980185.07	980322.15	0.61	-14.99
8700.0218	388318.0	5395143.0	606.10	980187.30	980322.13	0.61	-15.00
8700.0219	388267.0	5395163.0	585.57	980191.01	980322.12	0.68	-15.24
8700.0220	388222.0	5395183.0	584.04	980191.17	980322.10	0.70	-15.35
8700.0221	388177.0	5395203.0	597.67	980188.22	980322.08	0.67	-15.63
8700.0222	388132.0	5395223.0	608.80	980185.74	980322.07	0.68	-15.90
8700.0223	388087.0	5395243.0	621.11	980183.07	980322.05	0.73	-16.08
8700.0224	388042.0	5395263.0	629.18	980181.22	980322.03	0.72	-16.33
8700.0225	387997.0	5395283.0	630.23	980181.06	980322.02	0.61	-16.38
8700.0226	387952.0	5395303.0	628.60	980181.27	980322.00	0.67	-16.41
8700.0227	388862.0	5395123.0	653.86	980178.25	980322.16	0.40	-14.89
8700.0228	388815.0	5395142.0	643.81	980180.24	980322.14	0.43	-14.84
8700.0229	388768.0	5395162.0	637.00	980181.63	980322.12	0.44	-14.76
8700.0230	388722.0	5395181.0	640.84	980180.76	980322.11	0.46	-14.83
8700.0231	388676.0	5395199.0	639.69	980180.95	980322.09	0.47	-14.84
8700.0232	388630.0	5395208.0	633.85	980182.08	980322.08	0.47	-14.85
8700.0233	388584.0	5395239.0	622.86	980184.25	980322.06	0.48	-14.81
8700.0234	388537.0	5395258.0	618.72	980185.14	980322.04	0.57	-14.63
8700.0235	388492.0	5395276.0	617.79	980185.21	980322.03	0.57	-14.73
8700.0236	388447.0	5395296.0	609.81	980186.60	980322.01	0.58	-14.88
8700.0237	388402.0	5395316.0	611.17	980186.08	980322.00	0.59	-15.11
8700.0238	388357.0	5395336.0	622.28	980183.46	980321.98	0.60	-15.51
8700.0239	388312.0	5395356.0	634.39	980180.80	980321.96	0.59	-15.79
8700.0240	388267.0	5395376.0	649.84	980176.94	980321.94	0.61	-16.57
8700.0241	389272.0	5394955.0	674.72	980174.22	980322.30	0.38	-14.98
8700.0242	389319.0	5394936.0	673.87	980174.30	980322.31	0.42	-15.04
8700.0243	389366.0	5394917.0	665.12	980176.31	980322.33	0.39	-14.80
8700.0244	389412.0	5394898.0	663.62	980176.64	980322.34	0.38	-14.79
8700.0245	389258.0	5395178.0	667.34	980175.39	980322.12	0.36	-15.10
8700.0246	389304.0	5395161.0	671.38	980174.51	980322.13	0.37	-15.19
8700.0247	389350.0	5395142.0	674.64	980173.72	980322.15	0.37	-15.36
8700.0248	389396.0	5395123.0	677.62	980173.11	980322.16	0.36	-15.41
8700.0249	389442.0	5395104.0	678.90	980172.91	980322.18	0.37	-15.36
8700.0250	389489.0	5395086.0	679.45	980172.89	980322.19	0.36	-15.30
8700.0251	389535.0	5395066.0	680.09	980172.74	980322.21	0.37	-15.33
8700.0252	389426.0	5395324.0	675.66	980173.58	980322.00	0.38	-15.13
8700.0253	389518.0	5395287.0	682.26	980172.13	980322.03	0.37	-15.33
8700.0254	389564.0	5395267.0	683.89	980171.68	980322.05	0.39	-15.46
8700.0255	389610.0	5395248.0	685.56	980171.56	980322.06	0.38	-15.28
8700.0256	389656.0	5395229.0	680.81	980172.63	980322.08	0.37	-15.17
8700.0257	389672.0	5396086.0	649.94	980177.77	980321.39	0.46	-15.31
8700.0258	389719.0	5396068.0	640.84	980179.65	980321.40	0.48	-15.22
8700.0259	389530.0	5396558.0	637.62	980178.62	980321.01	0.61	-16.36
8700.0260	389576.0	5396543.0	634.57	980179.34	980321.02	0.65	-16.21
8700.0261	389623.0	5396525.0	630.60	980180.28	980321.03	0.64	-16.08
8700.0262	389670.0	5396508.0	624.89	980181.74	980321.05	0.62	-15.77
8700.0263	389718.0	5396492.0	614.52	980184.01	980321.06	0.62	-15.56
8700.0264	389765.0	5396475.0	606.85	980185.69	980321.08	0.58	-15.44
8700.0265	389813.0	5396458.0	606.00	980185.74	980321.09	0.53	-15.47

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LEAMAN GEOPHYSICS GRAVITY REDUCTION

CSR QUE ROAD GRAVITY SURVEY FEB 1987 ADDENDUM

BASE VALUE	BASE NUMBER	METER	CAL DATE	SCALE	DENSITY	ELEV DATUM
980177.50	8551.9976	561	10187	1.0093	2.67	0.00

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8700.0266	389031.0	5394625.0	656.81	980177.92	980322.56	0.55	-14.89
8700.0267	389076.0	5394607.0	658.16	980177.71	980322.57	0.52	-14.88
8700.0268	389121.0	5394586.0	657.41	980177.84	980322.59	0.50	-14.94
8700.0269	389167.0	5394565.0	654.64	980178.50	980322.61	0.51	-14.83
8700.0270	389212.0	5394546.0	648.83	980179.83	980322.63	0.51	-14.66
8700.0271	389259.0	5394527.0	645.02	980180.75	980322.64	0.48	-14.54
8700.0272	389305.0	5394506.0	640.99	980181.59	980322.66	0.49	-14.50
8700.0273	388484.0	5394870.0	656.93	980176.29	980322.36	0.82	-16.03
8700.0274	388439.0	5394890.0	652.03	980177.15	980322.34	0.70	-16.24
8700.0275	388394.0	5394910.0	644.49	980178.74	980322.32	0.79	-16.02
8700.0276	388349.0	5394930.0	636.08	980180.31	980322.31	0.83	-16.05
8700.0277	388304.0	5394950.0	630.39	980181.54	980322.29	0.82	-15.93
8700.0278	388259.0	5394970.0	618.46	980184.14	980322.27	0.76	-15.72
8700.0279	388214.0	5394990.0	604.12	980187.27	980322.26	0.67	-15.48
8700.0280	388169.0	5395010.0	587.95	980190.22	980322.24	0.67	-15.70
8700.0281	388124.0	5395030.0	580.23	980191.93	980322.22	0.72	-15.44
8700.0282	388079.0	5395050.0	571.14	980193.71	980322.21	0.77	-15.38
8700.0283	388034.0	5395070.0	575.00	980192.44	980322.19	0.66	-15.99
8700.0284	387989.0	5395090.0	588.51	980189.75	980322.17	0.62	-16.04
8700.0285	387944.0	5395110.0	597.21	980187.46	980322.16	0.61	-16.61
8700.0286	387899.0	5395130.0	591.87	980188.47	980322.14	0.59	-16.66
8700.0287	389434.0	5394716.0	654.40	980178.87	980322.50	0.41	-14.49
8700.0288	389458.0	5394880.0	664.79	980176.40	980322.36	0.39	-14.81
8700.0289	389504.0	5394862.0	666.60	980176.04	980322.37	0.41	-14.81
8700.0290	388941.0	5395308.0	661.54	980176.35	980322.01	0.42	-15.11
8700.0291	388896.0	5395327.0	660.82	980176.47	980321.99	0.43	-15.11
8700.0292	388851.0	5395347.0	655.57	980177.50	980321.97	0.42	-15.10
8700.0293	388962.0	5395513.0	655.66	980177.35	980321.84	0.37	-15.15
8700.0294	388914.0	5395533.0	652.09	980178.14	980321.83	0.38	-15.04
8700.0295	388868.0	5395552.0	647.97	980179.00	980321.81	0.37	-14.98
8700.0296	388823.0	5395572.0	644.93	980179.58	980321.79	0.34	-15.02
8700.0297	388777.0	5395591.0	645.42	980180.14	980321.78	0.33	-14.35
8700.0298	388732.0	5395610.0	643.63	980179.68	980321.76	0.34	-15.14
8700.0299	389472.0	5395306.0	678.69	980172.93	980322.02	0.37	-15.22
8700.0300	389038.0	5395699.0	655.70	980177.09	980321.69	0.39	-15.24
8700.0301	388992.0	5395718.0	658.93	980176.33	980321.68	0.40	-15.34
8700.0302	389080.0	5395895.0	643.57	980179.20	980321.54	0.41	-15.34
8700.0303	389398.0	5396191.0	640.77	980179.42	980321.30	0.43	-15.41
8700.0304	389744.0	5396275.0	625.48	980182.48	980321.24	0.48	-15.25
8700.0305	389698.0	5396295.0	628.34	980181.77	980321.22	0.51	-15.35
8700.0306	389653.0	5396314.0	626.51	980182.08	980321.20	0.49	-15.40
8700.0307	389608.0	5396334.0	630.29	980181.15	980321.19	0.49	-15.57
8700.0308	389563.0	5396353.0	627.45	980181.86	980321.17	0.48	-15.41
8700.0309	389517.0	5396372.0	621.45	980183.19	980321.16	0.49	-15.23
8700.0310	389472.0	5396391.0	617.37	980183.94	980321.14	0.49	-15.27
8700.0311	389303.0	5395428.0	669.97	980174.61	980321.92	0.36	-15.16
8700.0312	389322.0	5395474.0	671.95	980174.38	980321.88	0.28	-15.04
8700.0313	389618.0	5396215.0	650.27	980177.62	980321.28	0.48	-15.28
8700.0314	389636.0	5396261.0	638.35	980179.76	980321.25	0.49	-15.43
8700.0315	389671.0	5396360.0	617.47	980183.95	980321.17	0.52	-15.24
8700.0316	389689.0	5396404.0	605.27	980186.33	980321.13	0.54	-15.20
8700.0317	389707.0	5396450.0	607.89	980185.73	980321.10	0.56	-15.24

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LEAMAN GEOPHYSICS GRAVITY REDUCTION

CSR QUE ROAD GRAVITY SURVEY JAN 1988

BASE VALUE	BASE NUMBER	METER	CAL DATE	SCALE	DENSITY	ELEV DATUM
980177.50	8551.9976	556	10188	1.0139	2.67	0.00

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0400	389323.0	5395474.0	671.89	980174.84	980321.88	0.28	-14.59
8800.0401	389120.0	5395584.0	665.78	980175.43	980321.79	0.29	-15.11
8800.0402	389028.0	5395626.0	657.82	980176.94	980321.75	0.28	-15.14
8800.0403	388949.0	5395671.0	657.29	980176.89	980321.72	0.28	-15.25
8800.0404	388854.0	5395721.0	653.45	980177.65	980321.67	0.28	-15.21
8800.0405	388765.0	5395768.0	649.57	980178.19	980321.63	0.29	-15.38
8800.0406	388741.0	5395865.0	652.96	980177.36	980321.56	0.31	-15.45
8800.0407	388674.0	5395925.0	654.96	980176.21	980321.51	0.33	-16.13
8800.0408	388581.0	5395932.0	660.96	980174.34	980321.50	0.36	-16.79
8800.0409	388480.0	5395932.0	660.41	980174.32	980321.50	0.40	-16.88
8800.0410	388369.0	5395938.0	655.27	980175.35	980321.49	0.45	-16.80
8800.0411	388280.0	5395911.0	650.65	980176.36	980321.51	0.38	-16.79
8800.0412	388192.0	5395854.0	645.09	980177.49	980321.56	0.35	-16.83
8800.0413	388118.0	5395796.0	641.13	980178.05	980321.60	0.36	-17.09
8800.0414	388024.0	5395749.0	640.17	980178.16	980321.64	0.37	-17.19
8800.0415	387942.0	5395699.0	642.03	980177.59	980321.68	0.39	-17.41
8800.0416	387846.0	5395671.0	647.95	980176.09	980321.70	0.40	-17.76
8800.0417	387764.0	5395715.0	654.90	980174.31	980321.66	0.46	-18.08
8800.0418	387667.0	5395731.0	653.14	980174.48	980321.65	0.45	-18.25
8800.0419	387571.0	5395724.0	650.51	980174.81	980321.66	0.44	-18.45
8800.0420	387460.0	5395704.0	650.23	980174.96	980321.67	0.38	-18.43
8800.0421	387357.0	5395709.0	650.28	980174.81	980321.66	0.35	-18.59
8800.0422	387265.0	5395744.0	647.21	980175.44	980321.63	0.36	-18.53
8800.0423	387190.0	5395798.0	645.14	980176.08	980321.59	0.37	-18.24
8800.0424	387102.0	5395854.0	643.84	980176.54	980321.54	0.36	-18.00
8800.0425	387003.0	5395882.0	643.01	980176.25	980321.52	0.36	-18.43
8800.0426	386907.0	5395889.0	643.11	980176.06	980321.51	0.38	-18.57
8800.0427	386813.0	5395893.0	645.05	980175.61	980321.51	0.39	-18.62
8800.0428	386710.0	5395893.0	642.91	980175.93	980321.51	0.41	-18.71
8800.0429	386607.0	5395912.0	643.00	980175.80	980321.49	0.41	-18.81
8800.0430	386535.0	5395935.0	643.86	980175.58	980321.47	0.42	-18.82
8800.0431	386526.0	5396064.0	636.59	980177.01	980321.37	0.43	-18.71
8800.0432	386525.0	5396165.0	634.27	980177.64	980321.29	0.44	-18.44
8800.0433	386533.0	5396263.0	635.98	980177.43	980321.21	0.44	-18.24
8800.0434	386542.0	5396355.0	640.25	980176.86	980321.13	0.45	-17.88
8800.0435	386542.0	5396468.0	644.70	980176.28	980321.04	0.46	-17.49
8800.0436	386536.0	5396563.0	645.57	980175.99	980320.96	0.48	-17.51
8800.0437	386532.0	5396668.0	640.55	980176.99	980320.88	0.50	-17.39
8800.0438	386527.0	5396765.0	638.35	980177.43	980320.80	0.52	-17.29
8800.0439	389575.0	5394003.0	659.16	980177.84	980323.07	0.30	-15.27
8800.0440	388973.0	5393634.0	643.32	980181.61	980323.36	0.35	-14.86
8800.0441	388898.0	5393629.0	630.81	980184.19	980323.36	0.44	-14.65
8800.0442	389042.0	5393640.0	638.45	980182.48	980323.35	0.46	-14.83
8800.0443	389086.0	5393641.0	635.48	980183.42	980323.35	0.45	-14.48
8800.0444	388963.0	5393509.0	648.47	980181.14	980323.46	0.45	-14.32
8800.0445	389029.0	5393508.0	642.29	980182.28	980323.46	0.46	-14.39
8800.0446	388951.0	5393690.0	628.61	980184.57	980323.31	0.45	-14.65
8800.0447	388904.0	5393749.0	614.28	980187.19	980323.26	0.46	-14.78

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0448	388863.0	5393451.0	649.58	980180.59	980323.51	0.43	-14.71
8800.0450	388788.0	5393279.0	661.20	980178.30	980323.64	0.40	-14.88
8800.0451	388834.0	5393198.0	662.50	980178.08	980323.71	0.46	-14.86
8800.0452	388894.0	5393113.0	666.39	980177.30	980323.78	0.50	-14.90
8800.0453	388865.0	5393078.0	665.83	980177.45	980323.81	0.50	-14.89
8800.0454	388778.0	5393005.0	664.28	980177.74	980323.86	0.47	-14.99
8800.0455	388801.0	5392931.0	660.22	980178.73	980323.92	0.44	-14.89
8800.0456	386895.0	5393821.0	527.24	980203.12	980323.18	0.87	-15.48
8800.0457	386873.0	5393774.0	539.63	980200.84	980323.22	0.69	-15.54
8800.0458	386865.0	5393727.0	549.04	980199.05	980323.26	0.69	-15.52
8800.0459	386881.0	5393678.0	559.39	980197.04	980323.30	0.65	-15.58
8800.0460	386899.0	5393614.0	561.57	980196.71	980323.35	0.71	-15.46
8800.0461	386930.0	5393592.0	566.60	980195.57	980323.37	0.68	-15.67
8800.0462	386968.0	5393558.0	576.94	980193.41	980323.40	0.67	-15.83
8800.0463	386993.0	5393513.0	588.37	980191.21	980323.43	0.63	-15.86
8800.0464	387025.0	5393471.0	593.87	980190.26	980323.47	0.62	-15.77
8800.0465	387063.0	5393445.0	596.39	980190.00	980323.49	0.59	-15.59
8800.0466	387096.0	5393405.0	596.68	980189.93	980323.52	0.57	-15.65
8800.0467	387129.0	5393367.0	599.87	980189.35	980323.55	0.55	-15.65
8800.0468	387149.0	5393320.0	602.52	980188.82	980323.59	0.53	-15.72
8800.0469	387149.0	5393274.0	604.11	980188.47	980323.63	0.50	-15.83
8800.0470	387142.0	5393225.0	607.68	980187.56	980323.67	0.48	-16.10
8800.0471	387124.0	5393176.0	613.55	980186.38	980323.70	0.52	-16.12
8800.0472	387106.0	5393131.0	618.02	980185.42	980323.74	0.50	-16.26
8800.0473	387086.0	5393087.0	623.16	980184.50	980323.78	0.48	-16.22
8800.0474	387099.0	5393033.0	631.49	980182.91	980323.82	0.46	-16.23
8800.0475	387132.0	5392993.0	639.59	980181.34	980323.85	0.48	-16.22
8800.0476	387156.0	5392957.0	645.59	980180.16	980323.88	0.50	-16.24
8800.0477	387148.0	5392905.0	651.25	980179.15	980323.92	0.56	-16.11
8800.0478	387150.0	5392857.0	652.96	980178.97	980323.96	0.44	-16.11
8800.0479	387172.0	5392809.0	652.05	980179.14	980324.00	0.39	-16.21
8800.0480	387182.0	5392758.0	651.11	980179.57	980324.04	0.39	-16.01
8800.0481	387208.0	5392723.0	649.79	980179.76	980324.07	0.38	-16.12
8800.0482	387247.0	5392689.0	644.80	980181.12	980324.10	0.36	-15.79
8800.0483	387285.0	5392661.0	642.74	980181.58	980324.12	0.35	-15.77
8800.0484	388807.0	5393513.0	644.55	980181.58	980323.45	0.44	-14.66
8800.0485	388791.0	5393584.0	644.67	980181.53	980323.40	0.46	-14.60
8800.0486	388773.0	5393630.0	647.07	980180.90	980323.36	0.48	-14.70
8800.0487	388821.0	5393631.0	640.35	980182.31	980323.36	0.48	-14.62
8800.0488	388711.0	5393633.0	649.48	980180.28	980323.36	0.49	-14.83
8800.0489	388637.0	5393703.0	651.30	980179.68	980323.30	0.46	-15.05
8800.0491	388826.0	5393738.0	645.23	980181.10	980323.27	0.51	-14.75
8800.0492	388770.0	5393730.0	647.83	980180.62	980323.28	0.53	-14.70
8800.0493	388802.0	5393704.0	646.69	980180.83	980323.30	0.49	-14.78
8800.0495	386893.0	5393885.0	542.85	980200.00	980323.13	0.87	-15.48
8800.0496	386911.0	5393931.0	560.05	980196.60	980323.09	0.85	-15.48
8800.0497	386931.0	5393977.0	560.24	980196.37	980323.06	0.83	-15.66
8800.0498	386950.0	5394022.0	552.24	980198.01	980323.02	0.82	-15.56
8800.0499	386966.0	5394069.0	558.59	980196.73	980322.98	0.85	-15.52
8800.0500	386984.0	5394114.0	543.93	980199.55	980322.95	0.71	-15.69
8800.0501	387001.0	5394160.0	564.84	980195.33	980322.91	0.63	-15.84
8800.0502	387019.0	5394206.0	580.35	980192.30	980322.87	0.63	-15.78
8800.0503	387038.0	5394253.0	587.64	980190.80	980322.84	0.68	-15.76
8800.0504	387055.0	5394299.0	587.42	980191.11	980322.80	0.67	-15.48

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NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0505	387073.0	5394346.0	585.19	980191.39	980322.76	0.66	-15.60
8800.0506	387000.0	5394434.0	587.19	980190.94	980322.69	0.61	-15.63
8800.0507	386954.0	5394455.0	592.97	980189.83	980322.67	0.63	-15.57
8800.0508	386908.0	5394476.0	596.19	980189.18	980322.65	0.68	-15.52
8800.0509	386864.0	5394497.0	596.87	980189.08	980322.64	0.69	-15.46
8800.0510	386818.0	5394518.0	596.51	980189.13	980322.62	0.66	-15.50
8800.0511	386772.0	5394539.0	594.33	980189.61	980322.60	0.62	-15.47
8800.0512	386726.0	5394560.0	606.48	980186.99	980322.58	0.60	-15.70
8800.0513	386680.0	5394581.0	617.54	980184.67	980322.57	0.59	-15.84
8800.0514	386634.0	5394602.0	627.41	980182.70	980322.55	0.53	-15.91
8800.0515	386588.0	5394623.0	629.42	980182.48	980322.53	0.51	-15.74
8800.0516	386542.0	5394644.0	630.59	980182.21	980322.51	0.48	-15.78
8800.0517	386496.0	5394665.0	635.85	980180.91	980322.50	0.51	-16.01
8800.0518	386450.0	5394686.0	641.22	980179.55	980322.48	0.54	-16.26
8800.0519	386404.0	5394707.0	646.08	980178.14	980322.46	0.62	-16.62
8800.0520	386358.0	5394728.0	642.45	980178.97	980322.44	0.65	-16.45
8800.0521	386318.0	5394520.0	610.39	980185.82	980322.61	0.86	-15.74
8800.0522	386374.0	5394500.0	614.53	980185.09	980322.63	0.83	-15.83
8800.0523	386420.0	5394479.0	616.77	980184.65	980322.64	0.79	-15.89
8800.0524	386466.0	5394458.0	615.84	980184.92	980322.66	0.81	-15.80
8800.0525	386510.0	5394437.0	617.31	980184.74	980322.68	0.82	-15.70
8800.0526	386556.0	5394416.0	619.38	980184.32	980322.70	0.83	-15.71
8800.0527	386602.0	5394395.0	621.24	980183.95	980322.71	0.84	-15.73
8800.0529	386694.0	5394353.0	596.93	980189.13	980322.75	0.83	-15.37
8800.0530	386742.0	5394332.0	582.57	980192.01	980322.77	0.91	-15.26
8800.0531	386788.0	5394311.0	576.30	980193.35	980322.78	0.96	-15.12
8800.0532	386834.0	5394290.0	561.91	980196.12	980322.80	1.02	-15.13
8800.0533	386880.0	5394269.0	568.27	980194.98	980322.82	1.10	-14.96
8800.0534	386926.0	5394248.0	570.25	980194.44	980322.84	1.00	-15.23
8800.0535	386972.0	5394227.0	554.71	980197.29	980322.86	0.96	-15.49
8800.0536	387090.0	5394390.0	576.68	980192.80	980322.72	0.61	-15.88
8800.0537	387136.0	5394369.0	571.85	980193.85	980322.74	0.57	-15.84
8800.0538	387181.0	5394348.0	568.65	980194.55	980322.76	0.63	-15.72
8800.0539	387227.0	5394327.0	562.83	980195.69	980322.78	0.68	-15.70
8800.0540	387262.0	5394306.0	552.73	980197.82	980322.79	0.68	-15.57
8800.0541	387307.0	5394285.0	550.36	980198.14	980322.81	0.69	-15.72
8800.0542	387353.0	5394264.0	554.54	980197.14	980322.83	0.63	-15.98
8800.0543	387398.0	5394243.0	556.15	980197.01	980322.85	0.58	-15.87
8800.0544	387444.0	5394222.0	543.34	980199.58	980322.87	0.56	-15.85
8800.0545	387489.0	5394201.0	544.16	980199.42	980322.88	0.52	-15.91
8800.0546	387534.0	5394180.0	554.65	980197.32	980322.90	0.54	-15.94
8800.0547	387579.0	5394159.0	565.71	980195.28	980322.92	0.55	-15.81
8800.0548	387624.0	5394138.0	563.84	980195.87	980322.94	0.58	-15.58
8800.0549	387669.0	5394117.0	568.45	980194.86	980322.95	0.59	-15.69
8800.0550	387711.0	5394096.0	575.47	980193.48	980322.97	0.60	-15.70
8800.0551	387757.0	5394075.0	585.38	980191.74	980322.99	0.63	-15.47
8800.0552	387802.0	5394054.0	596.94	980189.50	980323.01	0.64	-15.44
8800.0553	387848.0	5394033.0	609.37	980187.12	980323.02	0.68	-15.36
8800.0554	387894.0	5394012.0	621.87	980184.56	980323.04	0.67	-15.49
8800.0555	387940.0	5393991.0	627.72	980183.37	980323.06	0.63	-15.58
8800.0556	387990.0	5393970.0	634.72	980181.98	980323.07	0.60	-15.64
8800.0557	388037.0	5393949.0	645.00	980179.88	980323.09	0.58	-15.76
8800.0558	388083.0	5393928.0	648.16	980179.17	980323.11	0.57	-15.87
8800.0559	388130.0	5393907.0	647.69	980179.64	980323.13	0.56	-15.53

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0560	387940.0	5393991.0	630.89	980182.79	980323.06	0.63	-15.54
8800.0561	387930.0	5393950.0	639.64	980180.88	980323.09	0.78	-15.62
8800.0562	387913.0	5393903.0	643.34	980180.20	980323.13	0.86	-15.53
8800.0563	387896.0	5393855.0	641.45	980180.82	980323.17	0.80	-15.38
8800.0564	387879.0	5393807.0	633.10	980182.59	980323.21	0.75	-15.33
8800.0565	387933.0	5393786.0	639.16	980181.44	980323.22	0.74	-15.33
8800.0566	387978.0	5393765.0	645.83	980180.11	980323.24	0.73	-15.37
8800.0567	387090.0	5393714.0	649.86	980178.73	980323.27	0.70	-16.02
8800.0568	388069.0	5393723.0	659.39	980177.55	980323.28	0.71	-15.31
8800.0569	387834.0	5393828.0	627.09	980183.68	980323.19	0.74	-15.41
8800.0570	387789.0	5393849.0	617.32	980185.56	980323.17	0.76	-15.42
8800.0571	387743.0	5393870.0	611.97	980186.55	980323.15	0.77	-15.45
8800.0572	387698.0	5393891.0	597.17	980189.50	980323.14	0.79	-15.38
8800.0573	387653.0	5393912.0	588.93	980191.16	980323.12	0.78	-15.34
8800.0574	387607.0	5393933.0	581.09	980192.47	980323.10	0.79	-15.54
8800.0575	387562.0	5393954.0	595.49	980189.39	980323.08	0.80	-15.76
8800.0576	387527.0	5393975.0	602.88	980187.90	980323.06	0.79	-15.79
8800.0577	387471.0	5393996.0	599.60	980188.53	980323.05	0.78	-15.80
8800.0578	387426.0	5394017.0	601.75	980187.97	980323.03	0.79	-15.90
8800.0579	387381.0	5394038.0	590.17	980190.21	980323.01	0.81	-15.90
8800.0580	387336.0	5394059.0	578.44	980192.41	980322.99	0.87	-15.93
8800.0581	387290.0	5394080.0	562.68	980195.40	980322.98	0.88	-16.01
8800.0582	387245.0	5394101.0	540.53	980199.66	980322.96	0.90	-16.07
8800.0583	387200.0	5394122.0	529.41	980201.73	980322.94	0.95	-16.13
8800.0584	387155.0	5394143.0	529.97	980201.81	980322.93	0.96	-15.91
8800.0585	387109.0	5394164.0	536.98	980200.49	980322.91	0.96	-15.83
8800.0586	387064.0	5394185.0	543.85	980199.31	980322.89	0.98	-15.63
8800.0587	387091.0	5394392.0	575.90	980193.44	980322.72	0.65	-15.36
8800.0588	387109.0	5394438.0	580.78	980192.30	980322.69	0.67	-15.47
8800.0589	387127.0	5394485.0	579.00	980192.35	980322.65	0.69	-15.72
8800.0590	387144.0	5394531.0	583.26	980190.93	980322.61	0.73	-16.22
8800.0591	387098.0	5394548.0	597.97	980187.80	980322.60	0.65	-16.53
8800.0592	387050.0	5394565.0	611.47	980184.82	980322.58	0.62	-16.87
8800.0593	387003.0	5394582.0	621.70	980182.65	980322.57	0.60	-17.03
8800.0594	386956.0	5394599.0	625.17	980182.20	980322.55	0.59	-16.79
8800.0595	386910.0	5394616.0	626.95	980182.02	980322.54	0.56	-16.64
8800.0596	386864.0	5394632.0	626.38	980182.46	980322.53	0.55	-16.31
8800.0597	386818.0	5394649.0	622.04	980183.64	980322.51	0.54	-15.97
8800.0598	386772.0	5394666.0	618.18	980184.68	980322.50	0.51	-15.71
8800.0599	386726.0	5394683.0	632.07	980181.62	980322.48	0.51	-16.03
8800.0600	386680.0	5394700.0	638.55	980180.20	980322.47	0.49	-16.18
8800.0601	386634.0	5394717.0	643.56	980178.85	980322.46	0.50	-16.52
8800.0602	386586.0	5394735.0	646.07	980178.17	980322.44	0.52	-16.67
8800.0604	389519.0	5393920.0	657.32	980178.62	980323.13	0.31	-14.91
8800.0605	389488.0	5393880.0	655.43	980179.21	980323.17	0.35	-14.68
8800.0606	389456.0	5393845.0	653.31	980179.71	980323.19	0.39	-14.59
8800.0607	389417.0	5393811.0	650.96	980180.23	980323.22	0.42	-14.53
8800.0608	389377.0	5393780.0	648.71	980180.70	980323.25	0.43	-14.51
8800.0609	389341.0	5393743.0	643.12	980181.93	980323.28	0.41	-14.43
8800.0610	389308.0	5393693.0	637.80	980183.08	980323.32	0.39	-14.39
8800.0611	389284.0	5393664.0	635.18	980183.61	980323.34	0.40	-14.38
8800.0612	389250.0	5393620.0	633.13	980183.98	980323.37	0.40	-14.46
8800.0613	389195.0	5393533.0	637.85	980183.12	980323.44	0.41	-14.45
8800.0614	389149.0	5393454.0	642.16	980182.33	980323.51	0.40	-14.47

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0615	389131.0	5393402.0	643.00	980182.18	980323.55	0.41	-14.48
8800.0616	389112.0	5393353.0	644.22	980181.96	980323.59	0.39	-14.52
8800.0617	389093.0	5393299.0	645.72	980181.66	980323.63	0.38	-14.58
8800.0618	389074.0	5393248.0	647.08	980181.55	980323.67	0.39	-14.45
8800.0619	389068.0	5393195.0	646.66	980181.59	980323.71	0.38	-14.55
8800.0620	389050.0	5393151.0	647.44	980181.50	980323.75	0.39	-14.50
8800.0621	389007.0	5393091.0	651.29	980180.73	980323.80	0.39	-14.56
8800.0622	388963.0	5393048.0	652.88	980180.34	980323.83	0.42	-14.65
8800.0623	388841.0	5392959.0	656.64	980179.24	980323.90	0.45	-15.05
8800.0624	388760.0	5392894.0	661.41	980178.51	980323.95	0.47	-14.87
8800.0625	388676.0	5392810.0	666.10	980177.42	980324.02	0.49	-15.09
8800.0626	388603.0	5392722.0	671.51	980176.30	980324.09	0.50	-15.20
8800.0627	388557.0	5392651.0	674.13	980175.76	980324.15	0.50	-15.29
8800.0628	388462.0	5392495.0	678.50	980175.06	980324.27	0.51	-15.24
8800.0629	388395.0	5392378.0	683.54	980173.73	980324.36	0.53	-15.65
8800.0630	388315.0	5392244.0	688.20	980172.52	980324.47	0.55	-16.03
8800.0631	387392.0	5392595.0	647.15	980180.62	980324.18	0.40	-15.86
8800.0632	387447.0	5392512.0	652.22	980178.95	980324.24	0.38	-16.62
8800.0633	387500.0	5392434.0	662.20	980176.68	980324.31	0.36	-17.01
8800.0634	387583.0	5392384.0	665.41	980175.99	980324.35	0.35	-17.12
8800.0635	387678.0	5392322.0	673.79	980174.30	980324.40	0.35	-17.22
8800.0636	387758.0	5392263.0	684.31	980172.29	980324.45	0.38	-17.18
8800.0637	387843.0	5392226.0	678.33	980173.68	980324.48	0.40	-16.97
8800.0638	387891.0	5392209.0	677.40	980173.96	980324.49	0.41	-16.88
8800.0639	387929.0	5392183.0	677.80	980173.97	980324.52	0.43	-16.79
8800.0640	387974.0	5392174.0	679.62	980173.62	980324.52	0.45	-16.78
8800.0641	388022.0	5392184.0	681.96	980173.36	980324.52	0.48	-16.53
8800.0642	388068.0	5392217.0	685.17	980172.54	980324.49	0.48	-16.69
8800.0643	388109.0	5392244.0	688.85	980171.89	980324.47	0.49	-16.59
8800.0644	388154.0	5392265.0	690.79	980171.55	980324.45	0.50	-16.53
8800.0645	388208.0	5392280.0	692.60	980171.22	980324.44	0.50	-16.48
8800.0646	388258.0	5392261.0	689.16	980172.03	980324.46	0.52	-16.35
8800.0647	389668.0	5398101.0	698.69	980164.68	980319.76	0.25	-17.40
8800.0648	389694.0	5398061.0	697.72	980165.10	980319.80	0.25	-17.20
8800.0649	389726.0	5398011.0	692.37	980165.83	980319.84	0.26	-17.56
8800.0650	389756.0	5397959.0	686.89	980167.07	980319.88	0.28	-17.42
8800.0651	389784.0	5397915.0	684.76	980167.52	980319.91	0.29	-17.41
8800.0652	389816.0	5397868.0	683.27	980167.88	980319.95	0.28	-17.40
8800.0653	389843.0	5397825.0	681.07	980168.30	980319.99	0.27	-17.45
8800.0654	389873.0	5397776.0	677.56	980168.90	980320.03	0.27	-17.58
8800.0655	389902.0	5397731.0	673.92	980169.53	980320.07	0.26	-17.71
8800.0656	389935.0	5397680.0	672.19	980169.79	980320.11	0.27	-17.82
8800.0657	389963.0	5397635.0	673.41	980169.62	980320.14	0.27	-17.79
8800.0658	389993.0	5397586.0	676.26	980169.21	980320.18	0.28	-17.68
8800.0659	390007.0	5397549.0	676.28	980168.90	980320.21	0.28	-18.01
8800.0660	390034.0	5397508.0	678.74	980169.05	980320.25	0.27	-17.41
8800.0661	390061.0	5397444.0	679.63	980169.12	980320.30	0.29	-17.21
8800.0662	390079.0	5397396.0	680.02	980169.10	980320.34	0.30	-17.18
8800.0663	390103.0	5397339.0	680.76	980169.34	980320.38	0.29	-16.85
8800.0664	390122.0	5397284.0	680.91	980169.34	980320.43	0.29	-16.86
8800.0665	390150.0	5397221.0	681.26	980169.34	980320.48	0.27	-16.87
8800.0666	390179.0	5397145.0	678.70	980169.97	980320.54	0.27	-16.80
8800.0667	390191.0	5397100.0	676.62	980170.39	980320.58	0.28	-16.81
8800.0668	390216.0	5397051.0	674.13	980170.86	980320.62	0.29	-16.87

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0669	390237.0	5396997.0	669.62	980171.71	980320.66	0.31	-16.93
8800.0670	390251.0	5396957.0	665.90	980172.45	980320.69	0.32	-16.94
8800.0671	390270.0	5396904.0	660.86	980173.46	980320.74	0.35	-16.93
8800.0672	390284.0	5396842.0	655.14	980174.68	980320.79	0.38	-16.86
8800.0673	390292.0	5396770.0	651.92	980175.39	980320.84	0.40	-16.82
8800.0674	390289.0	5396723.0	649.33	980176.00	980320.88	0.40	-16.76
8800.0675	390282.0	5396671.0	646.11	980176.81	980320.93	0.40	-16.62
8800.0676	390257.0	5396592.0	640.58	980178.04	980320.99	0.36	-16.59
8800.0677	390229.0	5396540.0	634.99	980179.24	980321.03	0.37	-16.51
8800.0678	390204.0	5396484.0	628.72	980180.84	980321.07	0.36	-16.21
8800.0679	390178.0	5396432.0	622.81	980182.40	980321.12	0.35	-15.86
8800.0680	390158.0	5396385.0	618.68	980183.61	980321.15	0.35	-15.50
8800.0681	387331.0	5395760.0	647.91	980175.32	980321.62	0.36	-18.50
8800.0682	387302.0	5395809.0	646.42	980175.74	980321.58	0.27	-18.43
8800.0683	387294.0	5395854.0	644.99	980176.21	980321.55	0.39	-18.08
8800.0684	387272.0	5395903.0	644.53	980176.50	980321.51	0.40	-17.83
8800.0685	387248.0	5395955.0	645.69	980176.43	980321.46	0.42	-17.61
8800.0686	387229.0	5396017.0	648.12	980175.95	980321.41	0.43	-17.55
8800.0687	387228.0	5396061.0	651.19	980175.17	980321.38	0.44	-17.68
8800.0688	387703.0	5395736.0	655.24	980174.03	980321.65	0.42	-18.31
8800.0689	387681.0	5395694.0	663.95	980171.95	980321.68	0.58	-18.55
8800.0690	387660.0	5395650.0	671.03	980170.37	980321.72	0.62	-18.73
8800.0691	387639.0	5395605.0	677.06	980168.93	980321.75	0.66	-18.98
8800.0692	387617.0	5395560.0	679.18	980168.54	980321.79	0.63	-19.03
8800.0693	387595.0	5395516.0	681.82	980168.04	980321.82	0.62	-19.05
8800.0694	387574.0	5395472.0	683.30	980167.72	980321.86	0.63	-19.11
8800.0695	387552.0	5395427.0	680.97	980168.25	980321.89	0.63	-19.06
8800.0696	387532.0	5395382.0	674.70	980169.59	980321.93	0.60	-19.02
8800.0697	387512.0	5395338.0	669.15	980170.80	980321.97	0.60	-18.95
8800.0698	387489.0	5395293.0	662.93	980172.03	980322.00	0.57	-19.01
8800.0699	387444.0	5395312.0	659.31	980172.93	980321.99	0.56	-18.81

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411180
QUERED2

LEAMAN GEOPHYSICS GRAVITY REDUCTION

CSR QUE ROAD GRAVITY SURVEY JAN 1988 (2)

BASE VALUE	BASE NUMBER	METER	CAL DATE	SCALE	DENSITY	ELEV DATUM
980177.50	8551.9976	556	10188	1.0139	2.67	0.00

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0700	387489.0	5395293.0	650.47	980175.17	980322.00	0.57	-18.32
8800.0701	387579.0	5395245.0	642.46	980177.26	980322.04	0.58	-17.83
8800.0702	387629.0	5395226.0	635.80	980178.86	980322.06	0.59	-17.55
8800.0703	387679.0	5395207.0	628.04	980180.64	980322.07	0.62	-17.27
8800.0704	387729.0	5395188.0	620.08	980182.42	980322.09	0.61	-17.09
8800.0705	387779.0	5395169.0	614.88	980183.63	980322.11	0.61	-16.91
8800.0706	387829.0	5395150.0	598.83	980187.15	980322.12	0.60	-16.58
8800.0707	387899.0	5395130.0	591.87	980188.64	980322.14	0.59	-16.49
8800.0708	387944.0	5395306.0	628.60	980181.37	980322.00	0.57	-16.41
8800.0709	387899.0	5395326.0	628.05	980181.36	980321.98	0.60	-16.48
8800.0710	387854.0	5395347.0	630.76	980180.63	980321.96	0.66	-16.60
8800.0711	387809.0	5395368.0	639.26	980178.50	980321.94	0.70	-17.00
8800.0712	387754.0	5395389.0	645.48	980176.73	980321.93	0.70	-17.53
8800.0713	387709.0	5395410.0	654.10	980174.48	980321.91	0.68	-18.09
8800.0714	387664.0	5395430.0	670.33	980170.73	980321.89	0.65	-18.66
8800.0715	387619.0	5395451.0	682.03	980168.00	980321.88	0.60	-19.12
8800.0716	387574.0	5395472.0	684.14	980167.66	980321.86	0.58	-19.05
8800.0717	387240.0	5396115.0	647.89	980175.99	980321.33	0.46	-17.45
8800.0718	387271.0	5396156.0	645.83	980176.33	980321.30	0.47	-17.46
8800.0719	387275.0	5396218.0	646.26	980176.13	980321.25	0.48	-17.52
8800.0720	387266.0	5396288.0	644.33	980176.46	980321.20	0.48	-17.52
8800.0721	387263.0	5396343.0	643.57	980176.50	980321.15	0.49	-17.58
8800.0722	387240.0	5396391.0	638.78	980177.58	980321.11	0.50	-17.38
8800.0723	387192.0	5396429.0	635.58	980178.19	980321.08	0.50	-17.37
8800.0724	387148.0	5396462.0	630.94	980179.10	980321.05	0.51	-17.34
8800.0727	386780.0	5395804.0	649.19	980175.01	980321.58	0.39	-18.49
8800.0728	386790.0	5395722.0	645.66	980175.77	980321.65	0.39	-18.49
8800.0729	386776.0	5395662.0	643.57	980176.25	980321.69	0.38	-18.47
8800.0730	386765.0	5395593.0	643.20	980176.31	980321.75	0.38	-18.54
8800.0731	386750.0	5395531.0	643.10	980176.47	980321.80	0.37	-18.47
8800.0732	386716.0	5395507.0	643.30	980176.47	980321.82	0.37	-18.45
8800.0733	387171.0	5394592.0	570.03	980193.57	980322.56	0.68	-16.19
8800.0734	387221.0	5394569.0	565.15	980194.65	980322.58	0.72	-16.04
8800.0735	387267.0	5394546.0	559.13	980195.98	980322.60	0.70	-15.94
8800.0736	387313.0	5394523.0	553.10	980197.32	980322.62	0.68	-15.82
8800.0737	387358.0	5394500.0	551.04	980197.90	980322.64	0.63	-15.72
8800.0738	387403.0	5394477.0	548.11	980198.47	980322.66	0.61	-15.77
8800.0739	387450.0	5394453.0	546.79	980198.85	980322.68	0.65	-15.62
8800.0740	387495.0	5394430.0	545.47	980199.26	980322.70	0.62	-15.53
8800.0741	387542.0	5394407.0	543.61	980199.63	980322.72	0.68	-15.48
8800.0742	387589.0	5394384.0	544.94	980199.46	980322.74	0.71	-15.38
8800.0743	387634.0	5394361.0	546.95	980198.90	980322.76	0.73	-15.54
8800.0744	387678.0	5394338.0	551.82	980197.91	980322.77	0.75	-15.57
8800.0745	387723.0	5394315.0	557.44	980196.80	980322.79	0.76	-15.58
8800.0746	387767.0	5394292.0	563.85	980195.73	980322.81	0.78	-15.39
8800.0747	387812.0	5394269.0	571.13	980194.43	980322.83	0.74	-15.32
8800.0748	387857.0	5394246.0	582.20	980192.32	980322.85	0.70	-15.31
8800.0749	387900.0	5394223.0	594.44	980189.85	980322.87	0.64	-15.45

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0750	387940.0	5394200.0	602.54	980188.35	980322.89	0.60	-15.42
8800.0751	387942.0	5394195.0	599.59	980189.09	980322.89	0.43	-15.44
8800.0752	387961.0	5394241.0	593.19	980190.50	980322.86	0.44	-15.24
8800.0753	387980.0	5394287.0	589.79	980191.53	980322.82	0.46	-14.82
8800.0754	387999.0	5394333.0	587.84	980191.73	980322.78	0.47	-14.95
8800.0755	388107.0	5394349.0	582.23	980192.59	980322.77	0.49	-15.17
8800.0756	388061.0	5394368.0	584.74	980192.04	980322.76	0.48	-15.22
8800.0758	387978.0	5394406.0	571.43	980194.81	980322.72	0.50	-15.02
8800.0759	387932.0	5394425.0	568.99	980195.11	980322.71	0.50	-15.18
8800.0760	387885.0	5394444.0	560.01	980196.73	980322.69	0.49	-15.31
8800.0761	387838.0	5394463.0	552.03	980198.32	980322.68	0.48	-15.29
8800.0762	387792.0	5394482.0	550.12	980198.45	980322.66	0.52	-15.48
8800.0763	387745.0	5394501.0	548.74	980198.65	980322.64	0.55	-15.51
8800.0764	387699.0	5394520.0	548.23	980198.62	980322.63	0.57	-15.60
8800.0765	387652.0	5394539.0	547.41	980198.67	980322.61	0.59	-15.68
8800.0766	387606.0	5394558.0	550.13	980197.91	980322.60	0.60	-15.88
8800.0767	387559.0	5394577.0	550.47	980197.86	980322.58	0.63	-15.81
8800.0768	387493.0	5394596.0	552.00	980197.66	980322.56	0.65	-15.68
8800.0769	387447.0	5394615.0	555.47	980197.04	980322.55	0.64	-15.61
8800.0770	387401.0	5394634.0	557.72	980196.17	980322.53	0.62	-16.04
8800.0771	387354.0	5394653.0	570.53	980193.13	980322.52	0.61	-16.55
8800.0772	387308.0	5394672.0	570.11	980193.07	980322.50	0.60	-16.69
8800.0773	387261.0	5394691.0	577.32	980191.35	980322.48	0.58	-17.00
8800.0774	387215.0	5394710.0	593.62	980187.90	980322.47	0.57	-17.23
8800.0775	387216.0	5394715.0	597.18	980187.14	980322.46	0.60	-17.26
8800.0776	387660.0	5395650.0	677.22	980168.84	980321.72	0.51	-19.15
8800.0777	387705.0	5395628.0	683.69	980167.32	980321.73	0.51	-19.42
8800.0779	387795.0	5395584.0	658.83	980173.21	980321.77	0.50	-18.47
8800.0780	387840.0	5395562.0	648.72	980175.77	980321.79	0.49	-17.93
8800.0781	387885.0	5395540.0	642.99	980177.22	980321.81	0.48	-17.63
8800.0782	387930.0	5395518.0	641.43	980177.80	980321.83	0.49	-17.36
8800.0783	387975.0	5395496.0	640.56	980178.17	980321.84	0.50	-17.18
8800.0784	388020.0	5395474.0	641.65	980178.23	980321.86	0.50	-16.92
8800.0785	388065.0	5395452.0	645.96	980177.52	980321.88	0.53	-16.77
8800.0786	388110.0	5395430.0	650.25	980176.83	980321.90	0.56	-16.60
8800.0787	388155.0	5395408.0	655.89	980175.69	980321.92	0.58	-16.64
8800.0788	388200.0	5395386.0	657.94	980175.33	980321.94	0.60	-16.59
8800.0789	388245.0	5395364.0	649.84	980177.03	980321.95	0.61	-16.49
8800.0790	387390.0	5395076.0	634.87	980178.28	980322.18	0.62	-18.40
8800.0791	387394.0	5395073.0	633.34	980178.70	980322.18	0.62	-18.28
8800.0792	387440.0	5395055.0	630.23	980179.54	980322.19	0.66	-18.03
8800.0793	387486.0	5395037.0	625.98	980180.61	980322.21	0.70	-17.77
8800.0794	387532.0	5395019.0	618.01	980182.54	980322.22	0.73	-17.39
8800.0795	387578.0	5395001.0	612.49	980183.89	980322.24	0.76	-17.11
8800.0797	387670.0	5394965.0	597.15	980186.83	980322.27	0.85	-17.13
8800.0798	387716.0	5394946.0	590.86	980188.44	980322.28	0.89	-16.74
8800.0799	387762.0	5394927.0	581.94	980190.40	980322.30	0.91	-16.53
8800.0800	387908.0	5395692.0	642.85	980177.52	980321.69	0.47	-17.25
8800.0801	387861.0	5395709.0	643.70	980177.12	980321.67	0.44	-17.49
8800.0802	387814.0	5395726.0	644.43	980176.84	980321.66	0.45	-17.61
8800.0803	387767.0	5395743.0	645.66	980176.38	980321.64	0.45	-17.81
8800.0804	387720.0	5395760.0	645.20	980176.47	980321.63	0.46	-17.79
8800.0805	387731.0	5395799.0	645.35	980176.33	980321.60	0.54	-17.78
8800.0806	387744.0	5395877.0	635.11	980178.99	980321.53	0.59	-17.03

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NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0807	387758.0	5395877.0	635.11	980178.84	980321.53	0.62	-17.15
8800.0808	387769.0	5395920.0	631.40	980179.63	980321.50	0.63	-17.04
8800.0809	387780.0	5395930.0	631.33	980179.64	980321.49	0.56	-17.11
8800.0810	387827.0	5395914.0	629.44	980180.18	980321.50	0.56	-16.96
8800.0811	387874.0	5395898.0	633.88	980179.32	980321.52	0.58	-16.93
8800.0812	387920.0	5395882.0	634.06	980179.38	980321.53	0.57	-16.87
8800.0813	387967.0	5395866.0	635.18	980179.14	980321.55	0.54	-16.92
8800.0814	388014.0	5395850.0	637.98	980178.62	980321.56	0.53	-16.92
8800.0815	388061.0	5395834.0	639.61	980178.27	980321.57	0.50	-16.99
8800.0816	388107.0	5395818.0	642.33	980177.80	980321.59	0.48	-16.95
8800.0817	388154.0	5395802.0	645.63	980177.36	980321.60	0.46	-16.79
8800.0818	388200.0	5395786.0	648.32	980176.89	980321.61	0.45	-16.75
8800.0819	388247.0	5395770.0	649.73	980176.71	980321.63	0.44	-16.68
8800.0820	388294.0	5395754.0	651.69	980176.49	980321.64	0.44	-16.53
8800.0821	388341.0	5395738.0	655.15	980175.85	980321.65	0.45	-16.49
8800.0822	388387.0	5395722.0	651.36	980176.74	980321.67	0.44	-16.36
8800.0823	388434.0	5395706.0	645.62	980178.36	980321.68	0.45	-15.87
8800.0824	388481.0	5395690.0	641.38	980179.55	980321.69	0.45	-15.54
8800.0825	388528.0	5395674.0	637.69	980180.28	980321.71	0.44	-15.56
8800.0829	388472.0	5395488.0	631.73	980182.14	980321.86	0.48	-14.97
8800.0830	388425.0	5395505.0	637.54	980180.80	980321.84	0.48	-15.16
8800.0831	388378.0	5395572.0	646.15	980178.62	980321.79	0.48	-15.59
8800.0832	388331.0	5395539.0	657.33	980175.62	980321.81	0.45	-16.44
8800.0833	388284.0	5395556.0	661.96	980174.68	980321.80	0.46	-16.45
8800.0834	388237.0	5395573.0	660.81	980174.86	980321.78	0.47	-16.47
8800.0835	388190.0	5395590.0	654.83	980176.02	980321.77	0.45	-16.50
8800.0836	388143.0	5395607.0	648.12	980177.17	980321.76	0.46	-16.65
8800.0837	388096.0	5395624.0	644.17	980177.72	980321.74	0.46	-16.85
8800.0838	388049.0	5395641.0	642.11	980178.00	980321.73	0.43	-17.00
8800.0839	388002.0	5395658.0	641.86	980177.83	980321.71	0.47	-17.15
8800.0840	387955.0	5395675.0	642.41	980177.54	980321.70	0.46	-17.34
8800.0841	388485.0	5395914.0	660.08	980174.14	980321.51	0.51	-17.02
8800.0842	387804.0	5394908.0	569.92	980193.13	980322.32	0.89	-16.19
8800.0843	387846.0	5394890.0	559.50	980195.71	980322.33	0.93	-15.64
8800.0844	387890.0	5394872.0	562.04	980195.48	980322.35	0.91	-15.41
8800.0845	387932.0	5394853.0	571.24	980193.79	980322.36	0.90	-15.31
8800.0846	387974.0	5394834.0	576.72	980192.79	980322.38	0.91	-15.24
8800.0847	388135.0	5394805.0	602.93	980187.20	980322.40	0.89	-15.71
8800.0848	388177.0	5394770.0	635.03	980180.08	980322.43	0.92	-16.53
8800.0849	388220.0	5394787.0	623.04	980182.99	980322.42	0.91	-15.97
8800.0852	388100.0	5394567.0	561.78	980196.01	980322.60	0.65	-15.43
8800.0853	388054.0	5394583.0	554.78	980197.41	980322.58	0.63	-15.41
8800.0854	388008.0	5394600.0	553.65	980197.61	980322.57	0.62	-15.44
8800.0855	387960.0	5394619.0	552.67	980197.64	980322.55	0.61	-15.60
8800.0856	387908.0	5394637.0	551.62	980197.71	980322.54	0.60	-15.73
8800.0857	387866.0	5394654.0	550.65	980197.77	980322.52	0.58	-15.86
8800.0858	387818.0	5394673.0	550.26	980197.67	980322.51	0.55	-16.05
8800.0859	387770.0	5394692.0	551.19	980197.48	980322.49	0.53	-16.06
8800.0860	387722.0	5394711.0	551.97	980197.14	980322.47	0.51	-16.25
8800.0861	387674.0	5394730.0	554.84	980196.28	980322.46	0.52	-16.52
8800.0862	387626.0	5394749.0	563.83	980194.31	980322.44	0.54	-16.69
8800.0863	387580.0	5394767.0	570.68	980192.84	980322.43	0.55	-16.78
8800.0864	387533.0	5394785.0	581.22	980190.49	980322.41	0.55	-17.05
8800.0865	387487.0	5394803.0	591.61	980188.06	980322.40	0.52	-17.44

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0866	387440.0	5394822.0	604.30	980185.25	980322.38	0.51	-17.76
8800.0867	387393.0	5394841.0	610.70	980184.08	980322.36	0.50	-17.66
8800.0868	387346.0	5394860.0	612.15	980183.67	980322.35	0.49	-17.77
8800.0869	387297.0	5394878.0	610.43	980184.05	980322.33	0.46	-17.75
8800.0870	387280.0	5394840.0	608.50	980184.24	980322.36	0.50	-17.93
8800.0871	388527.0	5395897.0	659.42	980174.36	980321.53	0.50	-16.96
8800.0872	388574.0	5395879.0	656.53	980175.29	980321.54	0.47	-16.64
8800.0873	388620.0	5395861.0	651.19	980176.82	980321.56	0.46	-16.19
8800.0874	388665.0	5395843.0	649.35	980177.50	980321.57	0.43	-15.92
8800.0875	388710.0	5395824.0	650.71	980177.53	980321.59	0.43	-15.63
8800.0876	388755.0	5395806.0	652.84	980177.09	980321.60	0.41	-15.69
8800.0877	388802.0	5395797.0	647.10	980178.47	980321.61	0.39	-15.46
8800.0878	388847.0	5395778.0	650.09	980177.93	980321.63	0.39	-15.44
8800.0879	388892.0	5395760.0	652.12	980177.61	980321.64	0.38	-15.38
8800.0880	388937.0	5395740.0	654.89	980177.07	980321.66	0.39	-15.38
8800.0881	388985.0	5395718.0	655.06	980177.12	980321.68	0.39	-15.31
8800.0882	389123.0	5395682.0	643.57	980179.21	980321.55	0.42	-15.32
8800.0883	389077.0	5395900.0	636.28	980180.65	980321.53	0.45	-15.27
8800.0884	389031.0	5395918.0	633.18	980181.17	980321.52	0.44	-15.36
8800.0885	388985.0	5395936.0	642.76	980179.27	980321.50	0.43	-15.37
8800.0886	388938.0	5395954.0	643.29	980179.24	980321.49	0.43	-15.28
8800.0887	388892.0	5395972.0	642.68	980179.29	980321.47	0.48	-15.28
8800.0888	388845.0	5395990.0	651.14	980179.45	980321.46	0.46	-15.47
8800.0889	388799.0	5396006.0	645.26	980178.73	980321.44	0.46	-15.33
8800.0890	388752.0	5396024.0	648.79	980177.61	980321.43	0.48	-15.72
8800.0891	388760.0	5396076.0	650.52	980177.23	980321.39	0.48	-15.72
8800.0894	388769.0	5396220.0	632.50	980180.88	980321.27	0.55	-15.43
8800.0895	388816.0	5396203.0	624.30	980182.71	980321.28	0.54	-15.23
8800.0896	388863.0	5396186.0	631.07	980181.27	980321.30	0.52	-15.38
8800.0897	388910.0	5396169.0	633.00	980180.91	980321.31	0.48	-15.41
8800.0898	388957.0	5396152.0	624.37	980182.94	980321.33	0.44	-15.13
8800.0899	389004.0	5396135.0	629.88	980181.83	980321.34	0.45	-15.17
8800.0900	389051.0	5396118.0	634.17	980181.06	980321.36	0.44	-15.12
8800.0901	389098.0	5396101.0	634.66	980181.04	980321.37	0.40	-15.09
8800.0902	389145.0	5396084.0	635.21	980181.11	980321.38	0.39	-14.94
8800.0903	389192.0	5396067.0	639.03	980180.27	980321.40	0.39	-15.04
8800.0904	389239.0	5396050.0	645.17	980178.92	980321.41	0.37	-15.22
8800.0905	389286.0	5396033.0	649.74	980177.98	980321.43	0.36	-15.29
8800.0906	389333.0	5396016.0	652.06	980177.48	980321.44	0.38	-15.32
8800.0907	388706.0	5396042.0	663.25	980173.68	980321.41	0.49	-16.78
8800.0908	388659.0	5396060.0	665.74	980172.94	980321.40	0.51	-17.00
8800.0909	388613.0	5396078.0	662.37	980173.39	980321.38	0.55	-17.15
8800.0911	388520.0	5396114.0	645.81	980176.64	980321.35	0.61	-17.07
8800.0912	388473.0	5396132.0	640.68	980177.48	980321.34	0.68	-17.16
8800.0913	388426.0	5396150.0	625.54	980181.93	980321.32	0.72	-16.63
8800.0914	388380.0	5396168.0	616.31	980183.03	980321.31	0.73	-16.32
8800.0915	388333.0	5396186.0	611.11	980184.25	980321.29	0.75	-16.08
8800.0916	388287.0	5396204.0	609.88	980184.24	980321.28	0.77	-16.30
8800.0918	388194.0	5396240.0	591.77	980187.68	980321.25	0.78	-16.39
8800.0919	388150.0	5394556.0	567.27	980195.12	980322.68	0.60	-16.30
8800.0920	388102.0	5396276.0	590.18	980187.89	980321.22	0.81	-16.43
8800.0921	388055.0	5396294.0	588.94	980188.17	980321.20	0.82	-16.37
8800.0922	388009.0	5396312.0	576.00	980190.67	980321.19	0.90	-16.32
8800.0923	387962.0	5396328.0	567.75	980192.31	980321.17	0.94	-16.24

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0924	387916.0	5396346.0	568.89	980192.03	980321.16	0.66	-16.57
8800.0925	387890.0	5396163.0	611.45	980183.77	980321.31	0.69	-16.58
8800.0926	387935.0	5396144.0	612.03	980184.03	980321.32	0.62	-16.28
8800.0927	387981.0	5396125.0	614.46	980183.67	980321.34	0.54	-16.26
8800.0928	388026.0	5396106.0	613.98	980183.82	980321.35	0.51	-16.26
8800.0929	388072.0	5396087.0	618.41	980182.92	980321.37	0.50	-16.30
8800.0930	388117.0	5396068.0	626.20	980181.14	980321.38	0.50	-16.57
8800.0931	388162.0	5396049.0	631.56	980179.92	980321.40	0.51	-16.74
8800.0932	388908.0	5394464.0	671.23	980174.73	980322.69	0.70	-15.23
8800.0933	388252.0	5396011.0	642.79	980177.61	980321.43	0.49	-16.89
8800.0934	388297.0	5395992.0	649.37	980176.23	980321.45	0.48	-17.00
8800.0935	388345.0	5395976.0	654.30	980175.14	980321.46	0.48	-17.14
8800.0936	388391.0	5395957.0	658.86	980174.26	980321.48	0.49	-17.13
8800.0937	388427.0	5395938.0	660.16	980174.09	980321.49	0.48	-17.07
8800.0938	389298.0	5394521.0	642.40	980181.35	980322.65	0.45	-14.48
8800.0939	389313.0	5394570.0	651.61	980179.56	980322.61	0.43	-14.45
8800.0940	389296.0	5394629.0	651.02	980179.61	980322.56	0.43	-14.47
8800.0941	389229.0	5394682.0	654.24	980178.92	980322.52	0.41	-14.50
8800.0942	389171.0	5394729.0	655.58	980178.65	980322.48	0.39	-14.49
8800.0943	389089.0	5394767.0	656.77	980178.30	980322.45	0.40	-14.56
8800.0944	389015.0	5394846.0	662.22	980177.08	980322.38	0.39	-14.65
8800.0945	388943.0	5394853.0	667.00	980175.99	980322.37	0.40	-14.79
8800.0946	389092.0	5394567.0	662.82	980176.76	980322.61	0.58	-14.89
8800.0947	389037.0	5394575.0	661.62	980177.06	980322.60	0.55	-14.85
8800.0948	388985.0	5394630.0	662.15	980176.82	980322.55	0.55	-14.94
8800.0949	388963.0	5394698.0	657.62	980178.03	980322.50	0.42	-14.70
8800.0950	388949.0	5394777.0	662.21	980177.14	980322.44	0.47	-14.57
8800.0951	388888.0	5394925.0	662.53	980176.83	980322.32	0.32	-14.85
8800.0952	388810.0	5394967.0	660.02	980177.24	980322.28	0.42	-14.80
8800.0953	388752.0	5395015.0	658.61	980177.44	980322.24	0.42	-14.83
8800.0954	388676.0	5395089.0	647.52	980179.43	980322.18	0.48	-14.91
8800.0955	388629.0	5395169.0	638.85	980181.14	980322.12	0.48	-14.83
8800.0956	388574.0	5395232.0	622.49	980184.52	980322.06	0.47	-14.63
8800.0957	388499.0	5395284.0	615.88	980185.72	980322.02	0.54	-14.61
8800.0958	388729.0	5395648.0	647.65	980178.83	980321.73	0.42	-15.09
8800.0959	388650.0	5395545.0	637.10	980181.07	980321.81	0.45	-14.98
8800.0960	388521.0	5395471.0	626.13	980183.45	980321.87	0.46	-14.80
8800.0961	388568.0	5395454.0	630.15	980182.72	980321.88	0.45	-14.76
8800.0962	388615.0	5395437.0	636.99	980181.17	980321.90	0.47	-14.96
8800.0963	388662.0	5395420.0	642.27	980180.20	980321.91	0.45	-14.93
8800.0964	388709.0	5395403.0	647.09	980179.25	980321.93	0.44	-14.95
8800.0965	388756.0	5395386.0	649.78	980178.78	980321.94	0.43	-14.92
8800.0966	388803.0	5395368.0	652.80	980178.01	980321.96	0.43	-15.11
8800.0967	388851.0	5395347.0	655.57	980177.62	980321.97	0.42	-14.98
8800.0968	388579.0	5395360.0	628.68	980183.15	980321.96	0.48	-14.67
8800.0969	388620.0	5395642.0	646.25	980178.90	980321.73	0.42	-15.30
8800.0970	388689.0	5395623.0	644.85	980179.30	980321.75	0.45	-15.15
8800.0971	388735.0	5395604.0	643.59	980179.76	980321.77	0.36	-15.05
8800.0972	388848.0	5394487.0	666.38	980175.66	980322.67	0.58	-15.35
8800.0973	388803.0	5394505.0	657.65	980177.55	980322.65	0.59	-15.15
8800.0974	388756.0	5394525.0	650.27	980179.67	980322.64	0.61	-14.45
8800.0975	388709.0	5394545.0	639.15	980182.06	980322.62	0.65	-14.19
8800.0976	388672.0	5394565.0	630.54	980183.74	980322.60	0.67	-14.17
8800.0977	388627.0	5394582.0	625.40	980184.71	980322.59	0.69	-14.17

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.0978	388582.0	5394600.0	620.97	980185.45	980322.57	0.73	-14.25
8800.0979	388537.0	5394617.0	638.45	980181.14	980322.56	0.77	-15.07
8800.0980	388492.0	5394639.0	652.74	980177.42	980322.54	0.77	-15.96
8800.0981	388446.0	5394661.0	660.42	980175.19	980322.52	0.79	-16.64
8800.0982	388302.0	5394683.0	658.98	980175.69	980322.50	0.78	-16.42
8800.0983	388356.0	5394705.0	652.04	980177.17	980322.49	0.76	-16.30
8800.0984	388311.0	5394727.0	646.74	980178.26	980322.47	0.84	-16,15
8800.0985	388266.0	5394750.0	642.83	980178.73	980322.45	0.84	-16.44
8800.0986	388196.0	5394537.0	575.32	980193.53	980322.62	0.57	-15.36
8800.0987	388243.0	5394518.0	580.57	980192.51	980322.64	0.53	-15.40
8800.0988	388290.0	5394499.0	579.06	980192.88	980322.65	0.48	-15.39
8800.0990	388373.0	5394461.0	568.67	980195.33	980322.68	0.50	-14.99
8800.0991	388419.0	5394442.0	574.44	980194.25	980322.70	0.53	-14.93
8800.0992	388466.0	5394423.0	575.87	980194.13	980322.72	0.55	-14.76
8800.0993	388508.0	5394404.0	585.05	980192.28	980322.73	0.59	-14.78
8800.0994	388555.0	5394385.0	595.74	980190.13	980322.75	0.63	-14.80
8800.0995	388602.0	5394367.0	610.18	980187.17	980322.76	0.72	-14.85
8800.0997	388696.0	5394329.0	644.91	980179.99	980322.79	0.63	-15.32
8800.0998	388742.0	5394310.0	652.11	980178.54	980322.81	0.72	-15.28
8800.0999	388788.0	5394291.0	654.48	980178.09	980322.83	0.77	-15.23

411186

LEAMAN GEOPHYSICS GRAVITY REDUCTION

CSR QUE ROAD GRAVITY SURVEY JAN 1988 (3)

QUERED3

BASE VALUE	BASE NUMBER	METER	CAL DATE	SCALE	DENSITY	ELEV DATUM
980177.50	8551.9976	556	10188	1.0139	2.67	0.00

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.1000	388834.0	5394272.0	653.06	980178.42	980322.84	0.81	-15.15
8800.1001	389097.0	5394919.0	664.49	980176.56	980322.32	0.38	-14.68
8800.1002	389052.0	5394938.0	662.81	980176.88	980322.31	0.38	-14.67
8800.1003	389009.0	5394960.0	660.48	980177.32	980322.29	0.39	-14.67
8800.1004	388966.0	5394979.0	657.97	980177.82	980322.27	0.40	-14.63
8800.1005	388922.0	5394998.0	657.29	980178.00	980322.26	0.40	-14.57
8800.1006	388876.0	5395017.0	656.64	980177.85	980322.24	0.41	-14.82
8800.1007	388831.0	5395036.0	658.96	980177.44	980322.23	0.43	-14.74
8800.1008	388787.0	5395055.0	658.60	980177.37	980322.21	0.45	-14.85
8800.1009	388771.0	5394125.0	600.79	980189.29	980322.96	0.72	-14.77
8800.1010	388792.0	5394175.0	621.92	980185.23	980322.92	0.66	-14.70
8800.1011	388752.0	5394080.0	610.00	980187.61	980323.00	0.60	-14.80
8800.1012	388730.0	5394100.0	588.34	980191.56	980322.98	0.63	-15.06
8800.1014	388637.0	5394140.0	592.14	980191.05	980322.95	0.61	-14.82
8800.1015	388591.0	5394159.0	580.10	980193.38	980322.93	0.63	-14.82
8800.1016	388545.0	5394178.0	581.50	980192.80	980322.91	0.61	-15.12
8800.1017	388478.0	5394197.0	588.75	980191.36	980322.90	0.57	-15.16
8800.1018	388432.0	5394216.0	577.54	980193.56	980322.88	0.54	-15.18
8800.1019	388386.0	5394235.0	577.25	980193.56	980322.87	0.54	-15.22
8800.1020	388339.0	5394254.0	578.25	980193.35	980322.85	0.50	-15.26
8800.1021	388293.0	5394273.0	579.32	980193.05	980322.83	0.47	-15.36
8800.1022	388238.0	5397057.0	636.90	980178.68	980320.59	0.90	-15.73
8800.1023	388200.0	5394311.0	577.45	980193.44	980322.80	0.44	-15.34
8800.1024	388153.0	5394330.0	574.89	980194.00	980322.79	0.45	-15.26
8800.1025	388023.0	5394349.0	568.67	980194.98	980322.77	0.49	-15.44
8800.1026	388038.0	5394157.0	602.25	980188.92	980322.93	0.50	-15.05
8800.1027	388085.0	5394136.0	602.50	980188.99	980322.94	0.48	-14.96
8800.1028	388131.0	5394119.0	606.96	980188.25	980322.96	0.49	-14.83
8800.1029	388177.0	5394100.0	616.17	980186.34	980322.97	0.49	-14.94
8800.1030	388223.0	5394082.0	626.41	980184.10	980322.99	0.48	-15.19
8800.1031	388270.0	5394064.0	627.09	980184.14	980323.00	0.47	-15.04
8800.1032	388316.0	5394046.0	629.88	980183.57	980323.02	0.47	-15.08
8800.1033	388363.0	5394027.0	622.37	980185.20	980323.03	0.46	-14.96
8800.1034	388409.0	5394008.0	610.51	980187.58	980323.05	0.44	-14.94
8800.1035	389755.0	5397101.0	667.26	980171.52	980320.57	0.45	-17.35
8800.1036	388502.0	5393971.0	614.31	980186.76	980323.08	0.42	-15.07
8800.1037	388549.0	5393953.0	626.71	980184.02	980323.10	0.43	-15.37
8800.1038	388595.0	5393934.0	633.89	980182.54	980323.11	0.41	-15.48
8800.1039	388640.0	5393916.0	638.23	980181.64	980323.13	0.41	-15.54
8800.1040	388685.0	5393898.0	636.72	980182.17	980323.14	0.42	-15.31
8800.1041	388704.0	5394944.0	585.44	980191.97	980322.30	0.45	-14.72
8800.1042	388798.0	5394061.0	623.93	980185.07	980323.01	0.63	-14.58
8800.1043	388844.0	5394042.0	628.38	980184.39	980323.03	0.53	-14.50
8800.1044	388890.0	5394023.0	630.96	980183.89	980323.04	0.47	-14.58
8800.1045	388936.0	5394004.0	636.49	980182.67	980323.06	0.41	-14.78
8800.1046	388982.0	5393985.0	643.83	980181.39	980323.08	0.43	-14.61
8800.1047	389028.0	5393966.0	650.40	980180.09	980323.09	0.41	-14.66
8800.1048	389074.0	5393947.0	655.22	980179.04	980323.11	0.40	-14.78

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.1049	389120.0	5393928.0	654.72	980179.03	980323.12	0.43	-14.88
8800.1050	390004.0	5397237.0	679.23	980169.38	980320.46	0.37	-17.11
8800.1051	389959.0	5397256.0	678.82	980169.26	980320.45	0.38	-17.29
8800.1052	389914.0	5397275.0	677.23	980169.35	980320.43	0.40	-17.47
8800.1053	389869.0	5397294.0	673.91	980169.93	980320.42	0.40	-17.53
8800.1054	389823.0	5397314.0	670.56	980170.68	980320.40	0.42	-17.40
8800.1055	389778.0	5397333.0	665.11	980171.49	980320.38	0.43	-17.64
8800.1056	389733.0	5397352.0	657.62	980172.82	980320.37	0.40	-17.80
8800.1057	389688.0	5397371.0	657.58	980172.76	980320.35	0.40	-17.85
8800.1058	389643.0	5397390.0	661.59	980171.96	980320.34	0.42	-17.82
8800.1059	389598.0	5397409.0	668.82	980170.43	980320.32	0.40	-17.93
8800.1060	389552.0	5397429.0	675.81	980168.93	980320.30	0.39	-18.05
8800.1061	389507.0	5397448.0	678.71	980168.29	980320.29	0.37	-18.12
8800.1062	389462.0	5397467.0	680.07	980168.05	980320.27	0.38	-18.07
8800.1063	389417.0	5397486.0	682.27	980167.34	980320.26	0.35	-18.36
8800.1064	389372.0	5397505.0	686.98	980166.24	980320.24	0.36	-18.52
8800.1065	389327.0	5397525.0	691.78	980165.87	980320.22	0.35	-17.93
8800.1066	389280.0	5397545.0	693.17	980166.48	980320.21	0.34	-17.04
8800.1067	389229.0	5397384.0	680.88	980168.31	980320.34	0.41	-17.68
8800.1068	389204.0	5397334.0	679.46	980168.63	980320.38	0.42	-17.68
8800.1069	389158.0	5397353.0	677.78	980169.12	980320.36	0.42	-17.51
8800.1070	389112.0	5397372.0	677.65	980168.99	980320.34	0.42	-17.64
8800.1071	389066.0	5397391.0	678.29	980168.72	980320.33	0.41	-17.79
8800.1072	389020.0	5397410.0	680.23	980168.46	980320.31	0.42	-17.64
8800.1073	388975.0	5397430.0	683.64	980167.68	980320.30	0.43	-17.72
8800.1074	388929.0	5397449.0	684.06	980167.50	980320.28	0.45	-17.77
8800.1075	388883.0	5397468.0	682.86	980167.73	980320.27	0.46	-17.76
8800.1076	388837.0	5397487.0	679.48	980168.32	980320.25	0.47	-17.80
8800.1077	388792.0	5397506.0	677.77	980168.86	980320.23	0.50	-17.55
8800.1078	388746.0	5397526.0	674.71	980169.28	980320.22	0.53	-17.69
8800.1079	389220.0	5397327.0	680.13	980168.52	980320.38	0.42	-17.66
8800.1080	389250.0	5397315.0	679.91	980168.53	980320.39	0.40	-17.73
8800.1081	389296.0	5397295.0	679.82	980168.74	980320.41	0.42	-17.53
8800.1082	389342.0	5397276.0	678.88	980168.97	980320.43	0.45	-17.47
8800.1083	389388.0	5397257.0	672.97	980170.17	980320.44	0.45	-17.45
8800.1084	389434.0	5397238.0	665.21	980171.80	980320.46	0.46	-17.35
8800.1085	389480.0	5397219.0	659.14	980172.99	980320.47	0.48	-17.35
8800.1086	389526.0	5397200.0	656.99	980173.47	980320.49	0.49	-17.29
8800.1087	389572.0	5397180.0	654.04	980174.06	980320.51	0.51	-17.28
8800.1088	389617.0	5397161.0	652.61	980174.22	980320.52	0.50	-17.44
8800.1089	389663.0	5397142.0	655.79	980173.59	980320.54	0.49	-17.47
8800.1090	389709.0	5397123.0	660.39	980172.78	980320.55	0.47	-17.41
8800.1091	389801.0	5397083.0	672.43	980170.54	980320.59	0.45	-17.32
8800.1092	389847.0	5397064.0	676.47	980169.61	980320.60	0.45	-17.48
8800.1093	389893.0	5397045.0	678.43	980169.41	980320.62	0.44	-17.32
8800.1094	389939.0	5397026.0	679.23	980169.41	980320.63	0.43	-17.19
8800.1095	389985.0	5397007.0	679.93	980169.34	980320.65	0.43	-17.14
8800.1096	390031.0	5397988.0	680.64	980168.27	980319.86	0.42	-17.28
8800.1097	390077.0	5396970.0	680.19	980169.30	980320.68	0.42	-17.17
8800.1100	389865.0	5396880.0	677.73	980169.66	980320.75	0.43	-17.35
8800.1101	389911.0	5396861.0	676.86	980169.70	980320.77	0.47	-17.46
8800.1102	389947.0	5396842.0	671.18	980170.79	980320.78	0.47	-17.50
8800.1103	389993.0	5396823.0	665.65	980172.10	980320.80	0.47	-17.30
8800.1104	390039.0	5396804.0	663.33	980172.68	980320.81	0.46	-17.19

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.1105	390085.0	5396785.0	664.78	980172.40	980320.83	0.48	-17.19
8800.1106	390131.0	5396766.0	664.82	980172.42	980320.85	0.49	-17.17
8800.1107	389814.0	5396895.0	677.62	980169.56	980320.74	0.48	-17.41
8800.1108	389767.0	5396914.0	677.55	980169.44	980320.72	0.49	-17.52
8800.1109	389722.0	5396933.0	678.37	980169.20	980320.71	0.52	-17.55
8800.1110	389673.0	5396950.0	678.24	980169.27	980320.69	0.53	-17.49
8800.1111	389626.0	5396971.0	672.41	980170.32	980320.67	0.50	-17.59
8800.1112	389579.0	5396990.0	663.84	980171.97	980320.66	0.49	-17.62
8800.1113	389534.0	5397007.0	655.96	980173.68	980320.64	0.48	-17.46
8800.1114	389485.0	5397028.0	650.58	980174.72	980320.63	0.46	-17.48
8800.1115	389433.0	5397049.0	648.66	980175.37	980320.61	0.47	-17.18
8800.1116	389390.0	5397066.0	651.14	980174.95	980320.60	0.47	-17.10
8800.1117	389343.0	5397088.0	656.54	980173.70	980320.58	0.45	-17.29
8800.1118	389296.0	5397107.0	663.37	980172.25	980320.56	0.46	-17.37
8800.1119	389252.0	5397128.0	666.88	980171.63	980320.54	0.45	-17.29
8800.1120	389204.0	5397145.0	665.69	980172.03	980320.53	0.43	-17.13
8800.1121	389157.0	5397164.0	663.05	980172.57	980320.51	0.42	-17.10
8800.1122	389116.0	5397181.0	659.61	980173.43	980320.50	0.44	-16.88
8800.1123	389073.0	5397197.0	657.15	980173.99	980320.49	0.43	-16.80
8800.1124	389027.0	5397216.0	660.38	980173.13	980320.47	0.44	-17.00
8800.1125	388981.0	5397234.0	668.59	980171.41	980320.45	0.42	-17.12
8800.1126	388935.0	5397254.0	673.91	980170.27	980320.44	0.42	-17.19
8800.1127	388889.0	5397275.0	676.27	980169.69	980320.42	0.40	-17.30
8800.1128	388843.0	5397293.0	676.44	980169.46	980320.41	0.42	-17.47
8800.1129	388797.0	5397311.0	673.91	980169.89	980320.39	0.43	-17.52
8800.1130	388752.0	5397329.0	671.44	980170.15	980320.37	0.44	-17.71
8800.1131	388704.0	5397348.0	668.73	980170.59	980320.36	0.45	-17.78
8800.1132	388658.0	5397366.0	666.39	980171.28	980320.34	0.47	-17.51
8800.1133	388612.0	5397385.0	664.43	980171.64	980320.33	0.49	-17.51
8800.1134	388563.0	5397404.0	661.28	980172.47	980320.31	0.51	-17.26
8800.1135	388519.0	5397423.0	659.10	980173.01	980320.30	0.48	-17.16
8800.1136	388472.0	5397441.0	658.64	980173.03	980320.28	0.48	-17.22
8800.1137	388426.0	5397460.0	658.54	980173.05	980320.27	0.46	-17.22
8800.1138	388379.0	5397479.0	657.49	980173.21	980320.25	0.48	-17.23
8800.1139	388366.0	5397399.0	663.77	980172.12	980320.31	0.49	-17.14
8800.1140	388327.0	5397306.0	656.91	980173.64	980320.39	0.50	-17.04
8800.1141	388325.0	5397300.0	656.17	980173.81	980320.39	0.51	-17.00
8800.1142	389009.0	5396988.0	645.65	980176.58	980320.65	0.42	-16.66
8800.1143	389055.0	5396970.0	643.36	980177.49	980320.67	0.44	-16.19
8800.1144	389101.0	5396952.0	644.36	980177.20	980320.68	0.44	-16.30
8800.1145	389148.0	5396934.0	645.31	980176.87	980320.70	0.45	-16.44
8800.1146	389194.0	5396916.0	646.00	980176.70	980320.71	0.46	-16.49
8800.1147	389240.0	5396898.0	647.23	980176.37	980320.73	0.48	-16.56
8800.1148	389286.0	5396880.0	648.63	980176.31	980320.74	0.48	-16.36
8800.1149	389332.0	5396862.0	645.49	980176.67	980320.76	0.49	-16.63
8800.1150	389378.0	5396844.0	646.45	980176.41	980320.77	0.44	-16.77
8800.1151	389424.0	5396826.0	649.89	980175.82	980320.79	0.44	-16.70
8800.1152	389470.0	5396808.0	655.41	980174.53	980320.80	0.48	-16.88
8800.1153	389517.0	5396790.0	661.93	980173.03	980320.82	0.53	-17.06
8800.1154	389564.0	5396772.0	669.11	980171.41	980320.83	0.55	-17.26
8800.1155	389610.0	5396754.0	670.78	980171.21	980320.85	0.60	-17.09
8800.1156	389656.0	5396736.0	666.32	980172.12	980320.86	0.58	-17.10
8800.1157	389702.0	5396718.0	666.07	980172.34	980320.88	0.56	-16.96
8800.1158	389748.0	5396700.0	666.57	980172.00	980320.90	0.53	-17.25

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.1159	389795.0	5396682.0	657.35	980173.78	980320.91	0.50	-17.33
8800.1160	389530.0	5396558.0	637.42	980178.67	980321.01	0.61	-16.35
8800.1161	389484.0	5396576.0	639.78	980178.08	980320.99	0.60	-16.47
8800.1162	389438.0	5396594.0	638.23	980178.32	980320.98	0.57	-16.55
8800.1163	389392.0	5396612.0	634.82	980179.07	980320.96	0.56	-16.45
8800.1164	389346.0	5396631.0	629.77	980180.19	980320.95	0.54	-16.34
8800.1165	389300.0	5396649.0	620.50	980182.23	980320.93	0.55	-16.09
8800.1166	389253.0	5396667.0	611.68	980184.20	980320.92	0.52	-15.88
8800.1167	389207.0	5396685.0	610.22	980184.68	980320.90	0.48	-15.71
8800.1168	389161.0	5396703.0	621.35	980182.60	980320.88	0.48	-15.59
8800.1169	389115.0	5396721.0	630.25	980180.76	980320.87	0.47	-15.66
8800.1170	389069.0	5396739.0	633.48	980180.11	980320.86	0.50	-15.64
8800.1171	389023.0	5396758.0	638.62	980179.04	980320.84	0.51	-15.67
8800.1172	388977.0	5396776.0	640.70	980178.62	980320.82	0.49	-15.69
8800.1173	388931.0	5396794.0	639.87	980178.73	980320.81	0.51	-15.71
8800.1174	388885.0	5396803.0	642.16	980178.19	980320.80	0.52	-15.78
8800.1175	388838.0	5396822.0	647.87	980176.74	980320.79	0.54	-16.07
8800.1177	388746.0	5396858.0	653.31	980175.65	980320.76	0.57	-16.02
8800.1178	388700.0	5396876.0	652.47	980175.91	980320.74	0.59	-15.90
8800.1179	388654.0	5396894.0	653.69	980175.64	980320.72	0.63	-15.87
8800.1180	388608.0	5396913.0	656.68	980174.64	980320.71	0.64	-16.26
8800.1181	388561.0	5396931.0	659.36	980173.88	980320.69	0.73	-16.39
8800.1182	388515.0	5396949.0	661.65	980173.27	980320.68	0.79	-16.47
8800.1183	388469.0	5396967.0	658.07	980174.29	980320.66	0.87	-16.06
8800.1184	388422.0	5396985.0	651.16	980175.82	980320.65	0.88	-15.87
8800.1185	388376.0	5397003.0	645.19	980177.03	980320.63	0.87	-15.82
8800.1186	388330.0	5397021.0	640.93	980177.92	980320.62	0.87	-15.76
8800.1187	388284.0	5397039.0	634.20	980179.08	980320.60	0.85	-15.92
8800.1188	388192.0	5397077.0	636.46	980178.55	980320.57	0.92	-15.91
8800.1189	388146.0	5397095.0	634.47	980178.70	980320.56	0.95	-16.11
8800.1190	388100.0	5397114.0	629.48	980179.22	980320.54	0.99	-16.51
8800.1191	388052.0	5397133.0	622.82	980180.83	980320.52	1.05	-16.14
8800.1192	389475.0	5396389.0	617.37	980184.07	980321.14	0.49	-15.15
8800.1193	389428.0	5396406.0	617.01	980183.97	980321.13	0.50	-15.29
8800.1194	389380.0	5396424.0	612.68	980184.85	980321.11	0.48	-15.27
8800.1195	389333.0	5396442.0	612.55	980184.77	980321.10	0.49	-15.35
8800.1196	389239.0	5396478.0	610.25	980185.24	980321.07	0.48	-15.31
8800.1197	389192.0	5396496.0	613.21	980184.60	980321.05	0.50	-15.34
8800.1198	389145.0	5396514.0	607.30	980185.74	980321.04	0.52	-15.32
8800.1199	389098.0	5396532.0	602.47	980186.60	980321.02	0.51	-15.40
8800.1200	389051.0	5396550.0	607.66	980185.55	980321.01	0.48	-15.45
8800.1201	389004.0	5396568.0	625.29	980182.05	980320.99	0.50	-15.45
8800.1202	388910.0	5396604.0	631.36	980180.90	980320.96	0.53	-15.35
8800.1203	388863.0	5396622.0	627.54	980181.77	980320.95	0.52	-15.22
8800.1204	388816.0	5396640.0	634.03	980180.02	980320.93	0.54	-15.65
8800.1205	388769.0	5396658.0	633.59	980180.11	980320.92	0.53	-15.65
8800.1206	388722.0	5396676.0	630.43	980180.74	980320.90	0.55	-15.60
8800.1207	388675.0	5396694.0	630.20	980180.64	980320.89	0.53	-15.75
8800.1208	388628.0	5396712.0	630.09	980180.60	980320.87	0.58	-15.75
8800.1209	388581.0	5396730.0	623.17	980182.21	980320.86	0.60	-15.46
8800.1210	388534.0	5396748.0	617.65	980183.22	980320.84	0.65	-15.48
8800.1211	388487.0	5396766.0	618.51	980182.91	980320.83	0.67	-15.58
8800.1212	388440.0	5396784.0	616.25	980183.27	980320.81	0.68	-15.65
8800.1213	388393.0	5396802.0	621.76	980182.11	980320.80	0.69	-15.69

NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.1214	388346.0	5396820.0	633.19	980179.68	980320.78	0.69	-15.86
8800.1215	388299.0	5396838.0	641.44	980177.79	980320.77	0.72	-16.08
8800.1216	388252.0	5396856.0	638.50	980178.61	980320.75	0.73	-15.82
8800.1217	388205.0	5396874.0	631.93	980179.96	980320.73	0.75	-15.72
8800.1218	388158.0	5396892.0	624.62	980181.30	980320.72	0.80	-15.76
8800.1220	389398.0	5396191.0	640.77	980179.56	980321.30	0.44	-15.26
8800.1221	389351.0	5396209.0	639.52	980178.87	980321.29	0.43	-16.19
8800.1222	389304.0	5396227.0	635.61	980180.63	980321.27	0.44	-15.17
8800.1223	389257.0	5396245.0	636.39	980180.32	980321.26	0.42	-15.34
8800.1224	389210.0	5396263.0	640.15	980179.45	980321.24	0.44	-15.44
8800.1225	389163.0	5396281.0	637.64	980179.78	980321.23	0.42	-15.60
8800.1226	389116.0	5396299.0	634.58	980180.59	980321.21	0.44	-15.36
8800.1227	389069.0	5396317.0	626.39	980182.18	980321.20	0.42	-15.38
8800.1228	389022.0	5396335.0	623.62	980182.62	980321.18	0.41	-15.48
8800.1229	388975.0	5396353.0	623.69	980182.51	980321.17	0.43	-15.55
8800.1230	388928.0	5396371.0	620.97	980182.94	980321.15	0.42	-15.64
8800.1231	388881.0	5396389.0	611.03	980185.01	980321.13	0.46	-15.47
8800.1232	388834.0	5396407.0	596.70	980187.78	980321.12	0.48	-15.49
8800.1233	388787.0	5396425.0	596.20	980187.98	980321.11	0.51	-15.34
8800.1234	388740.0	5396443.0	594.76	980188.11	980321.09	0.55	-15.44
8800.1235	388693.0	5396461.0	605.91	980185.90	980321.07	0.60	-15.39
8800.1236	388646.0	5396479.0	612.99	980184.42	980321.06	0.75	-15.31
8800.1237	388600.0	5396497.0	612.74	980184.38	980321.04	0.72	-15.41
8800.1238	388553.0	5396515.0	600.57	980186.72	980321.03	0.68	-15.50
8800.1239	388506.0	5396533.0	583.93	980189.77	980321.01	0.66	-15.73
8800.1240	388459.0	5396551.0	562.73	980193.42	980321.00	0.62	-16.27
8800.1241	388412.0	5396569.0	547.86	980196.09	980320.98	0.67	-16.46
8800.1242	388365.0	5396587.0	546.62	980196.38	980320.97	0.73	-16.34
8800.1243	388318.0	5396605.0	546.13	980196.36	980320.95	0.76	-16.41
8800.1244	388271.0	5396623.0	565.50	980192.78	980320.94	0.75	-16.18
8800.1245	388224.0	5396641.0	593.90	980187.43	980320.92	0.83	-15.85
8800.1246	388177.0	5396659.0	609.69	980184.19	980320.91	1.02	-15.77
8800.1247	388130.0	5396677.0	605.93	980184.87	980320.89	1.10	-15.74
8800.1248	388083.0	5396696.0	594.80	980187.10	980320.88	1.13	-15.65
8800.1249	388002.0	5396394.0	582.49	980189.53	980321.12	0.92	-16.09
8800.1251	387970.0	5396499.0	539.15	980197.55	980321.03	0.90	-16.53
8800.1252	388017.0	5396482.0	554.40	980194.86	980321.05	0.88	-16.26
8800.1253	387964.0	5396465.0	557.12	980194.28	980321.05	0.83	-16.36
8800.1255	388158.0	5396431.0	555.66	980194.72	980321.09	0.71	-16.37
8800.1256	388205.0	5396414.0	559.30	980194.18	980321.11	0.80	-16.11
8800.1257	388252.0	5396397.0	555.61	980194.82	980321.12	0.73	-16.29
8800.1258	388299.0	5396380.0	549.86	980195.70	980321.13	0.72	-16.56
8800.1259	388346.0	5396363.0	549.04	980195.73	980321.15	0.80	-16.62
8800.1260	388393.0	5396356.0	539.24	980197.13	980321.16	0.83	-17.13
8800.1262	388487.0	5396322.0	533.01	980197.20	980321.18	0.73	-18.41
8800.1263	388534.0	5396305.0	569.33	980191.40	980321.20	0.76	-17.05
8800.1264	388581.0	5396288.0	602.50	980185.96	980321.21	0.73	-16.01
8800.1265	388628.0	5396271.0	620.95	980182.88	980321.23	0.71	-15.49
8800.1266	388675.0	5396254.0	633.15	980180.54	980321.24	0.65	-15.51
8800.1267	388722.0	5396237.0	638.60	980179.58	980321.26	0.62	-15.44
8800.1268	389140.0	5394900.0	665.40	980176.39	980322.34	0.37	-14.69
8800.1269	389186.0	5394891.0	665.31	980176.39	980322.35	0.38	-14.71
8800.1270	389230.0	5394872.0	664.28	980176.61	980322.36	0.39	-14.70
8800.1271	389277.0	5394853.0	662.51	980176.89	980322.38	0.39	-14.78

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NUMBER	EASTING	NORTHING	HEIGHT	OBS GRAV	THEO GRAV	CORR	BOUG ANOM
8800.1272	389320.0	5394834.0	660.49	980177.42	980322.40	0.39	-14.67
8800.1273	389366.0	5394815.0	660.13	980177.51	980322.41	0.39	-14.66
8800.1274	389314.0	5394796.0	659.37	980177.54	980322.43	0.48	-14.67
8800.1275	389461.0	5394777.0	662.90	980176.97	980322.44	0.39	-14.69
8800.1276	389508.0	5394758.0	665.75	980176.32	980322.46	0.40	-14.78
8800.1277	389554.0	5394739.0	667.98	980175.85	980322.47	0.40	-14.84
8800.1278	389600.0	5394720.0	672.11	980174.91	980322.49	0.41	-14.96
8800.1279	389647.0	5394700.0	676.13	980173.90	980322.51	0.42	-15.19
8800.1280	389361.0	5394752.0	657.88	980178.12	980322.46	0.40	-14.54
8800.1281	389340.0	5394716.0	654.23	980178.95	980322.49	0.41	-14.44
8800.1282	389572.0	5394495.0	663.37	980176.98	980322.67	0.48	-14.80
8800.1283	389525.0	5394514.0	662.52	980177.08	980322.66	0.41	-14.84
8800.1284	389480.0	5394533.0	661.25	980177.42	980322.64	0.40	-14.75
8800.1285	389435.0	5394552.0	659.88	980177.74	980322.62	0.40	-14.68
8800.1286	389392.0	5394571.0	656.99	980178.38	980322.61	0.41	-14.59
8800.1287	389347.0	5394590.0	655.43	980178.76	980322.59	0.41	-14.50
8800.1288	389302.0	5394609.0	650.04	980179.76	980322.58	0.42	-14.53
8800.1289	389282.0	5394566.0	644.31	980180.93	980322.61	0.46	-14.49
8800.1290	389259.0	5394527.0	645.07	980180.75	980322.64	0.49	-14.51
8800.1291	389245.0	5394480.0	643.39	980180.94	980322.68	0.49	-14.70
8800.1292	389226.0	5394432.0	644.94	980180.49	980322.72	0.51	-14.86
8800.1293	389207.0	5394390.0	636.21	980181.85	980322.75	0.54	-14.83
8800.1295	389023.0	5394738.0	654.52	980178.53	980322.47	0.49	-14.70
8800.1296	388978.0	5394757.0	658.82	980177.48	980322.44	0.47	-14.90
8800.1297	388933.0	5394776.0	661.30	980177.18	980322.44	0.46	-14.72
8800.1298	388888.0	5394795.0	662.42	980176.89	980322.42	0.46	-14.77
8800.1299	388843.0	5394814.0	662.03	980176.90	980322.40	0.44	-14.84
8800.1300	388798.0	5394833.0	656.30	980177.97	980322.39	0.50	-14.83
8800.1301	388754.0	5394852.0	650.59	980178.94	980322.37	0.53	-14.93
8800.1302	388709.0	5394871.0	643.95	980180.28	980322.36	0.57	-14.84
8800.1311	388273.0	5397721.0	653.11	980174.29	980320.05	0.64	-16.66
8800.1312	388181.0	5397759.0	643.63	980176.11	980320.02	0.66	-16.65
8800.1313	388135.0	5397777.0	639.48	980176.97	980320.01	0.71	-16.54
8800.1314	388090.0	5397795.0	636.96	980177.33	980319.99	0.76	-16.61
8800.1315	388045.0	5397813.0	631.65	980178.04	980319.98	0.83	-16.86
8800.1316	387998.0	5397831.0	621.79	980179.99	980319.96	0.87	-16.79
8800.1317	387952.0	5397849.0	613.01	980181.91	980319.95	0.90	-16.56
8800.1318	387906.0	5397867.0	602.68	980183.97	980319.93	0.98	-16.43
8800.1319	388365.0	5397240.0	656.43	980173.79	980320.44	0.60	-16.93
8800.1320	388411.0	5397222.0	654.52	980174.25	980320.46	0.57	-16.90
8800.1321	388458.0	5397204.0	653.63	980174.62	980320.47	0.55	-16.73
8800.1322	388504.0	5397186.0	653.98	980174.46	980320.49	0.52	-16.87
8800.1323	388550.0	5397168.0	656.01	980174.07	980320.50	0.50	-16.89
8800.1324	388596.0	5397150.0	660.74	980173.07	980320.52	0.47	-17.01
8800.1325	388643.0	5397132.0	666.54	980171.91	980320.53	0.44	-17.07
8800.1326	388689.0	5397114.0	671.46	980170.93	980320.55	0.43	-17.11
8800.1327	388735.0	5397096.0	673.28	980170.57	980320.56	0.42	-17.14
8800.1328	388781.0	5397078.0	672.69	980170.81	980320.58	0.40	-17.05
8800.1329	388827.0	5397060.0	672.56	980170.88	980320.59	0.38	-17.04
8800.1330	388873.0	5397042.0	669.53	980171.37	980320.61	0.39	-17.16
8800.1331	388919.0	5397024.0	659.01	980173.75	980320.62	0.41	-16.84
8800.1332	388966.0	5397006.0	652.03	980175.65	980320.64	0.41	-16.32

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411192

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

Apr 16, 1988

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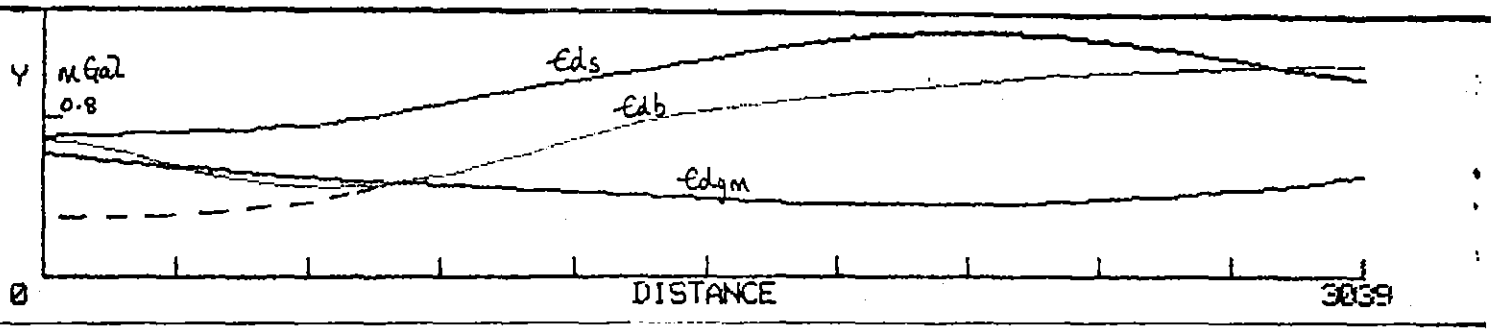
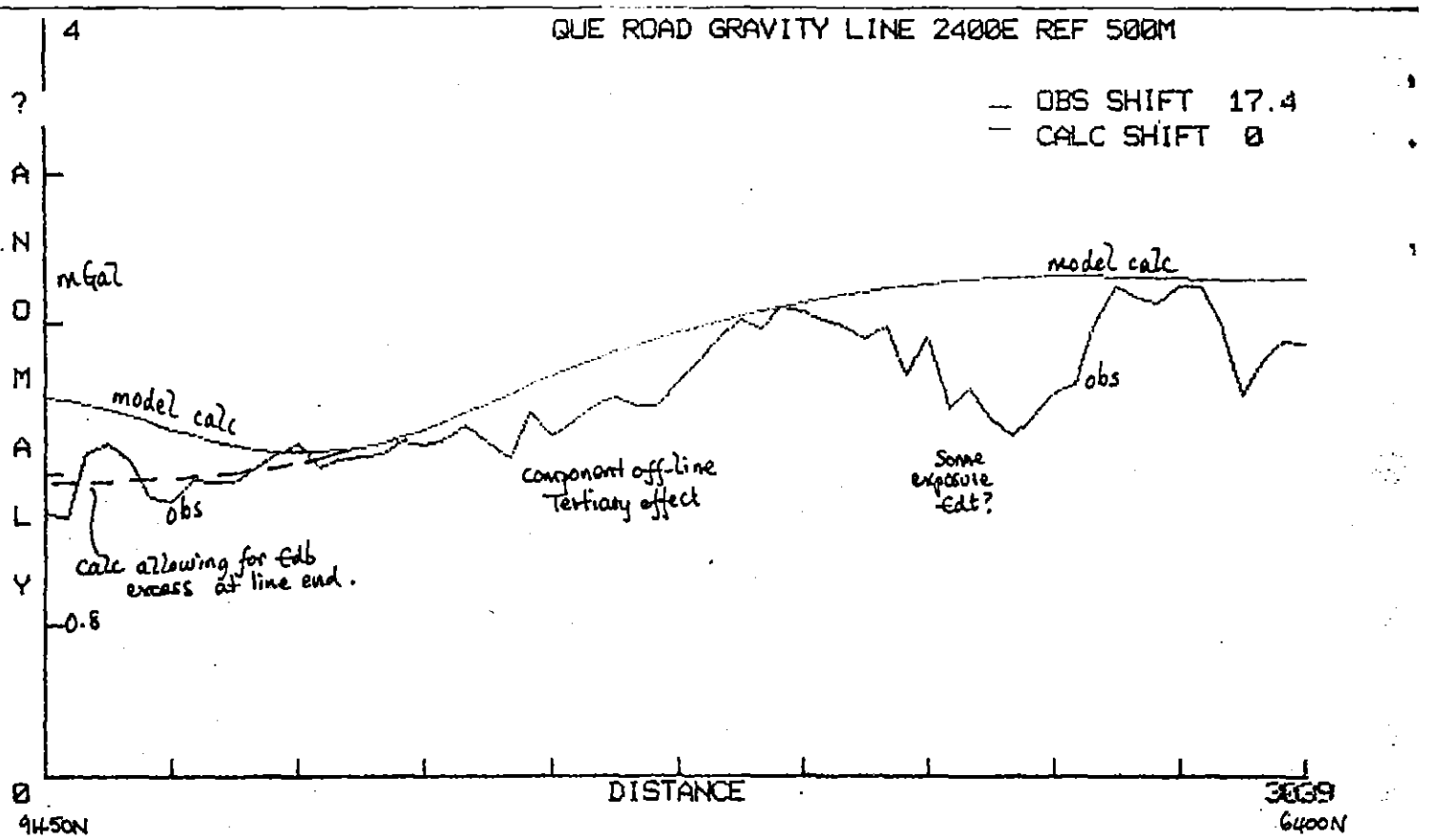
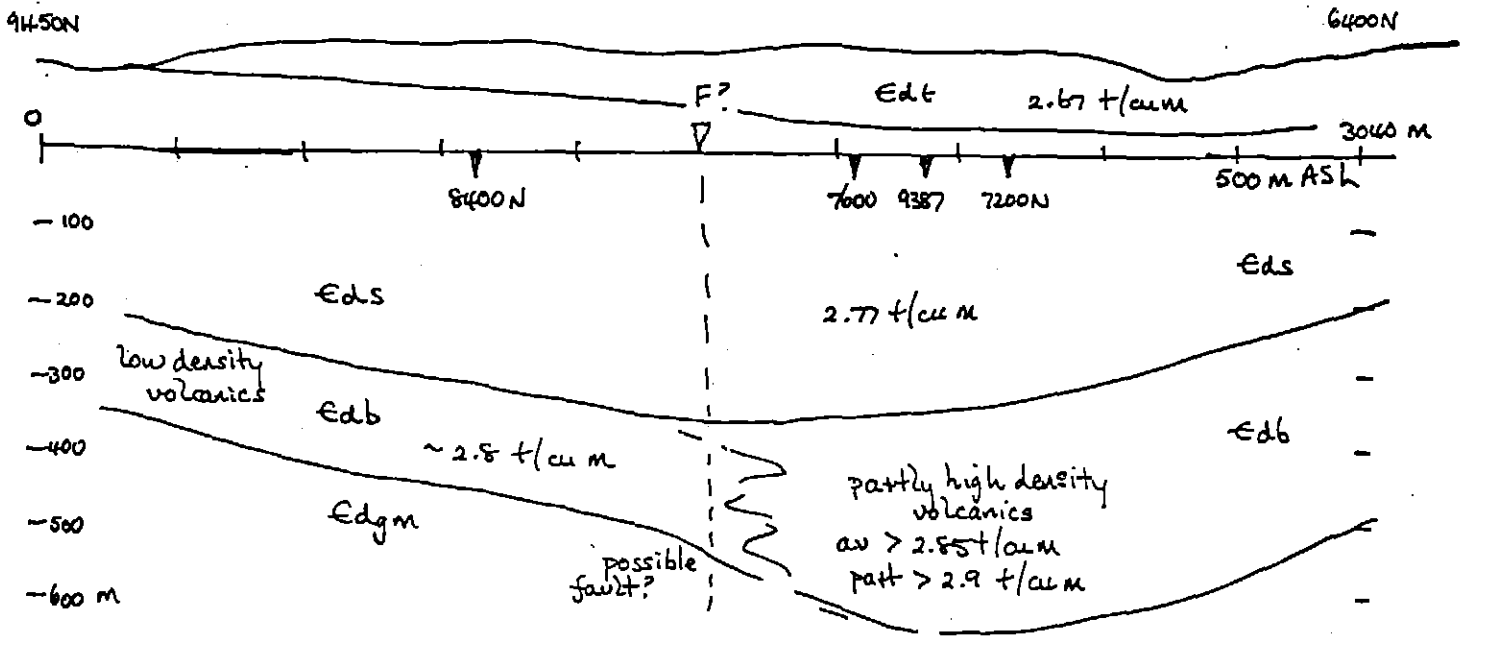
411193



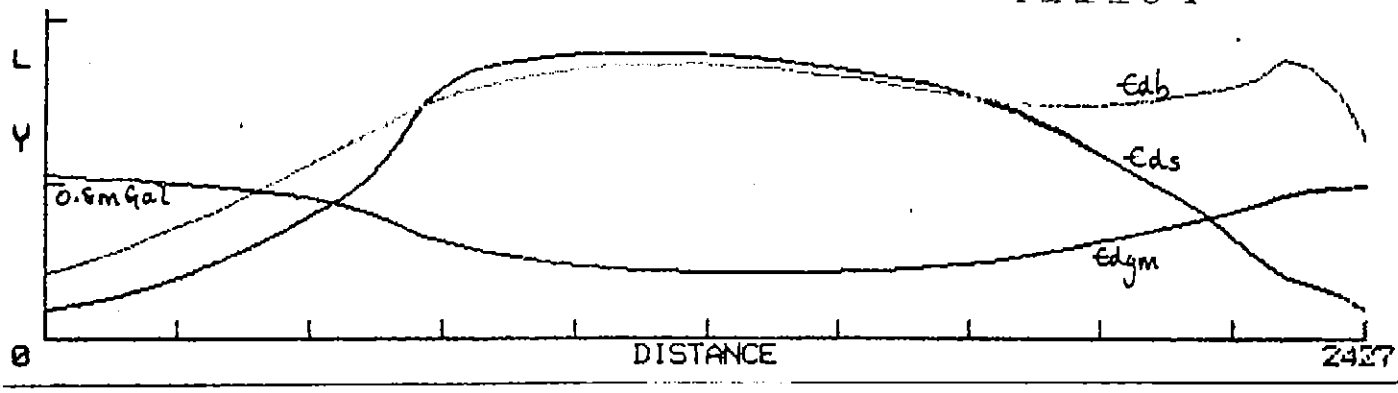




3D SOLUTION LINE 2400E

FIGURE 1

Showing anomaly components, profile match and model section

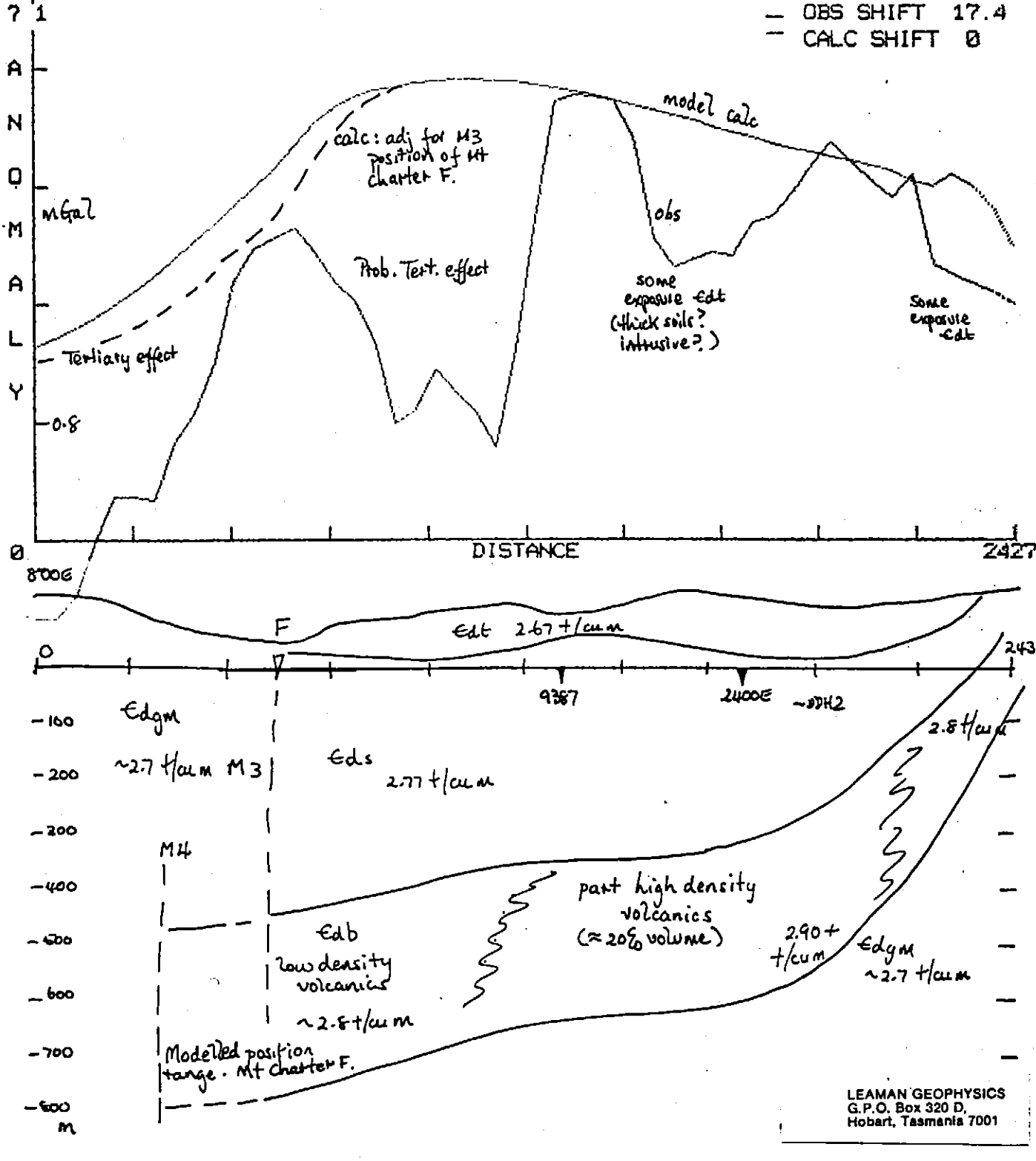


4

QUE ROAD BOUGUER GRAVITY CORRECTED TO 500M REF 7200N

7 1

— OBS SHIFT 17.4
— CALC SHIFT 0



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3D SOLUTION LINE 7200N

FIGURE 2

Showing anomaly components, profile match and model section

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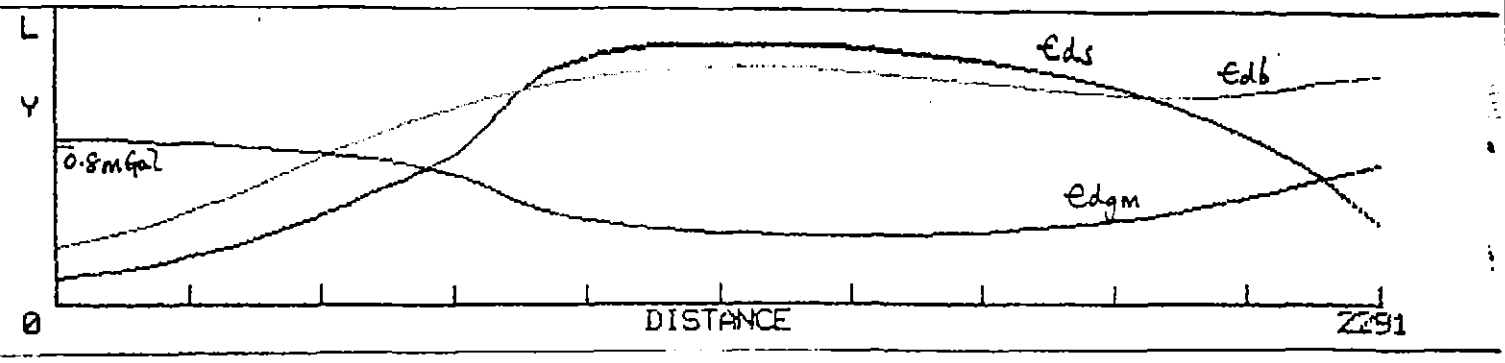

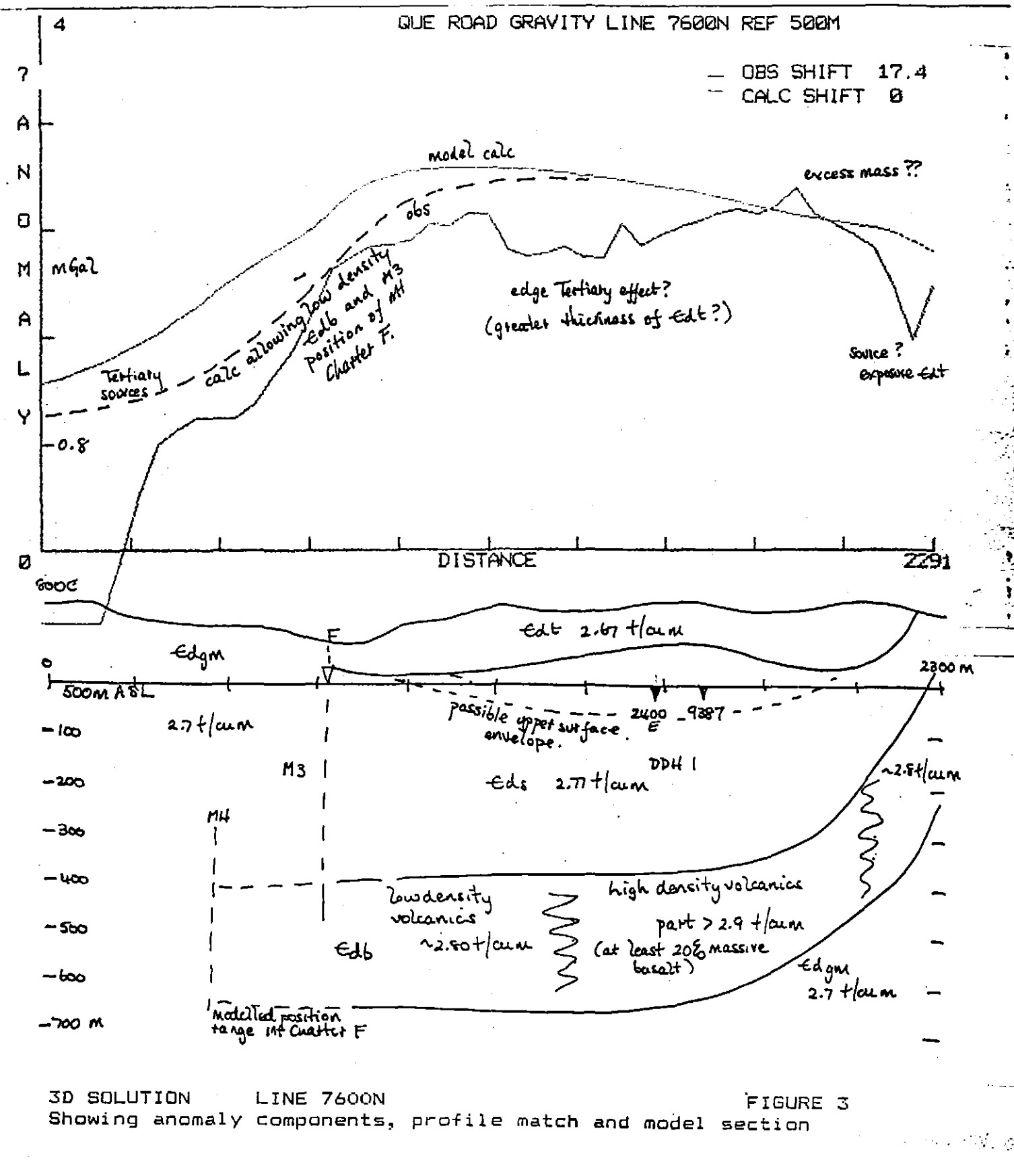

3D SOLUTION LINE 7600N FIGURE 3
Showing anomaly components, profile match and model section

411196

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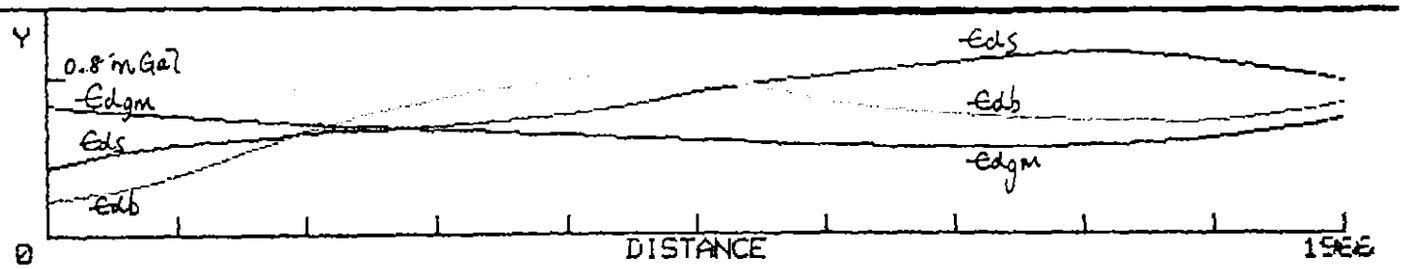

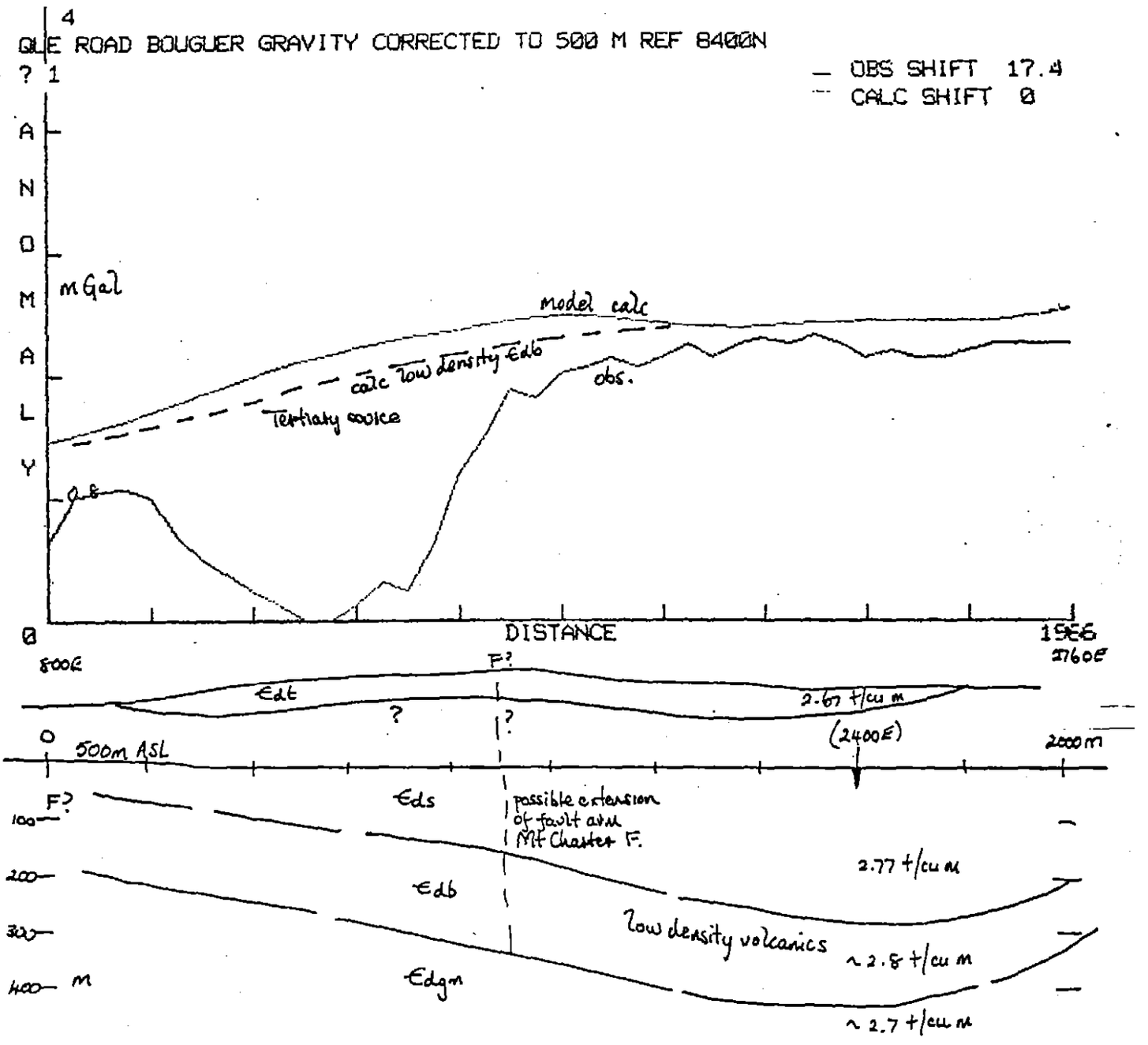

3D SOLUTION LINE 8400N FIGURE 4
Showing anomaly components, profile match and model section

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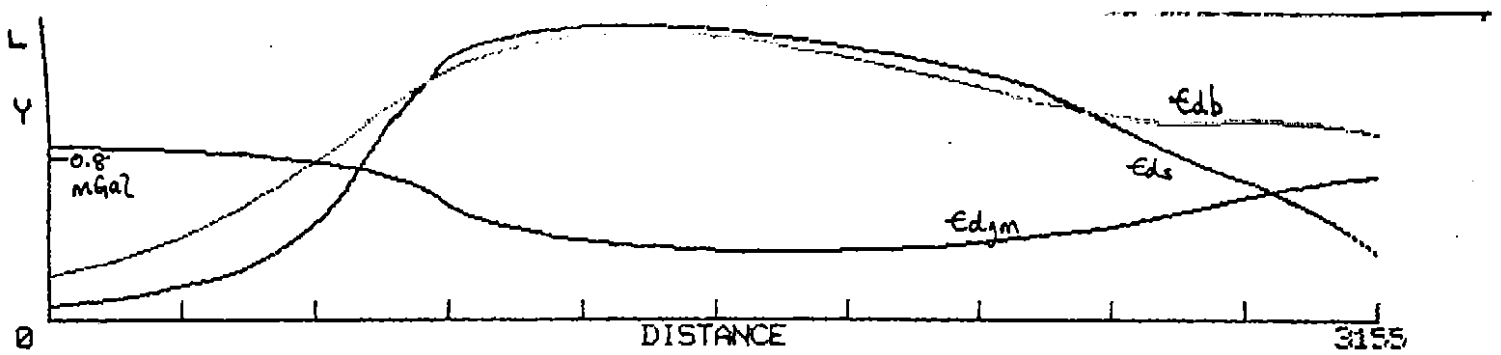
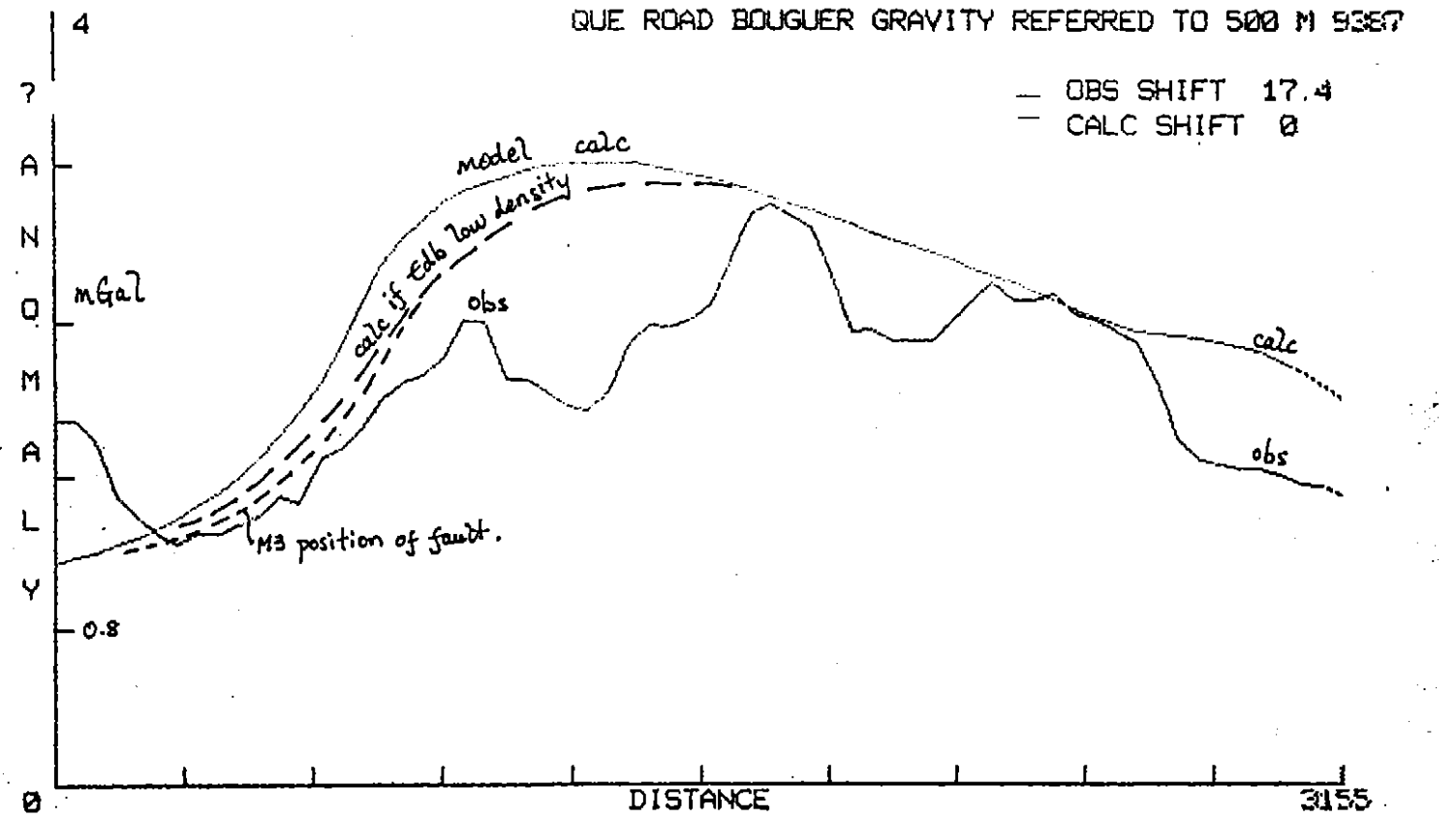
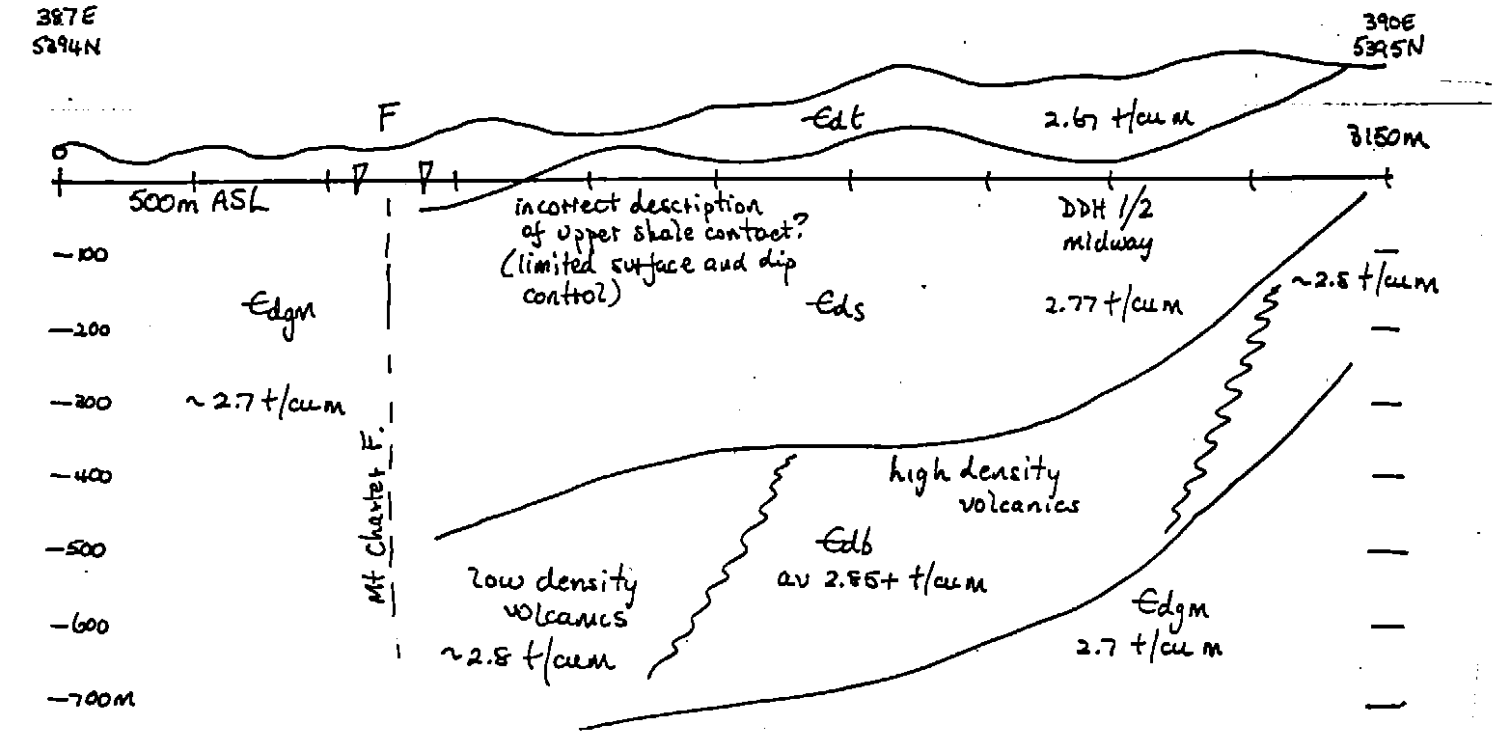
411197







3D SOLUTION LINE 9387
Showing anomaly components, profile match and model section

FIGURE 5

411198

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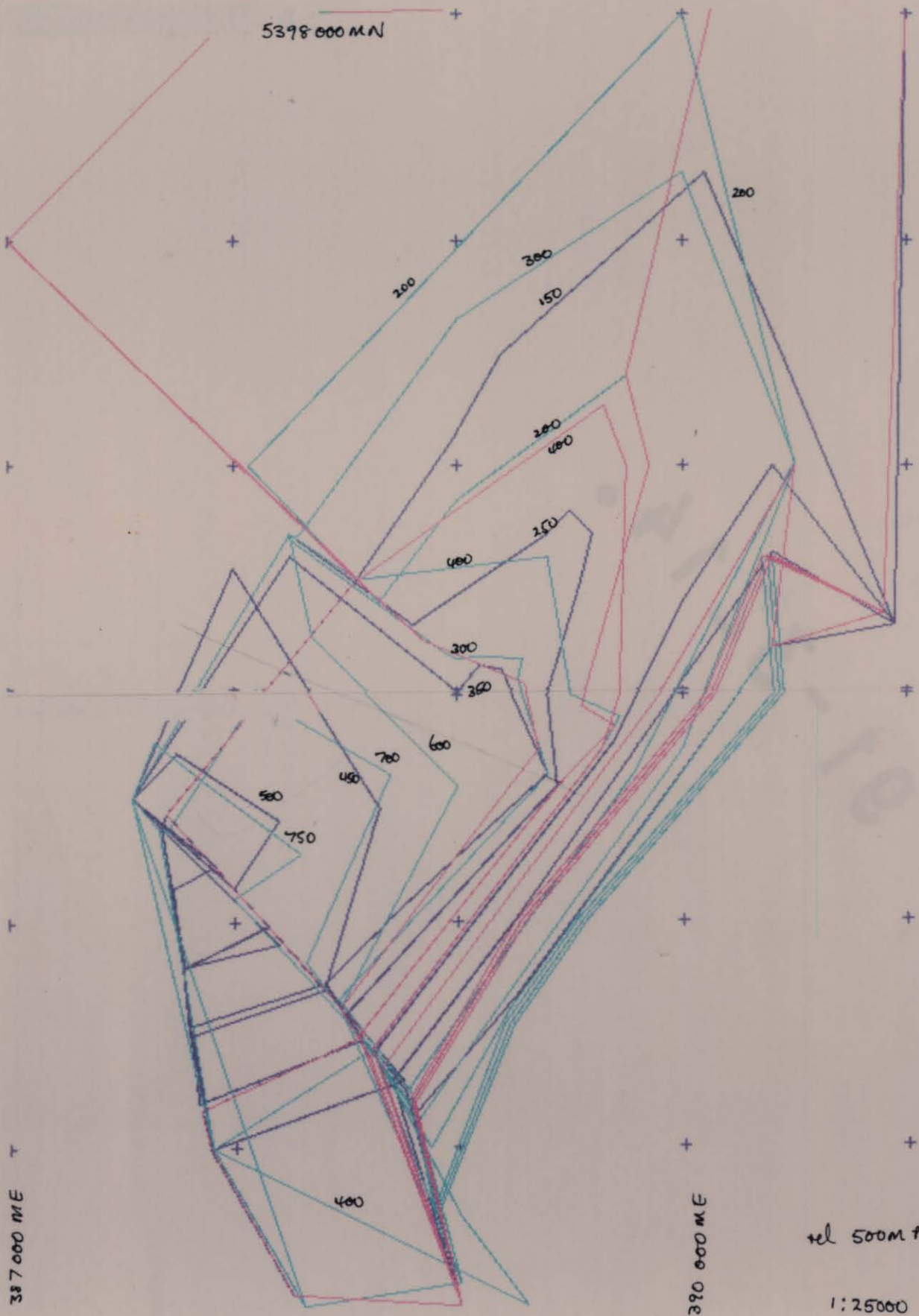
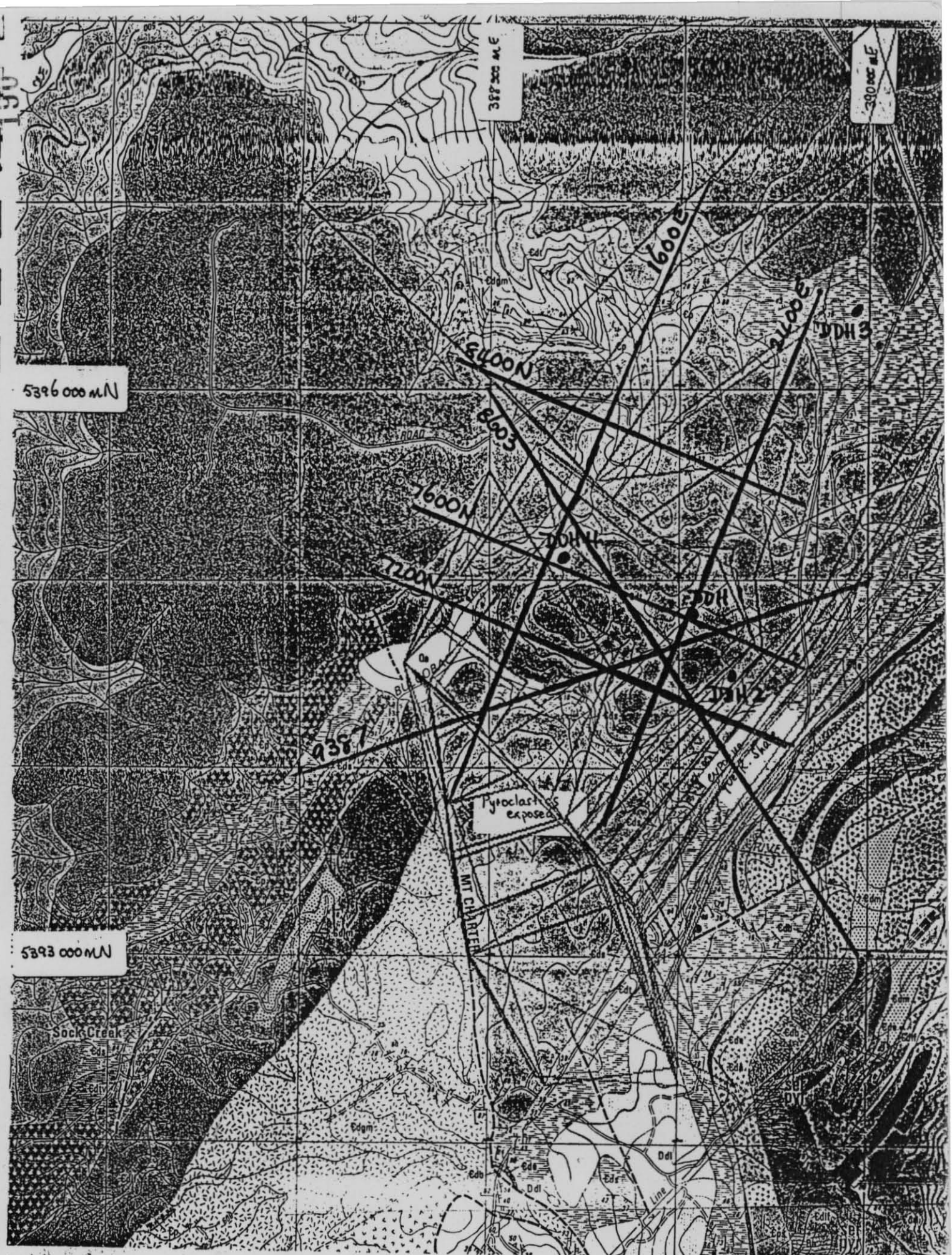


STRUCTURE CONTOURS FOR 3D MODEL ITERATION 4 - ALL SURFACES
Shale dark blue, basalt light blue, mixed seq red QRS4 QRB4 QRG1
FIGURE 6A



411199

GEOLOGICAL BASEMAP (after Komyshan, 1986) AND 3D MODEL
Profile positions and drillholes also shown

FIGURE 6B

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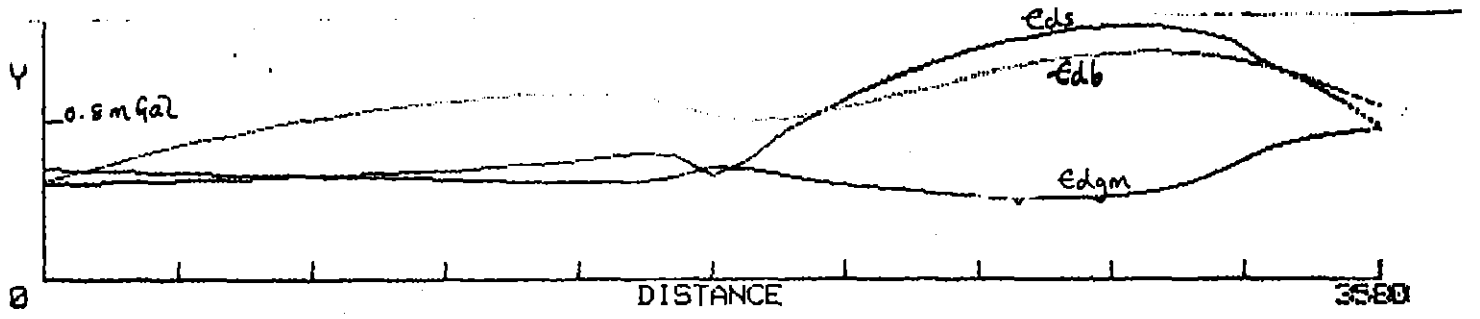

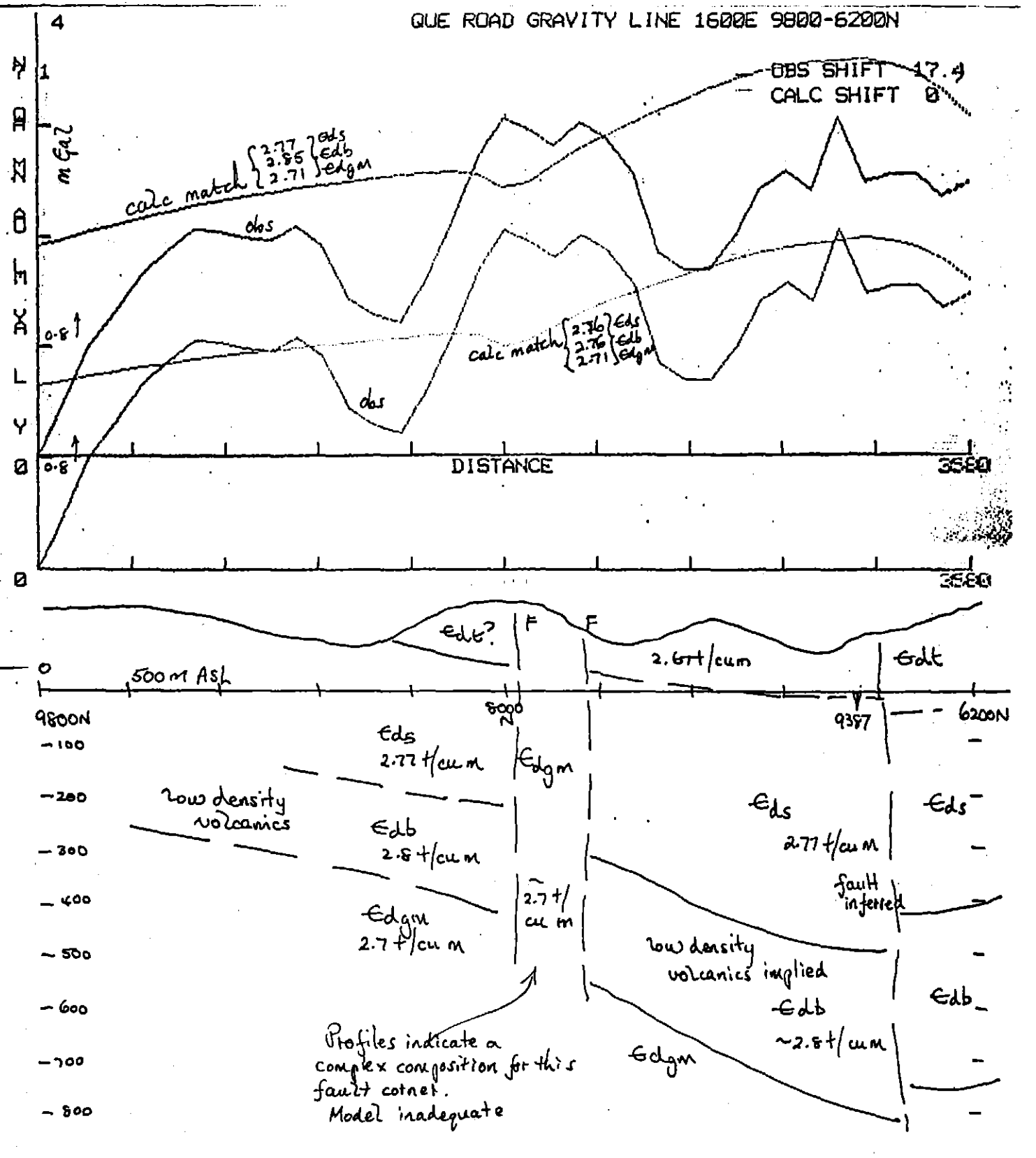

3D SOLUTION LINE 1600E FIGURE 7
Showing anomaly components, profile match and model section

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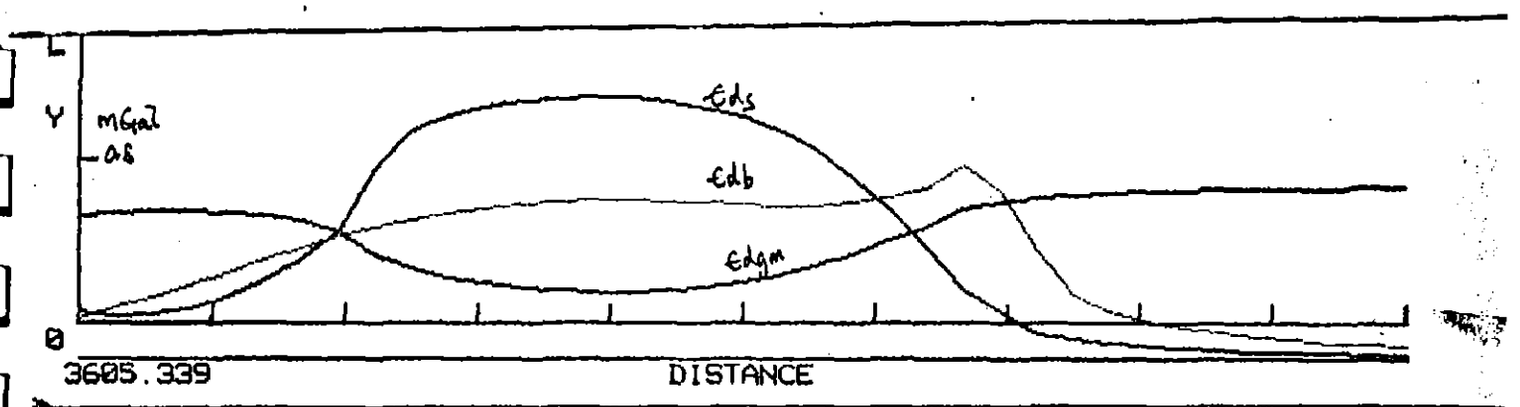
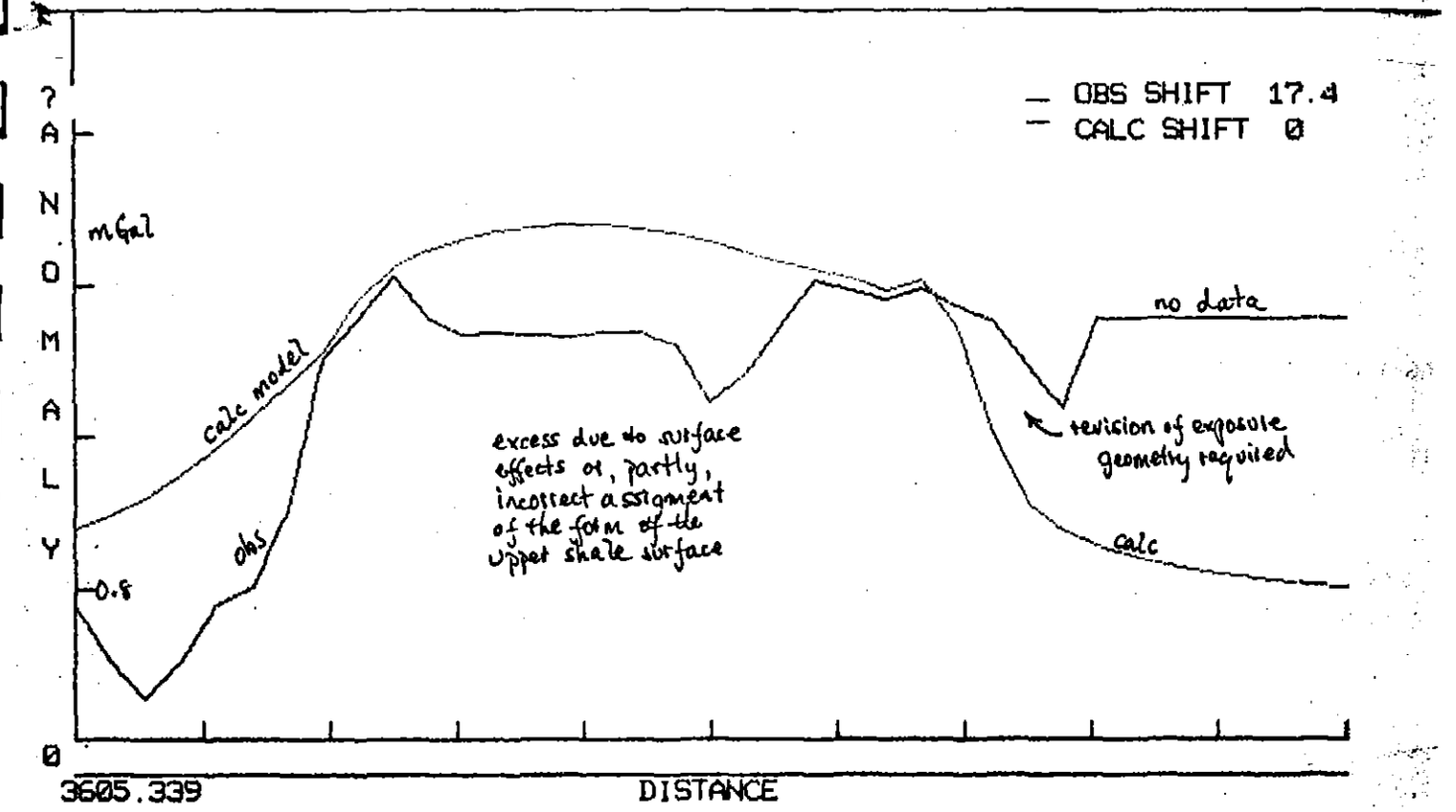
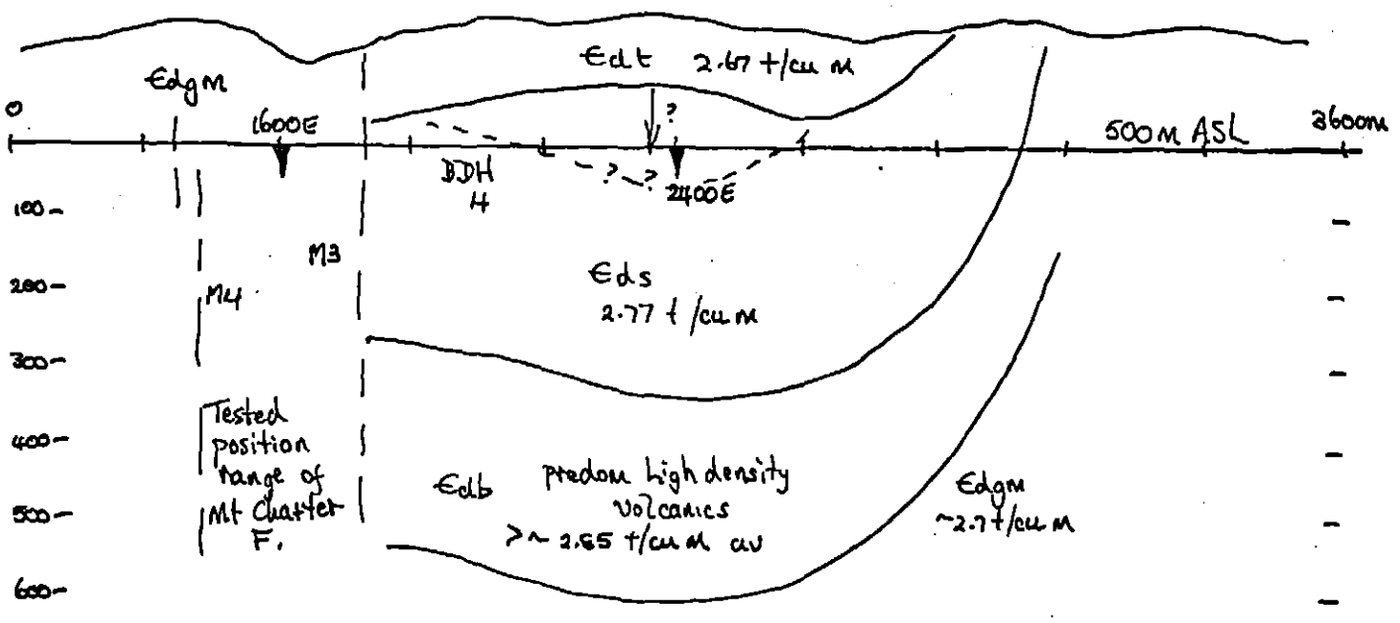
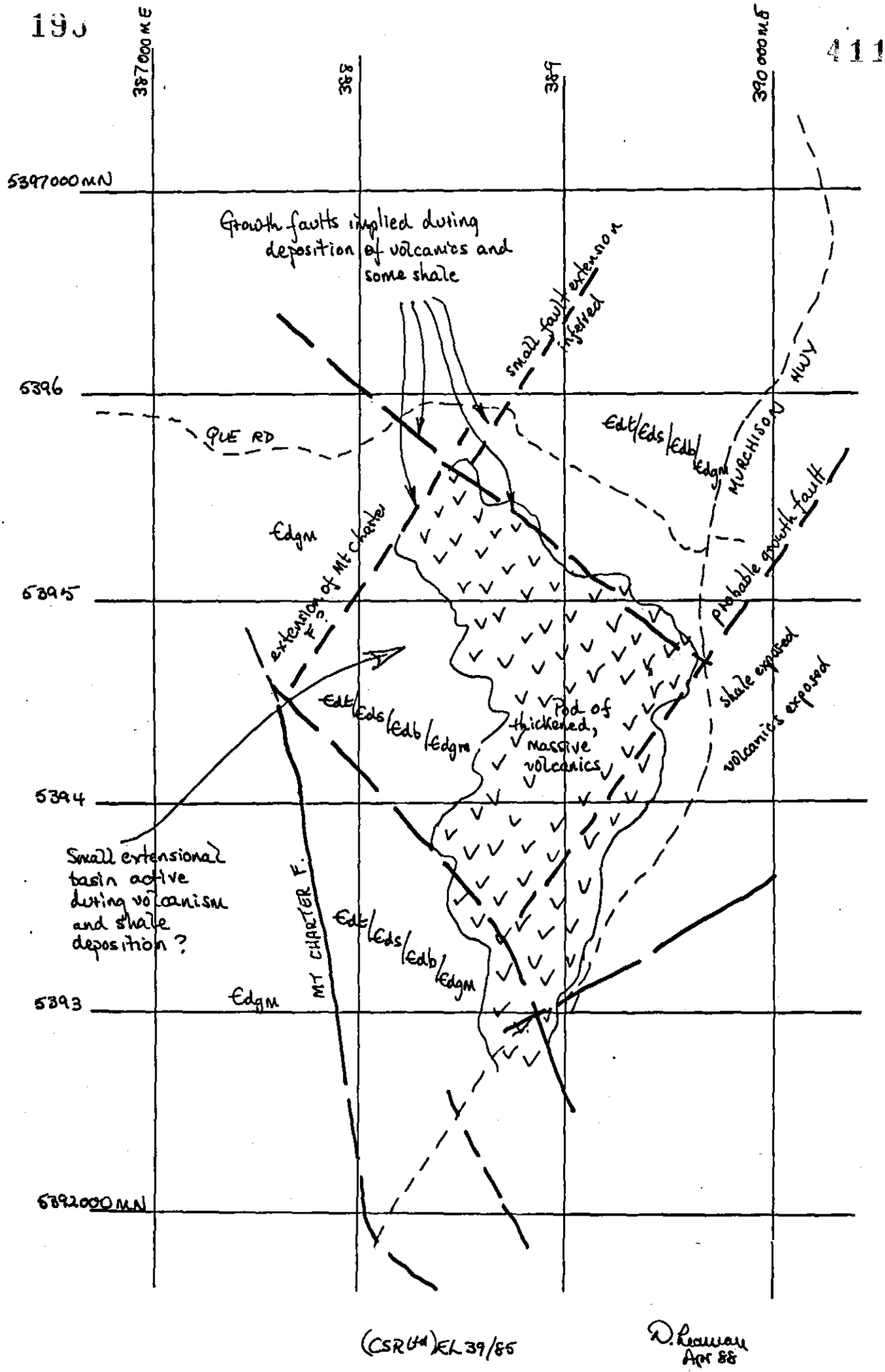
TELEPHONE: (002) 47 8849







3D SOLUTION LINE 8306 FIGURE 8.
Showing anomaly components, profile match and model section



SUMMARY OF INTERPRETATION

FIGURE 9

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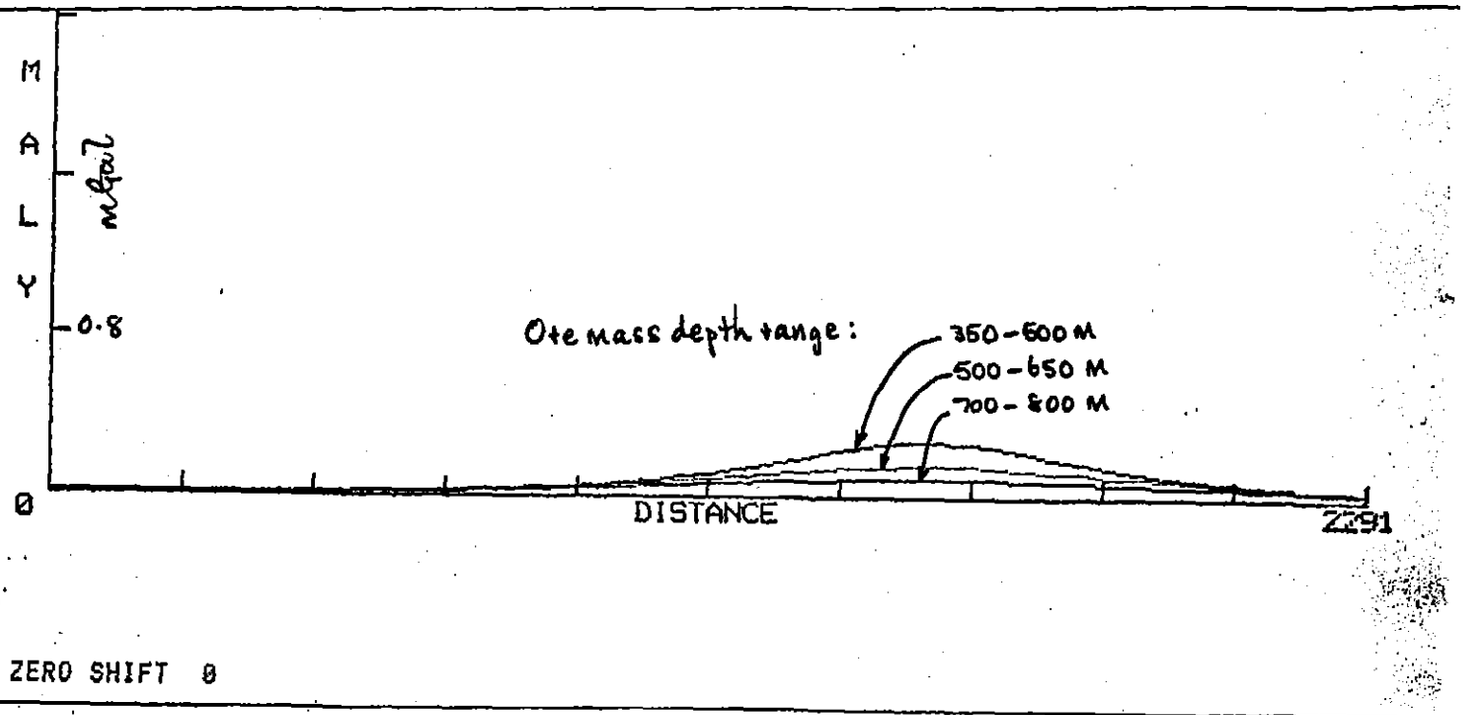
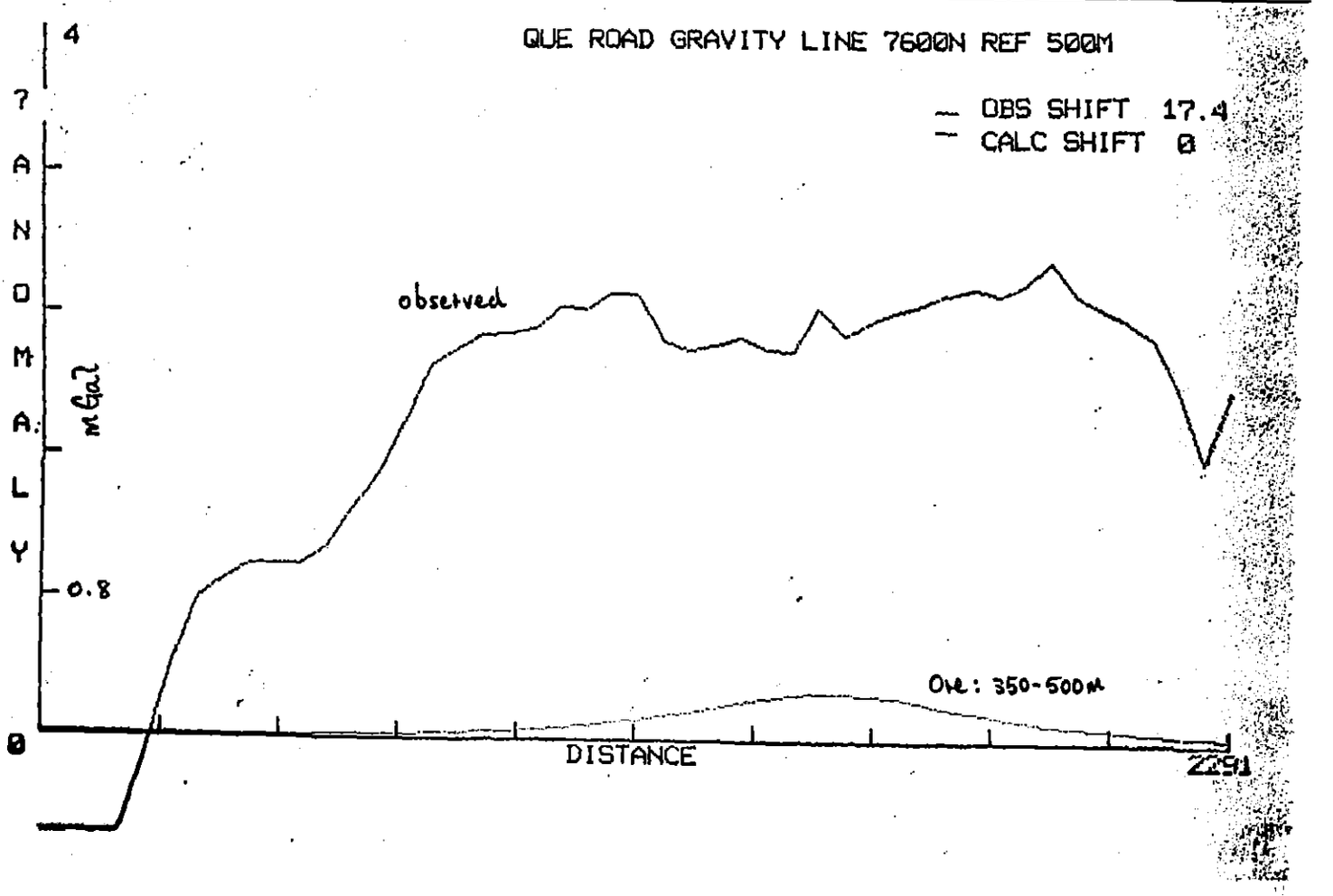
11203





COMPARATIVE EVALUATION OF LIMITED ORE SCALE SOURCES
Diagram indicates that, in an environment where substantial surface sources are present, and targets are deep there is little likelihood of direct resolution of an ore mass. There is also no clear evidence in the existing data for a mass and alteration couplet.

FIGURE 10

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411204

SK 55-3
PROJECT 258

PLACER EXPLORATION LIMITED

REPORT TAS 2/90
EXPLORATION LICENCE NO. 39/85

BULGOBAC RIVER, TASMANIA

CURRENT STATUS AT THE COMPLETION OF BRD 05

VOLUME 3

HOBART
MARCH 1990

P.D. ELLIS

APPENDIX IV

DRILL LOGS

DETAILED DRILL LOG SHEET - CODING PROCEDURES

1. Header

This is self evident. The hole number identifies the prospect for the system, eg. DDH BRD 01 = Bulgobac hole 1, and the type of drilling (eg. DDH = diamond drilling, PDH = percussion, RCH = reverse circulation. The computer system will work provided that all lithology codes and mineral species fields are the same and clearly defined for each prospect.

2. Depth to - Columns 1-7

Record the depth to the base of the logged interval in metres, to 2 decimal places.

3. Core Recovery - Columns 8-13

Record the measured core recovery for the interval, in metres to 2 decimal places.

4. Lithology - Columns 14-21

Space is provided to record up to two lithologies for the logged interval, using a three letter code for each. It is acceptable to use either a standardized general coding system, or to develop a set of prospect or project specific rock type codes, provided that these are consistent and defined for (at least) each prospect. It is helpful if these codes match those used in surface mapping of the prospect.

5. Oxidation - Column 22-23

Record the extent of oxidation of iron minerals, particularly sulphides. by the extent of limonite development, using single letter codes as follows:

0 (or blank)	Unoxidised-sulphides quite fresh - no limonites present.
1	Trace oxidation - sulphides fresh but minor limonite coating joints or fractures.
2.	Weakly oxidized - most sulphates preserved but significant limonite developed on joints and in joint selvages.
3.	Moderately oxidized - sulphides replaced by limonites in about 50% of the rock.
4.	Strongly oxidized - limonite throughout with minor remaining sulphides.
5.	Completely oxidized, limonite throughout, no remaining sulphides.

Fields 5-11. Record the sulphide content of the logged interval, as follows:

Field 5 (Total %) (Columns 24-25) Record the total of sulphides present, on a volume percent basis, using a two letter code as follows:

TR	present but less than 0.5% by volume.
01	0.5-1.5% by volume
99	98.5-99.5% by volume
then AL	99.5-100%

Field 6 Grainsize (Column 26) Record the average grainsize of sulphide minerals present, using single letter codes eg. c = coarse > 2mm, m = medium (0.5-2mm), F = fine < 0.5mm.

Fields 7-11 (Columns 27-38) These two character fields record the mode of occurrence and relative proportions of the most common sulphides. Fields are allowed for pyrite (py), chalcopyrite (cpy), pyrrhotite (po), galena (ga) and sphalerite (sp).

Codes used are a single letter code for the dominant mode of occurrence of the mineral in the logged interval, eg.

D = disseminated	A = vesicular
V = within veins	B = banded; bedded
F = coating fractures	C = disseminated in clasts
E = disseminated & fracture fill	G = bedded and fracture fill
N = vein & disseminated	W = worm tubes/bedded & nodules

and a single letter/number code to record the relative proportion of each sulphide species of the total sulphide using the codes.

Blank - mineral not present.
T = trace, mineral present but less than 5% of the total sulphide
1 = 5-15% of the total sulphide
to 9 = 85-95% of the total sulphide
and A = >95% of the total sulphide.

The proportion codes should sum to 10, unless significant proportions of a different sulphide to those listed occurs. The estimated volume percentage of any mineral can be obtained by multiplying the total sulphide percent (field 5) by the proportion code for that mineral and dividing by 10.

Sulphide minerals not included in the above list should be noted in the comments column.

Fields 12 to 24 (Columns 39-63) record alteration mineralogy.

Field 12 - Alternative Intensity - col. 39 - Record alteration intensity as a single number code as follows:

0 - Fresh unaltered rock with original texture and >95% of original rock forming minerals intact.

1 - Partly altered, original textures preserved and 5-35% of original minerals replaced by alteration products.

2 - Moderately altered, overall original textures preserved but 35-65% of original minerals replaced by alteration products.

3 - Strongly altered, original textures visible but 65-95% of original minerals replaced by alteration products.

4 - Completely altered, original textures still preserved but original minerals replaced by alteration products.

5 - Intensely altered - as above but original rock texture only poorly preserved.

6 - Fubarite - original rock mineralogy and textures completely obliterated.

Fields 13 - 24 Alteration Mineralogy Cols. 40-63. Twelve two column fields are allowed, to record the presence of specific alteration minerals. For each mineral two columns are provided. The first column for each mineral is for a single letter code for the estimated volume percentage of the mineral;

blank = not present,
T = present but less than 5%,
1 = 5-15%, 2 = 15-25%, ..., 9 = 85-95%,
A = +95%.

In the second column, use a single letter code to record the dominant mode of occurrence of the mineral;

P = pervasively disseminated,
W = wallrock selvages adjacent to veins or fractures,
F = coatings on fracture surfaces,
V = as vein fill material,
S = some particles partially silicified.

The minerals to record are:

LIMONITE, ALBITE, CHLORITE,
EPIDOTE, K-FELDSPAR, SERICITE,
CLAY MINERALS, SILIFICATION (not veining)
CALCITE, JAROSITE/ALUNITE,
BARITE, AND FUCHSITE.

Quartz Veining. Space is provided to routinely record only one vein set per logged interval. To make this workable, only quartz and quartz composite (eg quartz-calcite, quartz-barite, quartz-sulphide) veins should be recorded here (N.B. for NTT assume all barite veins have some quartz). Calcite,

jarosite-alunite or straight pyrite veining can be accommodated the alteration mineralogy or sulphide columns, with appropriate comments in the comment field.

Field 25 Vein type - Columns 66-67. Record here a two letter code to specify the vein type. Include barite veins with quartz veins. Letter codes QU = quartz carbonate, QB = quartz-barite, QC = quartz-calcite, TC = tremolite, QE = quartz-chlorite-carbonate-epidote, EC = carbonate-epidote QS = quartz-carbonate-sericite-epidote, QF = quartz-carbonate-sericite-chlorite-fuchsite etc. In the case of breccia fill use codes QX or BX. Attempts to record too many very different vein types in different logged intervals will render the system unworkable from a plotting or statistical point of view.

Field 26 Veining % - columns 68-69. Record the estimated volume percent of veining using 2 digit codes as for total sulphide percentage.

Field 27 Veins/metre (columns 70-71). Record the average number of veins per metre on a 0-99 scale.

Field 28 Angle to core axis (aca) column 72. Record the dominant angle between veins and the core axis using a single number code:

0 = parallel to, through to
9 = 90° to core axis

or letter codes such as

R = random, or
S = stockwork

Fields 29 - 32 deal with structure.

Field 29 - Bedding angle (column 77). Record the angle between the bedding trace and core axis using a single digit code.

0 = parallel to 9 = perpendicular.

Field 30 - Fractures/metre (columns 78,79). Record the average number of fractures (not healed) per metre in the logged interval on a 0-99 numeric scale.

Field 31, Joint angle (column 80). Record the dominant joint direction with a single digit angle code (0-99) if appropriate, or R for random.

Field 32, Hardness (column 81). This is a potentially very useful measure to assess aspects like ripability or grindability of the rock. Record using a single digit code as follows:

1. very soft easily crumbled by hand
2. soft - broken by hand with difficulty
3. moderate - broken with hammer, but does not ring when hit by a hammer
4. hard - broken by hammer, and rings when struck by hammer
5. very hard - broken with difficulty with hammer.

Fields 33, 34. Faulting. Record the percentage of the logging interval occupied by fault guage. using a 2 letter percentage code in columns 86-87, and the angle of the zone to the core axis with a two letter code (00-90) in column 88 -89.

Field 35. Unit Code (columns 90-93). This is for a 2 letter or digit code to identify major rock units, to correlate with field mapping units. and/or to control compositing of assay values. In many cases this information will be added or changed by later interpretations, but the ability to lump data together in a controlled way is very important for computer processing of data.

Field 36-37 (Columns 96-110)

Field 36 Sample Number (Column 96 - 102)

Space is provided for a sample number (normally a six digit number with or without a prefix letter.

Field 37 Sample Type (Column 103 - 110)

Two letter sample type code.

TS = Thin Section
WR = Whole Rock
GC = Geochemical sample of set interval
Pb = Lead Isotope sample

R.J. Fountain

(Modification by R.E.Williams
and P.D. Ellis)

LITHOLOGICAL CODING

DDH'S BRD 01 to 05

(Columns 14-21)

ROCK TYPE:

AN	ANDESITE
ANL	" LAVA
ANLG	" " GLASSY
ANLD	" " DACITIC BLEBS
AN1D	" DYKE
BS	BASALT
BSP	" PILLOW
BAP	" PILLOWED
BSPE	" PEPPERITIC?
BSV	" VESICULAR
BAV	" VESICULAR
BSM	" MASSIVE
BAS	" MASSIVE
BSPV	" PILLOW WITH VESICULAR PARTS
BPB	" PILLOW WITH BRECCIA
BAB	" BRECCIA
BSVP	" VESICULAR WITH SOME PILLOW MARGINS
BSVB	" " " " BRECCIAS
BSMP	" MASSIVE WITH SOME PILLOW MARGINS
BSMV	" " " " VESICULAR AREAS
DC	DACITE
DCL	" LAVA
DCLB	" " BRECCIA
DCLF	" " - FLOW BANDED
DCLG	" " - GLASSY
EPI	EPICLASTIC
MBC	MONOMICT BRECCIA
MBCD	" " DACITE
MST	MUDSTONE
PBC	POLYMICT BRECCIA
QCV	QUARTZ CARBONATE VEIN
QTPO	" FELDSPAR PORPHYRY
QTPS	" " " & SHALE

RVC	RHYOLITIC VOLCANICLASTICS
RVCS	" " & SILTSTONE
SHA	SHALE
SL	SILTSTONE (PELITIC METAMORPHICS)
SLB	" BEDDED
SLBC	" & BASALTIC CONGLOMERATE
SLBS	" " " INTRUSIONS
SLC	" & VOLCANIC CONGLOMERATE
SLGT	" /GREYWACKE/TUFF
SLGW	" / "
SLM	" /SHALE - MUSCOVITE
SLMP	" " " & PORPHYRY
SLMS	" " " & SANDY BEDS
SLT	" & RHYOLITIC TUFF INTERBEDS
SLTB	" & BEDDED TUFF
SLTF	" / TUFF
SLV	" /MUDSTONE - UNBEDDED
SLVB	" VOLCANICLASTIC INTERBEDS
SST	SANDSTONE
TF	TUFF
TFBC	" BRECCIA (DACITE?)
TFSH	" /SHALE INTERBEDS
TFX	" - CRYSTAL
TFXL	" - " LITHIC (DACITE)
TFXD	" - " DACITIC
TSB	" /BASALTIC LAPILLI
VC	VOLCANICLASTICS
VCG	VOLCANIC CONGLOMERATE

208

Project : RA : 0 Code : 411216

HOLE : BRD001 Coords : 389013.9E 5394846.1N Collar RL : 661.3
Logged by : REW. PDE. Driller : ORTNER Rig id : J49
Commenced : 05/04/87 Completed : 04/06/87
Start Log : 0.00 Total Depth : 860.50
Tot Oxid Depth : 0.00 Part Oxid Depth : 16.60

Target Description

Target was CSAMT phase anomaly at approx 370m also on flank of positive gravity anomaly.Geological interpn for hole 0-50m rhyolitic volcaniclastics,50-200 Que River Shale, 200-375 volcanics, target=massive sulphides, footwall volcanics.

Mineralisation

Trace Sp-Gn associated with qtz-cb veining and vesicle infilling in Hellyer Basalt.

Significant Results

sequence 0-75.0 rhyolitic volcaniclastics
75.0-527.5 Que River Shale
527.5-850.5 Hellyer Basalt
850.5-860.6 Epiclastics=Mixed Sequence

Alteration Details

General Comments

Preliminary results for O & C isotopes indicate calcite infilling in vesicles in Hellyer Basalt=150C, which is greater than in BRD02.

Geological Notes

DOWNHOLE SURVEY DATA:

Depth	Dip	Azimuth	Core Size
0.00	-90.00	0.00	HQ
30.00	-90.00	0.00	HQ
60.00	-90.00	321.00	NQ
90.00	-89.00	321.00	NQ
120.00	-89.00	261.00	NQ
150.00	-89.00	256.00	NQ
183.00	-89.00	259.00	NQ
213.00	-88.00	262.00	NQ
243.00	-87.00	276.00	NQ
273.00	-87.00	281.00	NQ
303.00	-87.00	287.00	NQ
333.00	-86.00	289.00	NQ
363.00	-86.00	288.00	NQ
393.00	-84.00	287.00	NQ
423.00	-85.00	288.00	NQ
451.00	-85.00	295.00	NQ
483.00	-85.00	288.00	NQ
544.00	-84.00	298.00	NQ
600.00	-84.00	304.00	BQ
630.00	-84.00	291.00	BQ
660.00	-84.00	304.00	BQ
690.00	-84.00	307.00	BQ
720.00	-83.00	304.00	BQ
750.00	-83.00	313.00	BQ

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	O X I D	--SULPHIDES-- Vo GP yCp Co Ga Sp Zs In Ta Zn Zn In	-------ALTERATION-------- Il Bi Ch Ep Kf Se Cl Si Ca la Ba Ma	VEINING Ty Vo Ho A	STRUCTURE Ba Ja Fe H	FAULT Gg Ang pc	SU tn ri at	Comments
2.50	1.10		RVC		2		0				0 3	
5.40	0.20		RVC		2		0				0 3	
6.00	0.40		RVC		0		0				0 4	
7.70	1.30		RVC		1	TRFDA	0				0 4	
10.40	3.00		RVC		1	01FKA	0		0		0 4	
12.00	1.60		RVC		1	TRFDA	0		0		0 4	
13.60	1.40		RVC		1	TRFDA	0		0		0 4	
16.60	3.00		RVC		1	TRFDA	0		0		0 4	
19.70	3.00		RVC		0	01FKA	0		0		0 4	
22.70	3.00		RVC		0	TRFDA	0		0		0 4	
25.70	3.00		RVC		0	01FDA	0		0		0 4	
28.70	3.00		RVC		0	TRFDA	0		0		0 4	
31.70	3.00		RVC		0	TRFDA	0		0		0 4	
34.70	3.00		RVC		0	TRFDA	0		0		0 4	
37.70	3.00		RVC		0	TRFDA	0		0		0 4	
40.10	2.40		RVC		0	TRFDA	0		0		0 4	
43.20	3.10		RVC		0	TRFDA	0		0		0 4	843.2=A295201=thin sect.
46.40	3.20		RVC		0	TRFDA	0		0		0 4	
49.50	3.10		RVC		0	TRFDA	0		0		0 4	
51.10	1.60		RVC		0	TRFDA	0		0		0 4	
52.60	1.50		RVC		0	TRFDA	0				0 4	
53.50	0.90		RVC		0	TRFDA	0				0 4	
55.70	2.20		RVC		0	TRFDA	0				0 4	
58.70	1.00		RVC		0	TRFDA	0				0 4	
60.90	2.20		RVC		0	01FKA	0				0 4	
61.60	0.70		VCG		0	01FKA	0				0 4	
64.60	3.00		VCG		0	01FKA	0				0 4	
67.60	3.00		VCG		0	01FKA	0				0 4	
69.30	1.70		VCG		0	02FKA	0				0 4	
70.70	1.40		VCG		0	02FKA	0				0 4	
73.70	3.00		VCG		0	02FKA	0				0 4	
75.60	1.90		VCG	MST	0	03FKA	0				0 4	875.0=contact
76.60	1.00		MST		0	05FDA	0				0 4	
79.70	3.10		SHA	MST	0	05FDA	0		7		0 4	
82.40	2.70		MST	SHA	0	02FDA	0		0		0 4	
85.60	3.20		SHA	MST	0	02FDA	0		0		0 4	
88.70	3.10		SHA		0	02FDA	0		7		0 4	
91.20	2.50		MST		0	02FDA	0				0 4	
93.00	1.00		MST	SHA	0	02FDA	0		0		0 4	
96.50	3.50		SHA		0	06FDA	0		0		0 4	
99.60	3.10		SHA	MST	0	05FVA	0	QCTR013	0		0 4	
100.40	0.80		MST		0	04FDA	0	QCTR022	0		0 4	
103.50	3.10		MST	SHA	0	04FDA	0				0 4	
106.30	2.80		MST	SHA	0	04FDA	0		0		0 4	
107.90	1.60		MST		0	01FDA	0				0 4	
109.70	1.80		MST		0	01FDA	0	QCTR012			0 4	
112.70	3.00		SHA		0	05FDA	0	QCTR03R	0		0 4	
115.70	3.00		MST	SHA	0	06FVA	0	QCTR027	7		0 4	
118.30	2.60		SHA	MST	0	06FVA	0		7		0 4	
121.40	3.10				0		0				0	

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	O I D	--SULPHIDES-- VoGPyCpCoGaSp IzIaIaIaIaIa	ALTERATION-------- iLiBiChEpKfSeClSiCaJaBaMa n t	VEINING TyVoNoA	STRUCTURE BaJaFa	H	FAULT &gAng pc	SU tn ri at	Comments
124.68	3.28		MST	SHA	0	01FDA	0		0	0	4		
127.78	3.10		MST		0	01FDA	0		QCTR01R	0	4		
130.78	3.08		MST		0	01FDA	0		QCTR013	0	4		
133.78	3.08		MST		0	01FDA	0			0	4		
136.78	3.08		MST		0	01FDA	0			0	4		
139.68	2.98		MST		0	01FDA	0		QCTR03R	0	4		
142.78	3.18		MST		0	01FDA	0		QC01848	0	4		
145.78	3.08		MST	SHA	0	01FDA	0		QC0287R	0	4		
148.78	3.08		MST		0	01FDA	0		QCTR01R	0	4		
149.68	2.98		MST		0	01FDA	0			0	4		
151.78	2.18		MST		0	01FDA	0			0	4		
154.78	3.08		MST		0	01FDA	0			0	4		
157.78	3.08		MST		0	01FDA	0			0	4		
159.88	2.18		MST		0	05FVA	0		QCTR04R	0	4		
161.18	1.38		MST		0	01FDA	0		QCTR04R	0	4		
162.88	1.78		MST		0	01FDA	0		QCTR04R	0	4		
163.48	0.68		MST		0	01FDA	0			0	4		
164.88	1.48		MST		0	01FDA	0		QC0105R	0	4		
166.78	2.98		MST		0	01FDA	0		QCTR033	0	4		
169.78	3.28		MST		0	01FDA	0		QC02084	0	4		
172.78	3.08		MST		0	01FDA	0		QCTR023	0	4		
175.78	3.08		MST		0	01FDA	0		QC05033	0	4		
178.78	3.08		MST		0	01FDA	0		QC01863	0	4		
180.28	1.58		MST		0	01FDA	0		QC03103	0	4		
183.28	3.08		MST		0		0		QC0515R	0	4		
184.78	1.58		MST		0		0		QCTR02R	0	4		
187.68	2.98		MST	SHA	0		0		QCTR05R	9	0	4	
190.78	3.18		SHA	MST	0		0		QCTR01R		0	4	
193.78	3.08		MST		0		0				0	4	
196.78	3.08		MST		0		0				0	4	
199.78	3.08		MST	SHA	0		0			9	0	4	
202.78	3.08		MST		0		0				0	4	
205.28	2.58		MST	SHA	0		0			9	0	4	
207.78	2.58		MST		0		0				0	4	
209.68	0.98		MST		0	01FDA	0				0	4	
211.78	3.08		MST		0	01FDA	0		QC01853		0	4	
214.78	3.08		MST		0	05FDA	0		QC01853		0	4	
217.78	3.08		SHA	MST	0	01FDA	0		QCTR013		0	4	
220.78	3.08		MST		0	01FDA	0		QC05153		0	4	
223.78	3.08		SHA	MST	0	06FBA	0		QCTR03R	0	0	4	
226.78	3.08		SHA	MST	0	06FBA	0		QCTR013	0	0	4	
229.78	3.08		SHA	MST	0	06FBA	0		QCTR013	0	0	4	
232.78	3.08		MST		0	06FBA	0				0	4	
235.78	3.08		MST		0	04FBA	0				0	4	
235.78	3.08		MST		0	04FBA	0				0	4	
238.78	3.08		MST	SHA	0	04F9A	0		QCTR013		0	4	
241.78	3.28		MST		0	02FDA	0		QCTR013		2	4	
243.48	1.78		MST	SHA	0	01FDA	0		QCTR023		0	4	
245.28	1.88		MST		0	03FVA	0		QC0105R		0	4	
245.68	0.48		MST		0	01FDA	0				0	4	

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	I	--SULPHIDES-- V o G Py Cp Co Ga Sp I	------ALTERATION------ Li Bi Ch Ep K Se Cl Si Ca Ja Ba Na n t	VEINING Ty Vo No A	STRUCTURE Ba Ja Fa H	FAULT Gp Ang pc	SU to ri at	Comments
246.10	0.50		MST		0	01FDA	0		0 4			
246.80	0.70		MST		0	01FDA	0	QCTR01R	0 4			
247.90	1.10		MST		0	01FDA	0	QCTR01R	0 4			
249.00	1.10		MST		0	01FDA	0	QC10023	0 4			
252.10	3.10		MST		0	01FDA	0	QCTR02R	0 4			
253.70	1.60		MST		0	01FDA	0	QCTR02R	0 4			
256.70	3.00		MST	SHA	0	01FDA	0	QCTR023	0 4			
259.70	3.00		MST		0	01FDA	0	QCTR023	0 4			
262.70	3.00		SHA	MST	0	03FBA	0	QCTR023 9	0 4			
265.70	3.00		SHA		0	03FBA	0	9	0 4			
268.70	3.00		SHA		0	02FDA	0	QCTR023 0	0 4			
271.60	2.90		SHA		0	03FBA	0	QC02023 0	0 4			
274.70	3.10		SHA	MST	0	01FDA	0	QCTR02R 0	0 4			
277.70	3.00		MST		0	01FDA	0	QCTR02R	0 4			
280.70	3.00		MST		0	01FDA	0	QC01023	0 4			
283.30	2.60		MST		0	TRFDA	0	QC01B4R	0 4			
286.40	3.10		MST	SST	0	TRFDA	0	QC01043	0 4			
289.50	3.10		MST		0	TRFDA	0	QCTR033	0 4			
292.60	3.10		MST		0	TRFDA	0	QCTR012	0 4			
295.70	3.10		MST		0	TRFDA	0	QC01B4R	0 4			
298.70	3.00		MST	SHA	0	TRFDA	0	QC01107R 0	0 4			
301.70	3.00		SHA	MST	0	TRFDA	0	QC0107R 9	0 4			
304.70	3.00		SHA	MST	0	TRFDA	0	QCTR033 9	0 4			
307.70	3.00		MST		0	TRFDA	0		0 4			
310.70	3.00		SHA	MST	0	TRFDA	0	QC02033	0 4			
313.70	3.00		MST		0	TRFDA	0	QC01043	0 4			
316.70	3.00		MST		0	03FBA	0	QC15034	0 4			
319.70	3.00		MST		0	01FBA	0	QCTR032	0 4			
322.70	3.00		MST		0	01FBA	0		0 4			
325.40	2.70		MST		0	01FBA	0		0 4			
328.50	3.10		MST		0	02FBA	0		0 4			
331.50	3.00		MST	SST	0	02FBA	0		0 4	0		
334.60	3.10		MST	SST	0	02FDA	0		0 4			
337.70	3.10		MST		0	01FDA	0	QCTR03R 9	0 4			
340.70	3.00		MST		0	01FDA	0	QC0124R 9	0 4			
343.70	3.00		SST	SHA	0	01FDA	0	QC01B4R 7	0 4			
346.70	3.00		SHA	MST	0	01FDA	0	QC0508R 6	0 4			
348.50	1.80		SHA	MST	0	06FBA	0	QC02043 4	0 4			
351.20	2.70		SHA		0	06FBA	0	QCTR04R 0	0 4			
352.70	1.50		SHA	MST	0	06FBA	0	QC0108R 4	0 4			
354.90	2.20		SHA	MST	0	06FBA	0	QC0108R 6	0 4			
356.00	3.10		MST	SHA	0	02FDA	0	QC01023 0	0			
361.10	3.10		SHA	MST	0	02FDA	0	0	0 4			
364.20	3.10		MST	SST	0	01FDA	0	0	0 4			
367.30	3.10		MST		0	01FDA	0	0	0 4			
367.50	2.40		MST		0	01FDA	0	QC4308R	0 4			
369.50	2.20		MST	SHA	0	01FDA	0	QCTR01R 0	0 4			
371.10	1.60		MST		0	01FDA	0		0 4			
371.90	0.80		MST		0	01FDA	0	QCTR03R	0 4			
372.40	0.50		MST		0	01FDA	0	7	0 4			

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	D I D	X	--SULPHIDES-- Yo Py Cp Co Ba Sp z	------ALTERATION------ Li Bi Ch Ep Kf Se Cl Si Ca Ja Ba Ma n t	VEINING Ty Yo No A	STRUCTURE Ba Ja Fa H	FAULT Gg Ang pc	SU tn ri at	Comments
374.10	1.70		MST		0	01	FDA	0	QC0106R	0 4			
378.90	2.40		MST		0	01	FDA	0	QCTR043	0 4			
382.60	3.10		SHA		0	01	FDA	0	QCTR023 8	0 4			
384.70	2.70		SHA		0	01	FDA	0	QCTR023 8	0 4			
386.60	1.90		MST	SHA	0	01	FDA	0	QCTRE3R 8	0 4			
388.20	1.60		MST		0	01	FDA	0	QCTR03R	0 4			
391.30	3.10		MST	SHA	0	03	FBA	0	8	0 4			
394.10	2.80		SHA	MST	0	03	FBA	0	0	0 4			
395.90	1.80		MST		0	03	FVA	0	QCTR03R	0 4			
398.70	2.80		MST		0	03	FVA	0	QCTR023	0 4			
401.80	3.10		MST	SHA	0	03	FBA	0	QCTR02R 8	0 4			
403.70	1.90		MST	SHA	0	03	FVA	0	QCTR03R 8	0 4			
406.70	3.00		SHA	MST	0	03	FVA	0	QCTR013 8	0 4			
408.40	1.70		SHA	MST	0	03	FDA	0	QCTR013 7	0 4			
411.70	3.30		SHA	MST	0	03	FVA	0	QC01083 7	0 4			
414.80	3.10		SHA	MST	0	02	FDA	0	7	0 4			
418.00	3.20		SHA	MST	0	01	FDA	0	7	0 4			
420.70	2.70		SHA	MST	0	01	FDA	0	7	0 4			
421.90	1.20		SHA	MST	0	01	FDA	0	QCTR023	0 4			
423.00	1.10		MST		0	01	FDA	0	QC0401R	0 4			
426.10	3.10		SHA	SST	0	01	FDA	0	8	0 4			
428.40	2.30		SHA	MST	0	01	FDA	0	QCTR017 8	0 4			
430.70	2.30		MST	SHA	0	01	FDA	0	QCTR02R 8	0 4			
433.70	3.00		MST	SHA	0	01	FDA	0	0	0 4			
436.70	3.00		SHA	MST	0	01	FDA	0	QCTR01R 8	0 4			
439.70	3.00		SHA	MST	0	01	FDA	0	QC02B8R 8	0 4			
442.70	3.00		SHA	SST	0	01	FDA	0	QCTR04R 8	0 4			
445.70	3.00		SHA	SST	0	01	FDA	0	8	0 4			
448.70	3.00		MST		0	01	FDA	0		0 4			
451.70	3.00		MST		0	01	FDA	0	QCTR05R	0 4			
454.70	3.00		SHA	MST	0	01	FDA	0	8	0 4			
457.70	3.00		SHA	MST	0	01	FDA	0	8	0 4			
460.70	3.00		MST	SHA	0	01	FDA	0	QCTR02R 8	0 4			
463.70	3.00		SHA	MST	0	01	FDA	0	8	0 4			
466.70	3.00		SHA	MST	0	01	FDA	0	8	0 4			
469.70	3.00		MST	SHA	0	01	FDA	0	8	0 4			
472.70	3.00		SHA	SST	0	01	FDA	0	QCTR01R 8	0 4			
475.70	3.00		SHA		0	01	FDA	0	QCTR013 8	0 4			
478.70	3.00		SHA		0	06	FBA	0	8	0 4			
481.70	3.00		SHA	MST	0	06	FBA	0	8	0 4			
484.70	3.00		SHA		0	04	FBA	0	QCTR012 7	0 4			
487.70	3.00		MST		0	01	FDA	0	QCTR032 7	0 4			
490.70	3.00		MST	SHA	0	01	FDA	0	QC01062	0 4			
493.50	2.80		SHA	MST	0	01	FDA	0	QCTR053 8	0 4			
496.60	3.10		SHA		0	02	FBA	0	7	0 4			
499.70	3.10		SHA		0	02	FBA	0	7	0 4			
502.40	2.70		MST	SHA	0	03	FVA	0	QC01013 7	0 4			
505.50	3.10		SHA		0	02	FBA	0	8	0 4			
508.60	3.10		SHA		0	06	FBA	0	0	0 4			
509.40	0.80		SHA		0	06	FBA	0	7	0 4			

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	D I D	--SULPHIDES-- X Vo6PyCpCo6aSp IzIzIzIzIzIz	n t	-------ALTERATION-------- ILiBiChEpKfSeClSiCaJaBaMa	VEINING TyVoNoA	STRUCTURE BaJaFa	H	FAULT GgAng pc	SU tn ri at	Comments
510.60	1.20		SHA		0	01FVA	0		7		0	4		
511.70	1.10		SHA		0	01FVA	0		6		0	4		
513.20	1.50		SHA		0	32FBA	0		QCTR02R		0	4		
513.90	0.70		SHA		0	04FBA	0		6		0	4		
514.80	0.90		SHA		0	01FBA	0		QCTR03R	6	0	4		
516.20	1.40		MST		0	02FVA	0				0	4		
516.40	0.20		MST		0	01FVA	0				0	4		
517.60	1.20		MST		0	15FBA	0				0	4		
519.50	1.20		SHA	MST	0	02FDA	0		QC0330R		0	4		
520.70	1.20		SHA	MST	0	02FVA	0		QCTR054		0	4		
522.60	2.10		MST	SHA	0	02FVA	0		QCTR07R	8	0	4		
525.90	3.10		MST		0	04FVA	0		QC01104		0	4		
527.50	1.60		MST		0	03FVA	0		QCTR043		0	4		
529.80	1.50		BAP	BAV	0	01FDA	1	1P 2P	QC0710R		0	4		
532.20	2.20		BAP	BAV	0	01FDA	1	2P 2P	QC0508R		0	4		
535.30	3.10		BAP	BAV	0	TRFDA	2	2P 2P	QC0407R		0	4		
538.40	3.10		BAP	BAV	0	02FD5 V2V3	2	2P 1V2P	QC0408R		0	4		
541.50	3.10		BAP	BAV	0	TRFDA	2	2P 1V2P	QC0308R		0	4		
544.60	3.10		BAP	BAV	0	TRFDA	2	2P 1V2P	QC0306R		0	4		
547.70	3.10		BAP	BAV	0	TRFDA	2	1P 1P2P	QC0610R		0	4		
550.70	3.00		BAP		0	TRFDA	2	1P 1P2P	QC0206R		0	4		
553.70	3.00		BAP		0	TRFDADT	1	1P 1P1P	QC0410R		0	4		
556.70	3.00		BAP		0	TRFDA	1	1P 1P1P	QC0410R		0	4		
559.70	3.00		BAP		0	TRFDA	1	1P 1P1P	QC0207R		0	4		
562.70	3.00		BAP		0	01FDA	2	1P 2P2P	QCTR024		0	4		
565.70	3.00		BAP		0	TRFDA	2	1P 2P2P	QCTR06R		0	4		
568.70	3.00		BAP		0	TRFDA	2	TP1V 1P2P	EC0510R		0	4		
571.70	3.00		BAP		0	TRFDA	2	TP1V 1P2V	QE10044		0	4		
574.70	3.00		BAP	BAV	0	TRFDA	1	TP1V TP1V	QE0405R		0	4		
577.70	3.00		BAP	BPB	0	01FDA	1	TP TP1P	QC0205R		0	4		
580.70	3.00		BAP		0	TRFDA	1	TP TP1P	QC0105R		0	4		
583.70	3.00		BAP		0	TRFD5	1	TP TP1P	QCTR054		0	4		
586.70	3.00	A295065	BAP		0	TRFDA	0	TP TP1P	QC0203R		0	4		9584.0=A295071 THIN SECT.
589.70	3.00		BAP	BPB	0	TRFD3	1	TP 1P1P	QCTR037		0	4		
592.70	3.00		BPB	BAP	0	TRFD4AT AtA2	1	TP 1PTP	QC0104R		0	4		
594.90	2.20		BAP	BPB	0	TRFDA	1	TP 1P1P	QCTR03R		0	4		
595.60	0.70		BAP		0	01FDB	1	TP 1P1P	QCTR054		0	4		
598.60	3.00		BAP	BPB	0	TRFD5	1	1P 1P1P	EC0206R		0	4		
601.70	3.10		BAP	BPB	0	TRFD5	1	1P 1P1P	ECTR02R		0	4		
604.70	3.00		BAP		0	TRFD8	1	1P 1P1P	ECTR047		0	4		
607.70	3.00		BAP	BPB	0	TRFDA	1	1P 1P1P	ECTR057		0	4		
610.70	3.00		BAP		0	TRFDA	2	2P 1P1P	QC01273		0	4		
613.70	3.00		BAS		0	TRFD5AI AtA2	1	TP 1PTP	QC0126R		0	4		
616.60	2.90		BAS		0	TRFDA	1	TP 1P1P	QC01237		0	4		
619.70	3.10		BAS	BAV	0	TRFDA	1	1P TP1P	ECTR037		0	4		
622.70	3.00		BAS	BAV	0	TRFD4 A2	1	1P TP1P	ECTR066		0	4		
625.70	3.00		BAS		0	TRFDA	1	1P TP1P	QC0224R		0	4		
628.70	3.20		BAS	BAV	0	TRFDA	1	1P TP1P	QCTR037		0	4		
631.70	3.00		BAS	BAP	0	01FD3	1	1P 1P	QCTR047		0	4		
634.70	3.00		BAS		0	TRFDA	1	TP 1P	ECTR057		0	4		

DEPTH TO	Recov	Sample Number	LITH'GY Maj	Min	O I D	--SULPHIDES-- VoBPyCpCoGaSp IsTeTeTeTeZn	ALTERATION									VEINING TyVcMoR	STRUCTURE BaJaFa	N	FAULT GpAng pc	SU to ri at	Comments
							LiBiChEpKfSeClSiCaJaBaMa o t														
637.70	3.00		BAS		0	TRFDA	1	TP	1P1P	EC01047	0	4			
640.70	3.00		BAS	BAV	0	B1FDA	1	TP	1P1P	ECTR037	0	4			
643.70	3.00		BAS		0	TRFDA	1	TP	1P1P	QCTR02R	0	4			
646.70	3.00		BAS	BAV	0	TRFDA	1	TP	1P1P	ECTR027	0	4			
649.70	3.00		BAS	BAV	0	TRFDA	1	TPTW	1P1P	EC01057	0	4			
652.70	3.00		BAS		0	TRFDA	1	TPTW	1P1P	EC0527R	0	4			
655.70	3.00		BAB		0	B1FD5	1	1PTW	TP1P	EC0504R	0	4			
658.70	3.00		BAS	BAB	0		1	1P	TP1P	EC02037	0	4			
659.10	0.40		BAV		0	TRFDA	1	TP	1P1P		0	4			
661.70	2.60		BAV	BAB	0	TRFDA	1	1PTW	1P1P	EC0105R	0	4			
664.70	3.00		BAB		0	TRFDA	1	1P	1P1P	QC0105R	0	4			
667.70	3.00		BAV	BAB	0	TRFDA	1	1P	TP1P	QCTR03R	0	4			
670.70	3.00		BAB		0	TRFDA	1	1P	TP1P	QC0101R	0	4			
673.70	3.20		BAB		0	TRFDA	1	1P	TP1P	QC0104R	0	4			
676.70	3.00		BAB		0	TRFDA	1	1P	TP1P	QCTR02R	0	4			
679.70	3.00		BAB	BAS	0	TRFDA	1	1P	1P1P	QC0108R	0	4			
682.70	3.00		BAV	BAB	0	TRFD7	03	1	1P	1P1P	QC0103R	0	4			
685.70	3.00		BAB		0	TRFDA	1	1PTW	TP1P	EC02036	0	4			
688.70	3.00		BAB	BAS	0	TRFDA	1	1P	TP1P	QC0103R	0	4			
691.70	3.00		BAS	BAS	0	TRFDA	1	1P	TP1P	QC0102R	0	4			
694.70	3.20	A295866	BAS	BAB	0	TRFDA	1	TP	TP1P	QCTR03R	0	4			
697.70	3.00		BAB		0	TRFDA	1	TP	TP1P	QCTR03R	0	4			
720.70	3.20		BAS		0	TRFDA	1	TP	TP1P	QCTP03R	0	4			
783.70	3.20		BAS		0	TRFDA	1	TP	1P1P	QC01044	0	4			
786.70	3.00		BAB	BAS	0	TRFDA	1	1P	TP1P	QC08052	0	4			
789.70	3.00		BAS	BAB	0	TRFDA	1	1P	TP1P	QC0405R	0	4			
712.70	3.00		BAS	BAV	0	TRFDA	1	1P	TP1P	QCTR04R	0	4			
715.70	3.00		BAS		0	TRFDA	1	2P	TP1P	QC0203R	0	4			
718.70	3.00		BAS	BPB	0	TRFDA	1	TP	TP1P	QCTR02R	0	4			
721.70	3.00		BAS	BAV	0	TRFDA	1	1P	TP1P	QC04027	0	4			
724.70	3.00		BAS	BAB	0	TRFDA	1	1P	1P	EC02024	0	4			
727.70	3.00		BAV		0	TRFD1V2	V4V3	1	1P	TP1P	EC01037	0	4			
730.70	3.00		BAV	BAS	0	B1FDA	1	TP	TP1P	EC01247	0	4			
733.70	3.20		BAS	BAV	0	TRFDA	1	TP	TP1P	QCTR02R	0	4			0733.7=A295804 THIN SECT.
736.70	3.00		BAV	BAS	0	TRF02	A2V5	1	1P	1P1P	EC01067	0	4			
739.70	3.00		BAB	BAV	0	TRFD3	D1V6	1	1P	1P1P	EC02047	0	4			
742.70	3.00		BAV	BAB	0	TRFD5	V1V5	1	1P	1P1P	EC02047	0	4			
745.70	3.00		BAS	BAB	0	TRFD5	V5	1	1PTW	1P1P	EC01037	0	4			
748.70	3.00		BAS	BAB	0	TRFD5	V2	1	TP	TP1P	QC0104R	0	4			
751.70	3.00		BAS	BAB	0	TRFD3	A2	1	1P	TP1P	QC0108R	0	4			
754.70	3.20		BAV	BAS	0	TRFDA	1	1P	TP1P	QC01003	0	4			0754.7=A295806 THIN SECT.
757.70	3.20		BAV	BAS	0	TRFDA	1	1P	TP1P	QCTR04R	0	4			
760.70	3.00		BAV	BAB	0	TRFDA	1	1P	TP1P	QCTR04R	0	4			
763.70	3.00		BAS	BAB	0	TRFDA	1	1P	TP1P	QC0205R	0	4			0762.7=A295807 THIN SECT.
766.70	3.00		BAS	BAB	0	TRFDA	1	1P	1P	QC0205R	0	4			0766.6=A295808 THIN SECT.
769.70	3.20		BAS		0	TRFD8D1	D1	1	2P	1P	QC0105R	0	4		
772.70	3.00		BAS		0	TRFDA	1	2P	1P	QC0205R	0	4			
775.70	3.00		BAS	BAB	0	TRFD4	03	1	1P	TP1P	QCTR03R	0	4			0775.7=A295809 THIN SECT.
778.70	3.00		BAV	BAB	0	TRFDA	1	1P	TP1P	QC0103R	0	4			
781.70	3.00		BAV	BAB	0	TRFD7D1	D2	1	1P	TP1P	QCTR03R	0	4		

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	I D	--SULPHIDES-- VoGPyCpCoBaSp ZsZaZaZaZaZa		-------ALTERATION-------- JLiBiChEpKfSaCISiCaJaRaMa n t			VEINING TyVoNoA	STRUCTURE BaJaFe	H	FAULT GgAng pc	SU tn ri at	Comments
784.70	3.00		BAS	BAB	0	TRFDA		1	1P		TP1P	QCTR05R	0	4		
787.70	3.00		BAB		0	TRFD901		1	1P		TP1P	QC0108R	0	4		
790.70	3.00		BAB	BAS	0	TRFD5	D1D4	1	1P		TP1P	QC0110R	0	4		
793.70	3.00		BAS	BAB	0	TRFD4	A6	1	TP		TP1P	QCTR10R	0	4		
796.70	3.00		BAB		0	01FD6	D1D1	1	TP		TP1P	QCTR04R	0	4		
799.70	3.00		BAV	BAB	0	TRFD3	D7	1	TP		TP1P	QCTR05R	0	4		
802.70	3.00		BAB	BAV	0	TRFD3	V7	1	1P		TP1P	QC0103R	0	4		0801.7=A295011 THIN SECT.
805.70	3.00		BAV	BAB	0	TRFD3	V7	1	1P		TP1P	QC0112R	0	4		
808.80	3.10		BAV	BAS	0	01FDA	DT	1	1P		TP1P	QC0110R	0	4		
811.80	3.00		BAV		0	01FDA	DT	1	1P		TP2P	QC2105R	0	4		
814.90	3.10		BAV		0	TRFDA		1	1P		TP1P	QC06073	0	4		
817.90	3.00		BAV	BPB	0	TRFD7	D3	2	1P		1P2P	QC2105R	0	4		
821.00	3.10		BAS	BAB	0	TRFDA		1	1P		TP1P	QC01052	0	4		
824.00	3.00		SAS		0	TRFD402	V4	1	TP		TP1P	QC0110R	0	4		
827.10	3.10		BAV		0	TRFDA		1	1P		1P	QC0105R	0	4		
830.10	3.00		BAS	BAV	0	TRFD3	D2V5	1	1P		TP2P	QC0210R	0	4		
833.20	3.10	A295867	BAV	BAS	0	TRFDA		1	1P		TP1P	QC01052	0	4		0831.0=A295873 THIN SECT=WHOLE ROCK A295867 0833.2=A295813 THIN SECT.
836.20	3.00		BAS		0	TRFDA		1	2P		1P	QC0505R	0	4		
839.30	3.10		BAV		0	TRFDA		1	1P		TP1P	QC0103R	0	4		0839.3=A295814 THIN SECT.
842.30	3.00		BAV		0	TRFD4	V6	1	1P		TP1P	QC04032	0	4		
845.40	3.10		BAV	BAS	0	TRFDA		1	1P		TP1P	QC0205R	0	4		
848.40	3.00		BAV	BAB	0	TRFDA		1	1P		TP1P	QC0505R	0	4		
850.50	2.10		BAB		0	TRFDA		1	1P		TP1P	QC1015R	0	4		
851.50	1.00		EPI		0	TRFDA		2	1P	TP	1P2P	QCTR03R	0	4		0851.5=A295815 THIN SECT.
854.50	3.00		EPI		0	TRFDA		2	1P	TP	1P2P	QCTR03R	0	4		
857.60	3.10	A295868	EPI		0	TRFDA		2	1P	TP	1P2P	QCTR03R	0	4		A295868 0855.7
860.60	3.00		EPI		0	TRFDA		2	1P	TP	1P2P	QCTR03R	0	4		

HOLE : DDH BRD 01A Coords : 389013.9E 5394846.1N Collar RL : 661.3
Logged by: PDE Driller: ORTNER Rig id: J49 (mod)
Commenced: 20th August 1989 Completed: 15th Nov 1989
Start Log: 592.8m Total Depth: 1133m
Total Oxid Depth: - Part Oxid Depth: -

Target Description

Extension of BRD 01 to test the Que/Hellyer sequence below the Hellyer Basalt and allow downhole geophysics to be run to test the surrounding area.

Mineralisation

None of significance - trace Sp-Gn associated with qtz-carb veining and vesiculé infilling in the basalt horizons.

Significant Results

0-75.0m	Pyroclastics
75.0-527.5m	Que River Shale
527.5-850.5m	Hellyer Basalt
850.5-922.0m	Dalcitic Lavas and Breccias
922.0-953m	Lower Basalt
953 -1052.2m	Feldspar phyric sequence
1052.2-1085.1m	Lower Andesites
1085.1-1109.8m	Lower Dacitic Tuffs and Lavas
1109.8-1133	Animal Creek Greywacke
1133	EOH

Alteration Details

Sericite-calcite common below 850.5m - stronger towards base.
Fuchsite-epidote-silica occurs particularly around 917-922m near the Lower basalt.

General Comments

3 weeks to remove PVC, set wedge and commence drilling.

Geological Notes

Pb isotopes indicate Que River-Hellyer-Rosebery mineralisation signature.
Geochemistry confirms alteration.

DOWNHOLE SURVEY DATA

Depth	Dip	Azimuth	Core Size
0	-90	0	HQ
30	-90	0	HQ
60	-90	321.0	NQ
90	-89	321.0	NQ
120	-89	261	NQ
150	-89	256	NQ
183	-89	259	NQ
213	-88	262	NQ
243	-87	276	NQ
273	-87	281	NQ
303	-87	287	NQ
333	-86	289	NQ
363	-86	288	NQ
393	-84	287	NQ
423	-85	288	NQ
451	-85	295	NQ
483	-85	288	NQ
514	-84	298	NQ
585	-84	304	NQ

WEDGE AT 586m

Depth	Dip	Azimuth	Core Size
604	-81	290	
634	-81	290	
664	-81	290	
724	-81	291	
769	-81	293	
883	-79	294	
970	-78	292	

DEPTH To	Core Recov	LITH'GY MaMi	0. Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
547.7	20.2	BSPV	0						701409	WR
571.7	24.0	BSP	0						701410	WR
550.7	0.1	BSP	0						701348	TS
577.7	6.0	BSPV	0						701411	WR
586.7	9.0	BSP	0						701412	WR
592.7	6.0	BSPB	0						701413	WR
610.8	18.1	BSPB	0						701414	WR
598.8	6.0	BSPB	0							
604.8	6.0	BSPB	0							
610.8	6.0	BSPB	0							
634.8	24.0	BSMV	0						701416	WR
616.8	6.0	BSM	0							
613.4	0.1	BSP	0						701349	TS
622.8	6.0	BSMV	0							
628.8	6.0	BSMV	0							
634.8	6.0	BSMP	0							
632.0	0.1	BSP	0						701350	TS
652.0	18.0	BSMV	0						701417	WR
640.8	6.0	BSMV	0							
646.8	6.0	BSMV	0							
648.5	0.1	TSB	0						701351	TS
652.8	6.0	BSMV	0							
688.8	36.0	BSBV	0						701418	WR
658.8	5.9	BSBM	0							
664.8	6.0	BSBV	0							
670.8	6.0	BSBV	0							
676.8	6.0	BSB	0							
682.8	6.0	BSBV	0							
688.8	6.0	BSBM	0							
694.8	6.0	BSMB	0						701419	WR
700.8	6.0	BSBM	0						701420	WR
BRECCIA TO 699.2										
718.3	17.5	BSMB	0						701421	WR
706.8	6.0	BSMB	0							

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
701.8	0.1	BS	0							701353	TS
709.8	3.0	BSMB	0								
711.9	2.1	BSMV	0								
718.3	6.4	BSMB	0								
713.7	0.1	BS	0							701354	TS
MASSIVE TO 714.5											
742.8	24.5	BSMV	0							701422	WR
724.8	6.5	BSMV	0								
730.8	6.0	BSVM	0								
735.0	0.1	BSP	0							701355	TS
736.8	6.0	BSMV	0								
742.8	6.0	BSBV	0								
741.7	0.1	BSBV	0							701301	Pb
742.6	0.1	BSBV	0							701302	Pb
754.8	12.0	BSMB	0							701423	WR
748.8	6.0	BSMB	0								
754.8	6.0	BSMV	0								
760.8	6.0	BSVB	0							701424	WR
784.8	24.0	BSMB	0							701425	WR
763.8	3.0	BSMB	0								
769.8	6.0	BSMB	0								
766.0	0.1	BS	0							701356	TS
775.8	6.0	BSMB	0								
779.1	3.3	BSMB	0								
784.8	5.7	BSMB	0								
781.1	0.1	BSMB	0							701303	Pb
796.8	12.0	BSBM	0							701426	WR
790.8	6.0	BSBM	0								
796.8	6.0	BSBM	0								
814.8	18.0	BSVB	0							701427	WR
802.8	6.0	BSVB	0								
808.8	6.0	BSVB	0								
814.8	6.0	BSVB	0								
809.5	0.1	BS	0							701357	TS

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp		Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
838.8	24.0	BSMV	0								701428	WR
820.8	6.0	BSMV	0					4				
826.8	6.0	BSMV	0					4				
832.8	6.0	BSMV	0					4				
838.8	6.0	BSMV	0					4				
851.2	12.4	BSB	0								701429	WR
844.8	6.0	BSVM	0					4				
849.3	4.5	BSBV	0					4				
849.4	0.1	BSB	0	TRFDA		1		4				
849.4	0.1	BSB	0								701201	WR
851.2	1.8	BSBV	0	O1FDA		1		4				
851.5	0.3	PBC	0								701430	WR
851.4	0.2	PBC	0	02FDA		1	1P	4				
851.4	0.1	PBC	0								701202	WR
851.5	0.1	PBC	0	02FDA		1	1PTP	4				
854.0	2.5	MBCD	0	03FCA		1	1P2S	4			701222	GC
853.1	0.1	MBCD	0								701203	WR
856.2	2.2	MBCD	0	01FDA		1	1P2STP	QC0202R	4		701223	GC
858.4	2.2	DCLB	0	TRFDA		1	1P1PTS1P	QC02022	4		701224	GC
856.7	0.1	DCLB	0								701305	TS
856.7	0.1	DCLB	0								701204	WR
860.0	1.6	MBCD	0	TRFDA		3	2P1P1P2P	QC0102R	02	4	701225	GC
862.0	2.0	PBC	0	01FVA		3	2P1PTS2P	QC0102R	4		701226	GC
864.0	2.0	MBCD	0		DTD1	3	2P1PTS1P		4		701227	GC
862.9	0.1	MBCD	0								701306	TS
862.9	0.1	MBCD	0								701205	WR
865.5	1.5	MBCD	0			1	TP1PTSTP	QC0102R	4		701228	GC
867.3	1.8	DCL	0	TRFDA	TD	3	2PTP4P2P	QE0304R	4		701229	GC
865.8	0.1	DCL	0								701307	TS
865.8	0.1	DCL	0								701206	WR
870.0	2.7	MBC	0	TRFDA		1	TP1P5PTP		4		701230	GC
867.9	0.1	MBC	0								701308	TS
867.9	0.1	MBC	0								701207	WR
872.0	2.0	DCL	0	TRFV9	V1	1	1P2PTP	QS02017	7	4	701231	GC

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
871.1	0.1	DCL	0							701309	TS
871.1	0.1	DCL	0							701208	WR
874.0	2.0	DCL	0	TRFDA	1 1P3PTP	QC0103R	7 4			701232	GC
875.6	1.6	DCL	0		1 1P3PTV	QC01012	4			701233	GC
878.0	2.4	DCL	0	01FDA	TP 1P1P		4			701234	GC
878.0	0.1	DCL	0							701209	WR
880.0	2.0	DCL	0		1 1P		4			701235	GC
882.0	2.0	PBC	0		2 TP3P		4			701236	GC
884.0	2.0	PBC	0	02FDA	2 TP1P		4			701237	GC
886.1	2.1	PBC	0	TRFDA	3 1P 2P1P2S1P		4			701238	GC
885.2	0.1	PBC	0							701310	TS
885.2	0.1	PBC	0							701210	WR
885.3	0.1	PBC	0							701211	WR-FRAG
887.9	1.8	PBC	0		3 TP 2PTP152P		4			701239	GC
889.2	1.3	TFXL	0	TRFVA	3 2P2P 1P		6 4			701240	GC
888.3	0.1	TFXL	0							701311	TS
888.3	0.1	TFXL	0							701212	WR
890.1	0.9	PBC	0	TRFDA	3 1P 1P1PTP1V	QC02038	4			701241	GC
890.2	0.9	QCV	0	TRFD9DT		QC80016	4			701242	GC
892.0	1.8	MBCD	0		2 TP1P2P1V	QC0204R	4			701243	GC
894.0	2.0	MBCD	0	TRFDA	2 TP1P 1V	QC01032	4			701244	GC
896.0	2.0	MBCD	0	TRFDA	2 TP1P2PTP		4			701245	GC
898.0	2.0	MBCD	0		2 TP1P2PTP		4			701246	GC
900.0	2.0	MBCD	0		2 TP1P2PTP		4			701247	GC
898.1	0.1	MBCD	0							701213	WR
902.0	2.0	MBCD	0	TRFDA	1 TP1P2P		4			701248	GC
904.0	2.0	MBCD	0	TRFDA	3 1P1P2P1P		03 4			701249	GC
902.1	0.1	MBCD	0							701312	TS
903.1	0.1	MBCD	0							701313	TS
906.0	2.0	MBCD	0	TRFDA	3 1PTP3P1V		4			701250	GC
906.1	0.1	MBCD	0							701214	WR
908.0	2.0	MBCD	0	TRFDA	3 1PTPTP1P		4			701252	GC
909.1	1.1	PBC	0	02FDA DT	4 2P TP1V 1		4			701253	GC
908.6	0.1	PBC	0							701314	TS

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp		Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
908.6	0.1	PBC	0								701215	WR
911.0	1.9	MBCD	0	01FDA		1PTP1P		4			701254	GC
913.0	2.0	MBCD	0	01FDA	DT 2	TP1P1PTV	QC01015	4			701255	GC
912.1	0.1	MBCD	0								701216	WR
915.0	2.0	MBCD	0	TRFDA	DT 2	TP1P2P1V	QC0102R	4			701256	GC
917.9	2.9	MBCD	0	TRFDA	2	TP1PTP1P	QS02014	4			701257	GC
918.8	0.9	BSM	0	D1FDA	3	1P 2P1P 1V 1W	QF50015	4			701258	GC
918.0	0.1	BSM	0								701315	TS
918.5	0.1	BS									701358	TS
920.3	1.5	BSMB	0	01MVA	AT 3	1P 2P1P 1V 1W	QC1004R	4				
921.1	0.8	MBCD	0	01FDA	AT 3	1P 2P1P 1V 1W	QF1505R	4			701259	GC
922.0	0.9	BSMB	0	TRFDA			QC0102R	4			701260	GC
932.0	10.0	BSMV	0	TRFDA			QC0205R	4			701261	GC
941.0	9.0	BSMP	0	TRFDA	AT 2	1P 2P	QC0106R	4			701262	GC
934.5	0.1	BSMP	0								701218	WR
938.7	0.1	BS									701359	TS
950.5	9.5	BSPV	0	TRFDA	2	1P 1P	QS0308R	4			701263	GC
943.2	0.1	BSPV	0								701316	TS
953.5	3.0	BSB	0	TRFDA	2	1P 2P	QC1008R		10		701264	GC
953.0	1.0	BSB	0								701317	TS
958.3	4.8	MBCD	0	TRFDA	1	TP1P1V	QC02036	10 4			701265	GC
958.1	0.1	MBCD	0								701318	TS
967.5	9.2	DCL	0	01FVA	1	1P2P	QC0102R				701266	GC
964.1	0.1	DCL	0								701219	WR
971.4	3.9	MBCD	0	04FVA	2	1P1P3P1V	QC01016	4			701267	GC
971.4	0.1	MBCD	0								701319	TS
971.4	0.1	MBCD	0								701220	WR
972.8	1.4	DCL	0	02FDA	3	IP 2PTP3PIP		5 4			701268	GC
974.9	2.1	MBCD	0	TRFDA	2	TP 1P1P2P1P	QC0102R	4			701269	GC
988.8	13.9	MBCD	0	01FV9DT	A1 1	1P1P 1P	QC0103R	4			701270	GC
982.1	0.1	MBCD	0								701221	WR
987.7	0.1	MBCD	0								701320	TS
994.8	6.0	MBCD	0	01FV9V1	VT 1	1P1P 1P	QC02045	4			701272	GC
998.2	3.4	MBCD	0	01MDA	1	1P1P3P1P	QC02107	502 4			701273	GC

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
996.9	0.1	MBCD	0							701322	TS
996.9	0.1	MBCD	0							701286	WR
1001.2	3.0	DCLF	0	01FVA	2 1P 1PTP2P1V	QS01067	6 4			701274	GC
999.7	0.1	DCLF	0							701323	TS
999.7	0.1	DCLF	0							701287	WR
1004.0	2.8	DCL	0	01FVADT	1 TP1P TP	QC04067	4			701275	GC
1006.6	2.6	DCL	0	01FVA	2 1P TPTP3PTP	QC0108R	5 4			701276	GC
1008.2	1.6	DCLF	0	TRFDA	1 TP1P2P	QC0108R	6 4			701277	GC
1013.0	4.8	DCL	0							701431	WR
1011.3	3.1	DCL	0	TRFDA	1 1P2P	QC0108R	4				
1008.7	0.1	DCL	0							701324	TS
1008.7	0.1	DCL	0							701288	WR
1013.0	1.7	DCL	0	TRFDA	2 1P 1PTP3PIV	QC0308R	4				
1014.6	1.6	MBCD	0	TRFVA	1 1P2P	QC0108R	4			701432	WR
1024.1	9.5	DCLF	0							701433	WR
1016.2	1.6	DCLG	0	TRFVA	2 1P 1P 2P1P	QC0108R	4				
1020.8	4.6	DCLF	0	TRFDA	1 1P1P1P	QC0208R	7 4				
1017.9	0.1	DCLF	0							701325	TS
1017.9	0.1	DCLF	0							701289	WR
1024.1	3.3	DCLB	0	O1FDA	1 1P	QC0208R	4				
1026.4	2.3	MBCD	0		TP1P2P	QX1215R	4			701434	WR
1025.2	0.1	MBCD	0							701326	TS
1025.2	0.1	MBCD	0							701290	WR
1028.8	2.4	MBCD	0	TRFDA	1 1PTP1P1P	QC0105R	4			701278	GC
1027.3	0.1	MBCD	0							701327	TS
1027.3	0.1	MBCD	0							701291	WR
1029.6	0.6	MBCD	0							701435	WR
1029.5	0.7	MBCD	0	TRFDA	1	QC0105R	4				
1029.6	0.1	QCV	0			QS90017	4				
1035.0	5.4	PBC	0	01FCA	1	QC0102R	4			701279	GC
1041.9	6.9	PBC	0	02FDA	3 TP2P2P1P	QC0102R	4			701436	WR
1041.0	0.1	PBC	0							701328	TS
1041.0	0.1	PBC	0							701292	WR
1046.0	4.1	MBCD	0	TRFDA	1 1P 1V	QC0102R	4			701280	GC

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
1052.2	6.2	MBCD	0							701437	WR
1048.0	2.0	MBCD	0	02FVA	1 1PTP	QC0502R	20 4				
1052.2	4.2	MBCD	0	TRFDA	1 1P	QC0215R	4	1012			
1052.2	0.1	MBCD	0							701329	TS
1052.2	0.1	MBCD	0							701293	WR
1060.0	7.8	ANLG	0	TRFDA	2 TP 1P1S1V	QE0311R	701 4			701438	WR
1053.7	0.1	ANLG	0							701330	TS
1053.7	0.1	ANLG	0							701294	WR
1058.2	0.1	ANLG	0							701331	TS
1059.8	0.1	ANLG	0							701332	TS
1067.9	7.9	ANL	0	TRFDA	2 1P TP1PTS1V	QE0311R	4			701281	GC
1060.4	0.1	ANL	0							701333	TS
1060.4	0.1	ANL	0							701297	WR
1065.7	0.1	ANL	0							701334	TS
1066.7	0.1	ANL	0							701335	TS
1066.7	0.1	ANL	0							701299	WR
1072.0	4.1	ANLD	0	TRFDA	2 TP 1P1PTS1V	QE0311R	4			701439	WR
1070.8	0.1	ANLD	0							701336	TS
1070.8	0.1	ANLD	0							701402	WR
1074.3	2.3	MBCD	0	TRFDA	2 TP 1P1P 1V	QE0311R	4			701440	WR
1077.8	3.5	ANL	0							701441	WR
1075.8	1.5	ANL	0	TRFDA	2 TP TP1P 1P	QE0311R	4				
1074.9	0.1	ANL	0							701337	TS
1074.9	0.1	ANL	0							701403	WR
1077.8	2.0	ANL	0	TRFVA	1 TP TP 1V	QE0311R	4				
1081.0	3.2	ANLD	0	TRFVA	2 1P 1P 2P	QE0311R	6 4			701442	WR
1080.1	0.1	ANLD	0							701338	TS
1080.1	0.1	ANLD	0							701404	WR
1085.1	4.1	ANL	0		1 TP 1PTPTP1V	QC0311R	4			701282	GC
1086.0	0.9	DCL	0	02FDA	2 1P 1PTPTP2V	QC0311R	4			701284	GC
1085.2	0.1	DCL	0							701339	TS
1085.2	0.1	DCL	0							701405	WR
1092.2	6.2	TFXD	0							701443	WR
1087.6	1.6	TFXD	0	02FBA	2 1PTP 1P		7 4				

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
1086.7	0.1	TFXD	0							701340	TS
1086.7	0.1	TFXD	0							701406	WR
1089.0	1.4	TFBC	0	01FBA	2 TP1P 1P	QC0104R	4				
1089.8	0.8	TFSH	0	01FBA	2 1PTP 1V	QC0104R	7				
1090.1	0.3	TFBC	0	01FBA	2 1PTP 1P	QC0104R	4				
1092.2	2.1	TFBC	0	01FBA	2 1PTPTP1P	QC0104R	4				
1090.6	0.1	TFBC	0							701341	TS
1096.3	4.1	TFXL	0							701444	WR
1095.8	3.6	TFXL	0	TRFDA	1 TPTP 1P	QS0104R	4	0551			
1093.9	0.1	TFXL	0							701342	TS
1095.3	0.1	TFXL	0							701343	TS
1096.0	0.2	TFXL BROKEN	0	01FVA	2 TPTP 1V	QC0205R	10 4				
1096.3	0.3	TFXL	0	01FVA		QC02057	4				
1098.0	1.7	ANID	0	TRFDA	1 TP TV	QC0109R	4			701285	GC
1097.7	0.1	ANID	0							701344	TS
1107.0	9.0	TFXD	0							701445	WR
1104.6	6.6	TFXD	0	01FDADT	2 TPTP 1V	QC03023	4				
1102.9	0.1	TFXD	0							701345	TS
1107.0	2.4	SLTF	0	08FDA	1 TP		7 4				
1109.8	2.8	PCL	0	03FDA	2 1P 1V		4			701446	WR
1107.1	0.1	PCL	0							701346	TS
1107.1	0.1	PCL	0							701407	WR
1118.5	8.7	SLGT	0							701447	WR
1112.0	2.2	SIGW	0	05FBA	1 1P		7 4				
1118.5	6.5	SLGT	0	02FBA	1 1P	QC02053	602 4				
1131.0	13.5	SLG	0							701448	WR
1112.7	0.1	SLGT	0							701347	TS
1120.6	2.1	SL	0	05FBA	1 1P		6 4				
1131.0	10.4	SLGW	0	04FBA	1 1P	QE0303R	6 4				
1133.0	2.0	ANL	0	03FDA	1 TP		4			701449	WR
1133	0.1	ANL	0							701360	TS
1133	EOH										

Project : RA : 0 Code :

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2750E, 7400N

HOLE : BRD002 Coords : 389296.9E 5394519.1N Collar RL : 642.4
Logged by : REW Driller : ORTNER Rig id : J49
Commenced : 22/06/87 Completed : 05/08/87
Start Log : 0.00 Total Depth : 676.60
Tot Oxid Depth : 0.00 Part Oxid Depth : 12.60

Target Description

Target was positive gravity anomaly interpreted at depth of 220m (downhole depth of about 500m)beneath base of Que River Shale.This depth was to great for a massive sulphide target to have been detected by C.S.A.M.T. However a co-incident C.S.A.M.T. phase anomaly was considered to be due to hanging wall mineralisation.

Mineralisation

Significant Results

Alteration Details

preliminary O & C isotope data on calcite vesicle infillings in the Hellyer Basalt indicate temperatures of 120C.

General Comments

Down hole E.M. was run to the end of the hole. No anomalies were detected. Compared to BRD001 the hole was probably stopped 20m short of the 'Mixed Sequence'- HOWEVER the isotope data indicates lower temperatures than in BRD001 consequently there is no likelihood of an ore body beneath the end of the hole. Petrophysics measurements were done on core samples.

Geological Notes

DOWNHOLE SURVEY DATA:

Depth	Dip	Azimuth	Core Size
0.00	-90.00	0.00	
90.00	-88.50	102.00	NQ
150.00	-85.00	76.00	NQ
210.00	-79.50	97.00	NQ
270.00	-77.00	100.00	NQ
325.00	-76.00	101.00	NQ
397.00	-73.00	101.00	NQ
472.00	-72.00	96.00	NQ
514.00	-73.50	91.00	NQ
600.00	-73.50	96.00	NQ
660.00	-74.00	96.00	NQ

411236

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	D I D	--SULPHIDES-- Vo Py Cp Co Ga Sp Is Za Za Za Za Zn z	ALTERATION Li Bi Ch Ep Kf Se Cl Si Ca Ja Ba Na n t	VEINING Ty Vo No A	STRUCTURE Ba Ja Fa	H	FAULT Gg Ang pc	SU to ri at	Comments
4.20	0.70		RVC		I		B			B	3		
5.20	1.00		RVC		1	TRFDA	B		7	B	4		
7.30	1.90		RVC		1	TRFDA	B		B	B	4		
8.00	0.30		RVC		1	B2FDA	B		B	B	4		
8.80	0.80		RVC		1	B2FDA	B			B	4		
10.30	0.90		RVC		1	TRFDA	B		B	B	4		
12.60	2.00		RVC		1	B1FDA	B			B	4		
15.70	2.70		RVC		B	TRFDA	B			B	4		
18.90	3.10		RVC		B	TRFDA	B		B	B	4		
22.10	2.20		RVC		B	TRFDA	B			B	4		
24.10	2.00		RVC		B	TRFDA	B			B	4		
25.60	1.00		RVC		B	B1FDA	B			B	4		
27.40	1.40		RVC		B	B1FDA	B			B	4		
30.40	1.90		RVC		B	B1FDA	B			B	4		
33.50	3.10		RVC		B	B1FDA	B			B	4		
34.60	1.10		RVC		B	B1FDA	B			B	4		
37.60	3.00		RVC		B	B1FDA	B		7	B	4		
40.60	3.00		RVC		B	B1FDA	B			B	4		
43.60	3.00		RVC		B	B1FDA	B		B	B	4		
46.60	3.00		RVC		B	B1FDA	B			B	4		
48.00	1.40		RVC		B	B3FDA	B			B	4		
49.60	1.60		RVC		B	B5FDA	B			B	4		
52.60	3.00		RVC		B	B6FKA	B			B	4		
55.60	3.00		RVC		B	B3FKA	B		7	B	4		
58.60	3.00		RVC		B	B5FKA	B			B	4		
61.50	2.10		RVC		B	B5FKA	B			B	4		
64.60	3.10		VCG		B	B7FKA	B			B	4		
65.80	1.20		VCG		B	B5FKA	B			B	4		
67.10	1.30		SHA	MST	B	B2FDA	B		B	B	4		
70.20	3.10		MST	SHA	B		B		7	B	4		
73.30	3.10		SHA	MST	B		B	QCTRB13	7	B	4		
76.40	3.10		SHA	MST	B		B	QCTRB13	7	B	4		
79.60	3.20		MST	SHA	B		B	QCTRB13	7	B	4		
82.60	3.00		SHA	MST	B		B	QCTRB23	7	B	4		
83.60	3.00		MST	SHA	B		B		7	B	4		
88.60	3.00		MST	SHA	B		B		7	B	4		
91.60	3.00		MST	SHA	B	B2FDA	B	QCTRB2R	7	B	4		
94.60	3.00		SHA	MST	B	B2FDA	B	QCTRB43	7	B	4		
97.60	3.00		SHA	SST	B	B5FDA	B	QCTRB33	7	B	4		
100.60	3.00		MST	SHA	B	B3FDA	B	QCTR03R	7	B	4		
102.90	2.30		MST	SHA	B	B2FDA	B	QCB183R	7	B	4		
106.00	3.10		MST	SHA	B		B	QCB1843	7	B	4		
109.00	3.00		MST	SHA	B		B	QCB1843	7	B	4		
112.10	3.10		MST		B		B	QCB1843		B	4		
115.20	3.10		MST	SHA	B		B	QCB318R	7	B	4		
118.80	2.80		MST	SHA	B		B	QCB1833		B	4		
119.90	1.90		MST		B		B	QCB2852		B	4		
123.00	3.10		MST		B		B	QCTRB32	7	B	4		
124.60	1.60		MST		B		B	QCTRB42	7	B	4		
127.60	3.00		MST		B		B	QCTRB22		B	4		

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	I D	--SULPHIDES-- Vo	GP	Py	Cp	Co	Ga	Sp	ALTERATION Ti	Li	Bi	Ch	Ep	Kf	Se	Cl	Si	Ca	Ja	Ba	Na	VEINING Ty	Vo	No	A	STRUCTURE Ba	Ja	Fa	H	FAULT Gg	Ang pc	SU to ri at	Comments
138.60	3.00		MST	SHA	0								0													QC0104R	7			0			4				
133.60	3.00		MST		0								0													QCTR04R				0			4				
136.60	3.00		MST		0	01	FDA						0													QC0105R				0			4				
139.30	2.70		MST		0								0													QCTR043				0			4				
142.40	3.10		MST		0								0													QC04002				0			4				
145.50	3.10		MST		0								0													QC02053				0			4				
148.60	3.30		MST		0								0													QC0105R				0			4				
151.60	3.00		MST	SHA	0								0													QCTR014	7			0			4				
154.60	3.00		MST	SHA	0	01	FDA						0													QCTR03R	7			0			4				
157.60	3.00		SHA	MST	0	02	FDA						0													QC01032	7			0			4				
160.60	3.00		MST	SHA	0								0													QC0105R	7			0			4				
163.60	3.00		MST	SHA	0								0													QCTR042				0			4				
166.60	3.00		MST		0								0													QC0205R				0			4				
169.60	3.00		MST		0								0													QCTR014				0			4				
172.60	3.00		MST		0								0													QCTR014				0			4				
175.60	3.00		MST		0								0													QCTR014				0			4				
178.60	3.00		MST		0								0													QCTR05R				0			4				
181.60	3.00		SHA	MST	0								0													QC0105R	0			0			4				
184.60	3.00		SHA	MST	0								0													QCTR01R	0			0			4				
187.60	3.00		MST	SHA	0	05	FDA						0														7			0			4				
190.60	3.00		SHA	MST	0	05	FDA						0													QCTR023	0			0			4				
193.60	3.00		SHA	MST	0	05	FDA						0													QC01053	0			0			4				
196.60	3.00		SHA	MST	0	05	FDA						0													QC01043	0			0			4				
199.60	3.00		SHA	MST	0	05	FDA						0													QC01043	0			0			4				
202.60	3.00		SHA		0	05	FDA						0													QCTR043	0			0			4				
205.60	3.00		SHA	MST	0	05	FDA						0													QCTR03R	0			0			4				
208.60	3.00		SHA	MST	0	01	FDA						0													QC02037	0			0			4				
211.60	3.00		SHA	MST	0	01	FDA						0													QCTR012				0			4				
214.60	3.00		SHA	MST	0	01	FDA						0													QCTR03R				0			4				
217.10	2.50		MST		0	01	FDA						0													QC12101				0			4				
219.30	2.20		MST		0	01	FDA						0													QC031BR				0			4				
220.60	1.30		MST		0	01	FDA						0													QC04154				0			4				
223.60	3.00		MST	SHA	0	01	FDA						0													QC0712R				0			4				
226.30	2.70		MST		0	01	FDA						0													QC0415R				0			4				
227.40	1.10		SHA	MST	0	01	FDA						0													QC02003				0			4				
229.60	2.20		MST		0	05	FDA						0													QC06154				0			4				
232.60	3.00		MST		0	02	FDA						0													QC032BR				0			4				
234.30	1.70		MST		0	02	FDA						0													QC011BR				0			4				
236.20	2.00		MST		0	02	FDA						0													QC011BR				0			4				
238.60	2.30		MST		0	02	FDA						0													QC011BR				0			4				
241.60	3.00		MST		0	02	FDA						0													QC0215R				0			4				
242.80	1.20		MST		0	02	FDA						0													QC011BR				0			4				
244.60	1.80		MST		0	02	FDA						0													QC011BR				0			4				
247.60	3.00		MST		0	02	FDA						0													QC011BR				0			4				
250.60	3.00		MST	SHA	0	02	FDA						0													QCTR06R				0			4				
253.60	3.00		SHA	MST	0	05	FDA						0													QC011BR	0			0			4				
256.40	2.80		SHA	MST	0	05	FDA						0													QC01104	6			0			4				
259.50	3.10		SHA	MST	0	05	FDA						0													QC01088	6			0			4				
262.60	3.10		MST	SHA	0	05	FDA						0													QC01053				0			4				
265.60	3.00		MST		0	05	FDA						0													QCTR054				0			4				

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	O I D	--SULPHIDES-- VoGPyCpCoBaSp IsIaIaIaIaZn	-------ALTERATION-------- lLiBiChEpKfSeClSiCaIaBaHa n t	VEINING TyVoNoA	STRUCTURE BaJaFa H	FAULT SgAng pc	SU tn ri at	Comments
268.30	2.70		MST	SHA	0	02FDA	0	QCTR054	0 4			
271.60	3.30		SHA		0	02FDA	0	QCTR033 6	0 4			
274.60	3.00		MST	SHA	0	02FDA	0	QC7R033	0 4			
277.60	3.00		MST	SHA	0	02FDA	0	QC01073	0 4			
279.50	1.90		MST		0	02FDA	0	QC01053	0 4			
280.50	1.00		MST		0	02FDA	000	QCTR03R	0 4			
282.50	2.00		MST	SHA	0	02FDA	0	QCTR058	0 4			
283.60	1.10		SHA		0	03FDA	0	QCTR103	0 4			
286.60	3.00		SHA	MST	0	03FDA	0	QCTR043 6	0 4			
289.60	3.00		MST	SHA	0	01FDA	0	QC0104R	0 4			
291.30	1.70		SHA	MST	0	03FDA	0	QCTR05R	0 4			
294.30	3.00		SHA	MST	0	01FDA	0	QC0105R 8	0 4			
297.40	3.10		SST	SHA	0	01FDA	0	QCTR049 8	0 4			
298.60	1.20		SHA	MST	0	02FDA	0	QC01073	0 4			
301.20	2.60		SHA	MST	0	02	0	QCTR043	0 4			
304.30	3.10		SHA	MST	0	02FDA	0	QCTR043	0 4			
307.50	3.20		SHA		0	05FDA	0	QC01033 8	0 4			
310.00	2.50		SHA		0	05FDA	0	QCTR05R 8	0 4			
312.70	2.70		SHA		0	05FDA	0	QC0106R 8	0 4			
313.30	0.60		SHA		0	02FDA	0	QCTR03R	0 4			
316.40	3.10		SHA		0	02FDA	0	QCTR013 8	0 4			
319.40	3.00		SHA		0	02FDA	0	QCTR013 9	0 4			
319.50	0.10		SHA	MST	0	02FDA	0	QCTR013	0 4			
322.60	3.10		SHA	MST	0	02FDA	0	QC01073	0 4			
324.70	2.10		MST	SHA	0	02FDA	0	QC27104	0 4			
325.80	1.10		MST		0	02FDA	0	QCTR043	0 4			
327.70	1.90		MST	SHA	0	02FDA	0	QCTR044	0 4			
328.60	0.90		MST		0	02FDA	0	QC7R044	0 4			
329.80	1.20		MST		0	02FDA	0	QCTR02R	0 4			
330.70	0.90		MST	SHA	0	02FDA	0	QCTR023	0 4			
332.40	1.70		MST	SHA	0	04FDA	0		0 4			
333.30	0.90		MST	SHA	0	02FDA	0		0 4			
334.80	1.50		MST	SHA	0	02FDA	0	QCTR014	0 4			
336.80	2.00		MST	SHA	0	02FDA	0	QCTR033	0 4			
339.90	3.10		SHA	MST	0	02FDA	0	QCTR03R	0 4			
343.00	3.10		SHA	MST	0	02FDA	0	QCTR073 7	0 4			
346.10	3.10		SHA	MST	0	02FDA	0	QCTR02R 7	0 4			
349.20	3.10		SHA	MST	0	04FDA	0	QCTR043	0 4			
352.30	3.10		SHA		0	03FDA	0	QC01033 8	0 4			
354.40	2.10		SHA		0	02FDA	0	QCTR032 8	0 4			
355.60	1.20		SHA		0	01FDA	0	QCTR03R 9	0 4			
356.40	0.80		SHA	MST	0	01FDA	0	QCTR023	0 4			
357.10	0.70		MST		0	01FDA	0	QC05104	0 4			
357.50	0.40		MST		0	01FDA	0	GC1525R	0 4			
359.20	1.70		MST	SHA	0	01FDA	0	QC0115R	0 4			
361.60	2.40		SHA	MST	0	06FDA	0	QC0106R 8	0 4			
364.60	3.00		SHA		0	01FDA	0	QC03066 7	0 4			
367.60	3.00		MST		0	01FDA	0	QC0306A 7	0 3			
370.60	3.00		MST	SHA	0	02FDA	0	QC03007	0 3			
373.60	3.00		SHA	BAS	0	02FDA	0	QC0413R 7	0 3			

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	O X I O	--SULPHIDES-- VoGPyCpCoGaSp IsIaIaIaIaIa	ALTERATION LiBiChEpKfSeClSiCaJaBaMa	VEINING TyVoNoA	STRUCTURE BaJaFa	H	FAULT GgAng pc	SU tn ri at	Comments
376.60	3.00	A295851	BPB	SHA	0	01FD9 D1	2 2P 2P	QC1020R		0 4			@374.6=A295832 thin sect.
379.60	3.00		BAS	BAV	0	02FVA	2 1P 1P2P	QC1015R		0 4			@377.2=A295833 thin sect.
382.60	3.00	A295852	BAS	BAV	0	*TRFDA*	*1 1P 1P2P*	QC1010R		0 4			
385.60	3.00		BAS	SHA	0	TRFDADT DT	2 1P 1P2P	QC1520R		0 4			
388.60	3.00		BAB	SHA	0	TRFDA	1 1P 1P 1P1P	QC2030R		0 4			
391.60	3.00	A295853	BPB		0	02FVAVT VTVT	1 TP IP 1P2P	QC1520R		0 4			
394.60	3.00		BAS	BPB	0	01FDA	1 1P 1P2P	QC1515R		0 4			@393.1=A295834 thin sect.
397.60	3.00		BAS	BAB	0	*01FDA*	*1 1P 1P2P*	QC1020R		0 4			
400.60	3.00	A295854	SHA	BAS	0	01FDA DT	0	QC1520R		0 3			@398.6=A295835 thin sect.
403.60	3.00	A295855	BAV	BAB	0	02FDA DTDT	1 1P 1P 1P1P	QC2015R		0 4			@400.8=A295836 thin sect.
406.60	3.00		BAB	SHA	0	02FDA	1 1P 1P 1P1P	QC1520R		0 4			
409.60	3.00		MST	SHA	0	01FDA	0	QC0815R		0 4			
412.60	3.00		SHA	BAV	0	03FDA	0	QC1515R 4		0 3			
415.60	3.00		BAP	BAV	0	01FDA	1 0P 2P	QC15153		0 4			
418.60	3.00		BAV	BPB	0	TRFDA	1 1P 1P	QC0815R		0 4			
421.60	3.00		BAV	BPB	0	TRFD5	1 1P 1P	QC05104		0 4			
424.60	3.00	A295856	BPB	BAV	0	01FD5	1 1P 1P	QC15103		0 4			
427.60	3.00		BAS	BAB	0	*TRFD5*	*1 1P 1P*	QC05103		0 4			
430.60	3.00		BAS	BPB	0	TRFD5	1 1P 1P	QC0510R		0 4			
433.60	3.00		BPB	BAP	0	02FD5	1 1P 2P	QC15152		0 4			@430.7=A295837 thin sect.
436.60	3.00		BAP	BPB	0	TRF	1 1P 1P	QC10102		0 4			
439.60	3.00		BAP	BPB	0	TRFDA	1 1P 2P	QC10070		0 4			
442.60	3.00	A295857	BAS	BPB	0	*TRF*	*1 TP 1P*	QC05073		0 4			
445.60	3.00		BAS	BPB	0	TRFD2	1 TP 2P	QC05123		0 4			
448.60	3.00		BAS	BAB	0	TRFDA	1 TP 2P	QC05083		0 4			
451.60	3.00		SHA	BAB	0	05FVA	0	QC08103 6		0 3			
454.60	3.00		MST	EPI	0	05FVA	0	QC24103 6		0 3			
457.60	3.00		MST	SHA	0	05FVA	0	QC24103 6		0 3			
460.60	3.00		MST	SHA	0		0	QC24103 7		0 3			
463.60	3.00		SHA	MST	0	05FVA	0	QC0203R 7		0 3			
466.60	3.00		MST	SHA	0	05FVA	0	QC0203R		0 3			
469.00	3.00		MST	SHA	0	05FVA	0	QC0203R		0 3			
471.70	2.90		SHA		0	*10FDA*	0	QC40034 6		0 3			
472.60	1.10		BAB		0	01FDA	1 1P 2P	QC0503R		0 4			@472.6=A295838 THIN SECT.
475.60	3.00	A295858	BAB	BPB	0	05FDA DT	1 1P 2P	QC03024		0 4			
478.60	3.00		BPB	BAB	0	01FDA	1 1P 2P	QC0305R		0 4			
481.60	3.00		BAB		0	05FDA	1 1P 2P	QC0810R		0 4			
484.60	3.00		BAB		0	*01FDADT*	*1 1P 2P*	QC0305R		0 4			
487.60	3.00		BAB		0	TRFD3	1 1P 2P	QC05034		0 4			
490.60	3.00		BAB		0	01FDT DTDT	1 1P 2P	QC1510R		0 4			
493.60	3.00		BAB		0	01FDTDT	1 1P 1P1P	QC0606R		0 4			@492.1=A295839 THIN SECT.
496.60	3.00	A295859	BAB		0	05FD2DT DT	1 TP 1P2P	QC0304R		0 4			
499.50	3.00		BAB		0	*03FD1 DTDT*	*1 1P 1P*			0 4			@498.5=A295840 THIN SECT.
502.60	3.00	A295861	BAB		0	01FD5	1 TP 1P	QC1R02R		0 4			
505.60	3.00		BAB	EPI	0	01FD5	1 1P	QC0303R 6		0 4			@503.6=A295841 THIN SECT. @505.8=A295841 THIN SECT.
508.60	3.00		BAB		0	TRFDA	1 1P	QC0505R		0 4			
511.60	3.00		EPI	BAB	0	01FDT	1 2P 1P	QC02024 5		0 4			
514.60	3.00		BAV	BAB	0	01FDT	1 2P 1P	QC0202R		0 4			
517.60	3.00		BAV	BPB	0	TRF	1 1P 1P	QC0206R		0 4			@515.2=A295843 THIN SECT

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	O X I D	--SULPHIDES-- VoGPyCpCoGaSp IsXnIaZaInIn x	-------ALTERATION-------- ILiBiChEpKfSeClSiCaJaBaHa n t	VEINING TyVoNoA	STRUCTURE BaJaFa H	FAULT GgAng pc	SU tn ri at	Comments
520.60	3.00		BAV	BAS	0	B1FD9DT	I	1P 2P	QC02B6R	0	4	
523.60	3.00		BAV	BAB	0	TRFD5DT D1	1	2P	QC0609R	0	4	
526.60	3.00		BAB	BAV	0	TRFD5	1	TP 1P	QC0608R	0	4	
529.60	3.00		BAV	BAB	0	TRFD5	1	TP 1P	QC0305R	0	4	
532.60	3.00		BAV	BPB	0	TRFD5	1	TP 1P	QC0505R	0	4	
535.60	3.00		BAS	BAB	0	TRFD5	1	TP 1P	QC0510R	0	4	
538.60	3.00		BAS	BAV	0	TRFDA	1	1P	QC0510R	0	4	@536.0=A295844 THIN SECT.
541.60	3.00		BAS	BAB	0	TRFDA	1	1P	QC0812R	0	4	
544.60	3.00		BAS		0	TRFDA	1	1P	QC0510R	0	4	
547.60	3.00	A295862	BAS	BAB	0	B2FVA	1	1P	QC0712R	0	4	
550.60	3.00		BAS	BAB	0	B3FVA	1	1P	QC0608R	0	4	
553.60	3.00		BAB	BAS	0	B1FVA	1	1P	QC1505R	0	4	
556.60	3.00		BAB	BAS	0	B2FV9	1	1P1P	QC0508R	0	4	
559.60	3.00		BAS	BAB	0	B2FDA	1	1P	QC0304R	0	4	@556.9=A295846 THIN SECT. @559.6=A295845 THIN SECT.
562.60	3.00		BAB	BPB	0	TRFDA	1	1P	QC04054	0	4	
565.60	3.00		BAB	BAS	0	TRFDA DTDT	1	1P	QC0705R	0	4	
568.60	3.00		BAB		0	TRFDA	1	1P	QC0303R	0	4	
571.60	3.00		BAS	BAB	0	B2FDA	1	1P	QC05004	0	4	
574.60	3.00		BAB		0	TRFD9DT	1	1P	QC0608R	0	4	
577.60	3.00		BAB		0	TRFD5DT DT	1	1P	TC03054	0	4	
580.60	3.00		BAB	BAV	0	TRFDA	1	1P	QC0305R	0	4	
583.60	3.00		BAB	BAV	0	B2FVA	1	1P	TC04057	0	4	
586.60	3.00		BAV	BAB	0	TRFDA	1	1P	QC0506R	0	4	
589.60	3.00		BAV		0	TRFDA	1	1P	QC0708R	0	4	
592.60	3.00		BPB	BAV	0	TRFDA	1	1P	QC0207R	0	4	
595.60	3.00		BAP		0	TRFD5	1	1P	QC0506R	0	4	
598.60	3.00		BAV	BPB	0	TRFD5	1	1P	TC04057	0	4	
601.60	3.00		BAP		0	TRFD5	1	1P	QC0308R	0	4	
604.60	3.00		BPB	BAP	0		1	1P	QC0206R	0	4	@604.6=A295847 THIN SECT.
607.60	3.00	A295863	BAB		0	TRFDA	1	1P	QC0104R	0	4	
610.60	3.00		BAS		0	TRFDA	1	1P	TC06087	0	4	
613.60	3.00		BAS	BAB	0	TRFDA	1	1P	QC02044	0	4	
616.60	3.00		BAB	BAS	0	TRFDA	1	1P	TC03066	0	4	
619.60	3.00		BAS	BAB	0	TRFDA	1	1P	TC02067	0	4	
622.60	3.00		BAS	BAB	0	TRFDA	1	1P	TC03127	0	4	
625.60	3.00		BAB	BAS	0	TRFDA	1	1P	TC0536R	0	4	
628.60	3.00		BAV	BAB	0	TRFDADT	1	1P	QC01043	0	4	
631.60	3.00		BAV	BAB	0	TRFDA	1	1P	QE0504R	0	4	
634.60	3.00		BAV	BAB	0	TRFDA	1	1P	QC0506R	0	4	@632.0=A295848 THIN SECT.
637.60	3.00		BAB	BAV	0	TRFDADT	0	TP	TC05107	0	4	
640.60	3.00		BAV	BAB	0	TRFDA	0	TP	TC05057	0	4	
643.60	3.00		BAS	BAV	0	TRFDA	0	TP	TC05077	0	4	
646.60	3.00		BAB		0	TRFDA	0	TP	TC02077	0	4	
649.60	3.00		BAB	BAV	0	TRFDA	0	TP	QC0104R	0	4	
652.60	3.00		BAB	BAV	0	TRFDA	0	TP	QC0103R	0	4	
655.60	3.00		BAB	BAV	0	TRFDA	0	TP TP TP	TC06157	0	4	@653.0=A295849 THIN SECT.
658.60	3.00		BAS	BAB	0	TRFVA	0	TP TP TP	TC07107	0	4	
661.60	3.00		BAS	BAV	0	TRF3A	1	1P 1P	TC08127	0	4	@661.6=A295850 THIN SECT.
664.60	3.00		BAS	BAP	0	TRFDA	0	TP TP	TC04127	0	4	

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DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	O I O	--SULPHIDES-- VoGPyCpCoBaSp Zs Ze In Te Za In	ILiBiChEpKfSeClSiCaJaBaMa n t	-------ALTERATION-------- TP	TP	VEINING TyVoMoA	STRUCTURE BaJaFa H	FAULT GgAng pc	SU tm ri at	Comments
667.62	3.00		BAS	BAV	0	TRFDA z	0 t	TP	TP	IC01857	0 4			
670.60	3.00		BAS	BAB	0	TRFDA	1		1P1P	QC07108	0 2	15	3	
673.60	3.00	A295864	BAS		0	TRFDA	1		1P1P	QC1010R	0 3			
676.60	3.00		BAS		0	TRFDA	1		1P1P	QC0510R	0 1	60	3	

Project : RA : 0 Code :

2625E.
9400N

234

HOLE : BRD003 Coords : 389952.6E 5396407.3N Collar RL : 610.3
Logged by : REW/PDE Driller : ORTNER Rig id : J49
Commenced : / / Completed : / /
Start Log : 3.60 Total Depth : 541.40
Tot Oxid Depth : 0.00 Part Oxid Depth : 0.00

Target Description
STRATIGRAPHIC DRILLHOLE TO ASSIST GRAVITY INTERPRETATION

Mineralisation
NONE OF SIENIFICANCE

Significant Results

Alteration Details

General Comments
0 – OLE RIVER SHALE (MUDSTONE)

Geological Notes

DOWNHOLE SURVEY DATA:

Depth	Dip	Azimuth	Core Size
60.00	-90.00	0.00	HQ
120.00	-88.00	126.50	NQ
180.00	-87.00	74.50	NQ
240.00	-84.00	54.50	NQ
277.00	-82.00	48.50	NQ
340.00	-82.00	38.50	NQ
400.00	-82.50	39.50	NQ
463.00	-82.00	35.50	NQ
508.00	-81.00	31.50	NQ
538.00	-81.00	31.50	NQ

411242

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	I O	--SULPHIDES-- %s	------ALTERATION------ %z	VEINING	STRUCTURE	FAULT pc	SU ri at	Comments
3.68	0.68		MST	SHA	1	TRFDA	0		7	0		
4.48	0.80		MST		1	TRFDA	0			0		
6.28	1.58		MST		1	TRFDA	0			0		
7.18	0.90		MST		0	TRFDA	0			0		
8.58	0.92		RVC	GWK	2	TRFDA	0			0		
9.58	1.48		MST		0	TRFDA	0			0		
11.58	2.00		MST	SHA	0	TRFDA	0		7	0		
12.76	1.20		MST		0	TRFDA	0			0		
14.08	1.28		MST		0	TRFDA	0			0		
16.78	2.78		MST		0	TRFDA	0			0		
20.38	3.60		MST		0	TRFDA	0	QCTR03I		0		
22.48	2.18		MST		0	TRFDA	0			0		
24.18	1.68		MST		0	TRFDA	0			0		
25.48	1.28		MST		0	TRFDA	0			0		
27.38	1.88		MST	SHA	0	TRFDA	0		7	0		
28.28	0.88		MST		0	TRFDA	0			0		
29.88	1.68		SHA	MST	0	TRFDA	0			0		
30.88	0.78		SHA		0	TRFDA	0			0		
32.38	1.28		SHA		0	TRFDA	0			0		
34.38	1.68		SHA		0	TRFDA	0			0		
34.88	0.58		SHA		0	TRFDA	0			0		
35.28	0.48		SHA		0	TRFDA	0			0		
36.98	1.58		SHA		0	02FDA	0			0		
42.28	2.98		SHA	MST	0	TRFDA	0	QCTR02I	0	0		
42.18	2.88		MST		0	TRFDA	0			0		
43.48	1.38		MST		0	TRFDA	0	QC01842		0		
46.48	3.00		MST		0	TRFDA	0	QCTR03R		0		
49.48	3.08		MST		0	TRFDA	0	QC01864		0		
52.48	3.08		MST		0	TRFDA	0	QCTR05R		0		
55.48	3.08		MST		0	TRFDA	0	QCTR03R		0		
58.48	3.08		MST		0	TRFDA	0	QCTR03R		0		
60.08	1.58		MST		0	05FDA	0	QCTR02R		0		
61.48	1.52		MST		0	TRFDA	0	QCTR02R		0		
64.48	3.08		MST		0	TRFDA	0	QCTR05R		0		
67.48	3.08		MST	SHA	0	TRFDA	0	QCTR05R	7	0		
69.48	2.08		SHA	SLT	0	TRFDA	0	QCTR05R	7	0		
71.48	2.08		SHA	SLT	0	TRFDA	0	QCTR05R		0		
72.58	1.18		SHA	SLT	0	01FDA	0	QCTR04R		0		
73.18	0.68		SHA	SLT	0	TRFDA	0			0		
74.58	1.88		SHA	SLT	0	03FDA	0	QCTR04R		0		
76.48	1.88		MST		0	TRFDA	0	QCTR04R		0		
79.48	2.98		MST		0	TRFDA	0	QCTR05Z		0		
80.98	1.58		MST		0	TRFDA	0	QCTR01R		0		
84.28	3.18		MST		0	TRFDA	0	QCTR01R		0		
85.48	1.48		MST		0	TRFDA	0	QCTR01R		0		
88.48	3.08		MST		0	TRFDA	0	QCTR01R		0		
91.48	3.08		MST	SHA	0	TRFDA	0	QCTR01R	7	0		
97.48	6.28		MST		0	TRFDA	0	QCTR03R		0		
100.48	3.08		MST	SHA	0	TRFDA	0	QC0105R	7	0		
103.48	2.58		SHA		0	01FDA	0	QCTR05R		0		

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	X	--SULPHIDES-- VoGPyCpCoBaSp ZnZnZnZnZnZn	------ALTERATION------ ILiBiChEpKfSeClSiCaJaBaNa	VEINING STRUCTURE TyVoNoA	BaJaFm H	FAULT GgAng pc	SU tn ri at	Comments
106.40	3.00		SHA		0	TRFDA	0	QCTR05R	0		0	
109.40	3.00		SHA		0	TRFDA	0	QCTR05R	7		0	
112.40	3.00		MST	SHA	0	TRFDA	0	QCTR05R	7		0	
115.20	2.60		MST		0	TRFDA	0	QCTR05R			0	
117.60	2.70		MST		0	TRFDA	0	QCTR05R			0	
118.40	0.90		MST		0	TRFDA	0	QCTR03R			0	
118.90	0.40		MST		0	TRFDA	0	QCTR03R			0	
120.70	1.80		MST		0	TRFDA	0	QCTR03R			0	
121.40	0.70		MST		0	TRFDA	0	QCTR03R			0	
122.70	1.30		MST		0	TRFDA	0	QCTR03R			0	
124.00	1.20		MST		0	TRFDA	0	QCTR02R			0	
125.00	0.90		MST		0	TRFDA	0	QCTR03R			0	
126.40	1.40		MST		0	TRFDA	0	QCTR04R			0	
129.40	3.00		SHA	MST	0	TRFDA	0	QCTR07R	7		0	
130.00	0.60		SHA	MST	0	TRFDA	0	QCTR02R			0	
132.70	2.70		SHA	SST	0	TRFDA	0	QCTR02R			0	
135.40	2.70		SHA	SST	0	TRFDA	0	QCTR05R	6		0	
138.40	3.00		MST		0	TRFDA	0	QCTR05R			0	
141.50	3.10		SHA		0	QIFDA	0	QCTR032			0	
143.10	1.60		SHA		0	QIFDA	0	QCTR03R	7		0	
145.40	2.30		SHA		0	QIFDA	0	QCTR03R			0	
148.40	3.00		SHA		0	TRFDA	0	QCTR06A			0	
151.40	3.00		MST		0	QIFDA	0	QCTR04R			0	
154.40	3.00		MST		0	TRFDA	0	QCTR03R			0	
157.40	3.00		MST		0	TRFDA	0	QCTR03R			0	
160.40	3.00		SHA		0	TRFDA	0	QCTR03R	6		0	
163.40	3.00		MST		0	TRFDA	0	QCTR031			0	
166.40	3.00		MST		0	TRFDA	0	QCTR05R			0	
169.30	2.90		SHA	SST	0	TRFDA	0	QCTR02R	7		0	
172.20	2.90		SHA		0	TRFDA	0	QCTR08R			0	
173.40	1.40		MST		0	TRFDA	0	QC0106R			0	
175.10	1.70		MST		0	TRFDA	0	QC0106R			0	
177.40	2.30		MST		0	TRFDA	0	QC0106R			0	
180.20	2.80		MST	SLT	0	TRFDA	0	QCTR04R			0	
181.40	1.20		MST		0	TRFDA	0	QCTR04R			0	
184.20	2.80		MST		0	TRFDA	0	QCTR05R			0	
184.90	0.70		MST		0	TRFDA	0	QCTR021			0	
187.40	2.50		MST		0	QIFDA	0	QCTR05R			0	
190.40	3.00		MST		0	TRFDA	0	QCTR04R			0	
193.42	3.02		MST		0	TRFDA	0	QCTR032			0	
195.20	1.80		MST		0	TRFDA	0	QCTR03R			0	
196.40	1.20		MST		0	TRFDA	0	QC0105I			0	
199.40	3.00		MST	SHA	0	QIFDA	0	QCTR041	6		0	
202.40	3.00		MST		0	TRFDA	0	QCTR041			0	
205.40	3.00		MST		0	TRFDA	0	QC0104R			0	
207.00	1.60		MST		0	TRFDA	0	QCTR04R			0	
208.40	1.40		MST		0	TRFDA	0	QC0105R			0	
210.80	2.40		MST		0	TRFDA	0	QCTR05R			0	
211.50	0.70		MST		0	TRFDA	0				0	
212.40	0.90		MST		0	TRFDA	0	QCTR02R			0	

DEPTH TO	Core Recov	Sample Number	LITH'GY Maj	Min	I D	--SULPHIDES-- X	VoBPyCpCoGaSp z	-------ALTERATION-------- ILiBiChEpKfSeClSiCaJaBaMa n t	VEINING TyVoMoA	STRUCTURE BaJaFa H	FAULT GgAng pc	SU tm ri at	Comments
214.40	2.00		MST		0	TRFDA	0		QCTR02R	0			
217.40	3.00		MST		0	TRFDA	0		QC01103	0			
220.40	3.00		MST		0	TRFDA	0		QC01103	0			
222.90	2.50		MST	SST	0	TRFDA	0		QC01102	0			
226.00	3.10		MST		0	02FDA	0		QCD1072	0			
229.20	3.20		MST	SHA	0	TRFDA	0		QCTR042	0			
232.30	3.10		MST		0	TRFDA	0		QCTR01R	0			
232.90	0.50		MST		0	TRFDA	0		QCTR011	0			
235.40	2.50		MST		0	TRFDA	0		QCTR01R	0			
238.40	3.00		MST		0	TRFDA	0		QCD105R	0			
240.50	2.10		MST		0	TRFDA	0			0			
241.40	0.90		MST		0	TRFDA	0		QCTR02R	0			
244.40	3.00		MST	SHA	0	TRFDA	0		QCTR072 7	0			
247.40	3.00		MST	SHA	0	TRFDA	0		QCTR05Z	0			
250.40	3.00		MST		0	TRFDA	0		QCTR04R	0			
253.40	3.00		MST		0	TRFDA	0		QCTR04R	0			
256.40	3.00		MST		0	TRFDA	0		QCTR04R	0			
258.50	2.00		MST		0	TRFDA	0		QCTR04R	0			
260.30	2.00		MST		0	TRFDA	0		QCTR05R	0			
260.80	0.30		MST		0	TRFDA	0			0			
262.70	2.00		MST		0	TRFDA	0		QCTR047	0			
263.10	0.10		MST	SHA	0	TRFDA	0		7	0			
263.90	0.80		MST		0	TRFDA	0			0			
264.90	1.10		MST		0	TRFDA	0			0			
265.10	0.10				0	TRFDA	0			0			
268.10	3.00		MST		0	TRFDA	0		QC0104R	0			
271.40	3.30		SHA	MST	0	TRFDA	0		QCTR02R 0	0			
272.70	1.20		SHA	MST	0	01FDA	0		QCTR04R	0			
274.40	1.40		SHA	MST	0	02FDA	0		QCTR04R	0			
274.90	0.50		MST		0	TRFDA	0		QCTR04R	0			
277.40	2.50		MST		0	02FDA	0		QCTR06R	0			
280.40	2.60		MST	SLT	0	TRFDA	0		QCTR04R	0			
282.50	1.50		MST		0	REFDA	0		QCTR04R	0			
285.00	2.40		MST		0	TRFDA	0		QCTR036	0			
285.30	0.30		MST		0	TRFDA	0		QCTR03R	0			
286.20	0.90		MST		0	TRFDA	0		QCTR05R	0			
289.30	3.10		MST		0	TRFDA	0		QCTR05R	0			
291.50	1.70		MST		0	TRFDA	0		QCTR061	0			
294.20	2.30		MST		0	TRFDA	0		QC0108R	0			
295.30	0.80		MST		0	TRFDA	0		QCTR05R	0			
296.40	0.50		MST		0	TRFDA	0		QCTR05R	0			
298.40	2.00		MST		0	01FDA	0		QCTR05R	0			
298.70	0.30		MST		0	03FDA	0		QCTR05R	0			
299.90	0.90		MST	SLT	0	07FDA	0		QCTR05R 4	0			
301.40	1.50		MST	SLT	0	10FDA	0		QCTR08R 6	0			
304.40	3.00		BAP	BAB	0	03FDA	1	1P	QC25202	0			
307.40	3.00				0	TRFDA	0		QC99012	0			
310.40	3.00			BAB	0	05FD9	1	1P	QC79012	0			
313.40	3.20		BAB		0	TRFDA	1	1P	QC0515R	0			
316.40	3.00			BAV	0	01F++	1	1P	QC5012R	0			

DEPTH TO	CORE RECOV	Sample Number	LITH'GY MAJ	MIN	O I D	--SULPHIDES-- Vo Z	Py aZ	Cp aZ	Po aZ	Ga aZ	Sp aZ	ALTERATION Il	Al	Ch	Eg	Kf	Se	Cl	Si	Ca	Ja	Ba	Ma	VEINING Ty	Vo	No	A	STRUCTURE Ba	Ja	Fe	K	FAULT Bg	Ang pc	SU to ri at	Comments
319.48	3.00		BAV		0	01FD9D1						1												1P				QC1015R			0				
322.48	3.00		BAV	BAB	0	TRFDA						1												1P				QC0515R			0				
325.48	3.00		BAV		0	TRFDA						1												1P				QC0510R			0				
328.48	3.00		BAV		0	TRFDA						1												1P				QC0512R			0				
331.48	3.00		BAS	BAV	0	01FDA						1												1P				QC0308R			0				
334.48	3.00		BAS	BAV	0	01FD9D1						1												1P				QC1010R			0				
337.48	3.00		BAS	BAV	0	TRFDA						1												1P				QC0510R			0				
339.66	2.28		BAS		0	TRFDA						1												1P				QC0815R			0				
342.78	3.18		BAS		0	TRFDA						1												1P				QC0812R			0				
345.88	3.18		BAS		0	TRFD8D2						1												1P				QC0712R			0				
348.98	3.18		BAS		0	TRFDA						1												1P				QC0712R			0				
352.08	3.18		SHA	BAV	0	02FDA						1												1P				QC0108R			0				
354.78	2.78		SHA		0	02FDA						0																QC0105R			0				
357.88	3.18		BAB	SHA	0	01FDA						1												1P				QC4005R			0				
359.98	2.18		SHA	BAV	0	01FDA						1												1P				QC25044			0				
361.48	1.58		SHA		0	01FDA						0																QCTR05R			0				
364.48	3.00		BAV	SHA	0	TRFD9D1						1												1P				QC0110R			0				
367.48	3.00		BAV	BAP	0	TRFDA						1												1P				QC0110R			0				
370.08	2.68		BAV	BAP	0	01FDA						1												1P				QC0308R			0				
373.18	3.18		BAV		0							1												1P				QC0210R			0				
375.48	2.28		SHA	BAV	0	01FFA						1												1P				QCTR05R			0				
376.48	1.00		SHA	MST	0	01FFA						0																QCTR05R			0				
378.08	1.58		SHA	MST	0	01FFA						0																QCTR05R			0				
379.58	1.50		SHA	MST	0	02FDA						0																QCTR05R			0				
382.48	2.90		EPI	SHA	0	05FDA						0																QC0101R	6		0				
384.98	2.50		SHA	MST	0	02FDA						0																QCTR042			0				
388.08	3.10		MST	SHA	0	01FDA						0																QCTR024	6		0				
391.18	3.10		MST	SHA	0	TRFDA						0																QCTR024	4		0				
394.28	3.10		BAB	SHA	0	01FDA						0																QC0804R			0				
397.38	3.10		BAB	BAS	0	TRFDA						0																QC0110R			0				
400.48	3.10		BAS	BAB	0	TRFVA						0																QCTR08R			0				
403.48	3.00		BAS		0	TRFDA						0																QCTR08R			0				
406.48	3.00		BAS		0	TRFD5	D5					0																QC0107R			0				
409.48	3.00		BAS		0	TRFD5	D5					0																QC0107R			0				
412.48	3.00		BAS	BAV	0							0																QC0208R			0				
415.48	3.00		BAS	BAB	0							0																QC0508R			0				
418.48	3.00		BAS		0							0																QC0408R			0				
421.48	3.00		BAS	BAV	0							0																QC04074			0				
424.48	3.00		BAV	EPI	0							0																QC0105R			0				
427.48	3.00		BAB	EPI	0	TRFDA						0																QCTR05R			0				
430.48	3.00		BAB		0	TRFDA						0																QC7R02R			0				
433.48	3.00		BAB	BAV	0	TRFDA						0																QC0106R			0				
436.48	3.00		BAB	BAV	0	TRFDA						0																QC3R05R			0				
439.48	3.00		BAB	BAV	0	TRFDA	D1D1D1					0																QC0106R			0				
442.48	3.00		BAB	BAV	0	TRFA5		A5				0																QCTR05R			0				
445.48	3.00		BAB	BAV	0	TRFDA						0																QCTR07R			0				
448.48	3.00		BAV	BAB	0	TRFD5		A5				0																QCTR07R			0				
451.48	3.00		BAV	BAB	0	TRFDA						0																QCTR07R			0				
454.48	3.00		BAB		0	TRFDA						0																QC01052			0				
457.48	3.00		BAS	BAB	0	TRFDA						0																QCTR06R			0				

336·3 = A321 401 T/S SPARSELY AUGITE + OLIVINE PHYRIC METABASALT - HYDROTHERMALLY ALTERED
= A 321 402 = ANALYSIS

351·3 = A321403 T/S LITHIC VITRIC TUFF - HIGHLY ALTERED PYROCLASTIC ROCK COMPOSED OF VESICULAR GLASSY FRAGMENTS OF MICROLITHIC TEXTURE ANDESITE

= A321405 = ANALYSIS
405·4 = A321404 T/S AUGITE PHYRIC METABASALT

= A321407 = ANALYSIS
413·1 = A321406 T/S AUGITE + PLAGIOCLASE PHYRIC METABASALT

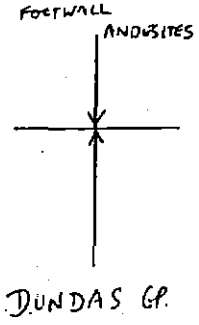
= A321409 = ANALYSIS
422·4 = A321408 T/S AUGITE + OLIVINE PHYRIC METABASALT
424·1 = A321410 T/S EXTENSIVELY RECRYSTALLISED RHYOLITE OR RHYODACITIC LAVA

HELLYER BASALTS
↑
"MIXED SEQUENCE"
↓
FOOTWALL ANDESITES

433·5 = A321411 T/S VIRTUALLY APHYRIC, SLIGHTLY VESICULAR META ANDESITE
= A321412 = ANALYSIS

450·5 = A321413 T/S VIRTUALLY APHYRIC, SLIGHTLY VESICULAR META ANDESITE
= A321414 = ANALYSIS

DEPTH TO	CORE RECOV	Sample Number	LITH'GY MAJ	MIN	O I D	X	--SULPHIDES-- Vo	Py	Cp	Po	Ba	Sp	------ALTERATION------ l	Li	Al	Ch	Ep	Kf	Se	Cl	Si	Ca	Ja	Ba	Ma	VEINING Ty	Vo	Mo	A	STRUCTURE Ba	Ja	Fa	H	FAULT Gg	Ang pc	SU ta ri st	Comments
460.40	3.00		BAS	BAB	0	TRFDA							0														QCTR06R			0								
463.40	3.00		BAB	BAS	0	TRFDA							0														QCTR06R			0								
463.80	0.40		BAS	BAB	0								0														QCTR06R			0								
466.30	2.50		BAS	BAB	0	TRFDA							0														QC0104R			0								
469.40	3.10		BAB	GWK	0	TRFDA							0														QCTR05R	5		0								
472.40	3.00		GWK	BAB	0	B1FDA							0														QC0105R			0								
474.20	1.80		GWK	SHA	0	TRFDA							0														QCTR03R	7		0								
475.40	1.10		GWK		0	B1FDA							0														QCTR05R			0								
478.40	3.00		SHA	GWK	0	TRFDA							0														QC0106R			0								
481.40	3.00		SHA	GWK	0	TRFDA							0														QC0405R	6		0								
484.20	2.80		GWK	SHA	0	TRFDA							0														QC01045	6		0								
487.30	3.10		GWK	SHA	0	TRFDA							0														QCTR04R	6		0							486.2m = A321415	T/S IMMATURE QTZ WACKE & SHALE CLASTS
490.40	3.10		GWK		0	TRFDA							0														QCTR04R			0								
493.40	3.00		GWK	SHA	0	TRFDA							0														QCTR024	5		0								
495.00	1.60		GWK		0	TRFDA							0														QCW108R			0								
496.40	1.40		GWK	SHA	0	TRFDA							0														QCTR05R			0								
498.00	1.60		GWK	SHA	0	TRFDA							0														QC0104R	5		0								
501.20	3.20		GWK		0	TRFDA							0														QC0104R			0								
504.30	3.10		GWK	SHA	0	TRFDA							0														QC0105R			0								
506.40	2.10		GWK		0	TRFDA							0														QC0105R			0								
508.30	1.70		GWK		0	TRFDA							0														QCTR04R			0								
511.40	3.10		GWK		0	TRFDA							0														QCTR031			0								
514.40	3.00		GWK		0	TRFDA							0														QCTR02R	6		0								
517.40	3.00		GWK		0	TRFDA							0														QCTR03R			0								
520.40	3.00		GWK		0	TRFDA							0														QCTR02R			0							519.6m = A321416	T/S IMMATURE QTZ WACKE
523.40	3.00		GWK		0	TRFDA							0														QCTR05R	6		0								
526.40	3.00		GWK		0	TRFDA							0														QCTR03R			0								
529.40	3.00		GWK		0	TRFDA							0														QCTR04R			0								
532.40	3.00		GWK		0	TRFDA							0														QCTR02R			0								
535.40	3.00		GWK		0	TRFDA							0														QCTR05R	6		0								
538.40	3.00		GWK	SHA	0	TRFDA							0														QC01044	6		0								
541.40	3.00		GWK	SHA	0	TRFDA							0														QCTR034	6		0							540.5m = A321417	T/S BANDED SILTSTONE-SHALE



Project : RA : 0 Code :

HOLE : BRD004 Coords : 0.0E 0.0N Collar RL : 0.0
Logged by : REW&PDE Driller : ORTNER Rig id : J49
Commenced : / / Completed : / /
Start Log : 3.00 Total Depth : 301.00
Tot Oxid Depth : 0.00 Part Oxid Depth : 20.60

1710E
7625N
RL = 625.

240

Target Description

1 generate data for gravity interpretation.
2 test pyritised volcanics outcropping in Mutter Creek= I.P. anomaly
3 test for interpreted N-S fault.

Mineralisation

Significant Results

Alteration Details

General Comments

Geological Notes

DOWNHOLE SURVEY DATA:

Depth	Dip	Azimuth	Core Size
0.00	0.00	0.00	
54.00	-56.00	293.50	NQ
114.00	-55.50	294.50	NQ
169.00	-55.00	291.00	NQ
225.00	-56.00	290.50	NQ
277.00	-55.00	289.50	NQ

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DEPTH TO	CORE RECOV	Sample Number	LITH'GY MAJ	MIN	D I D	--SULPHIDES-- %	------ALTERATION---------	VEINING	STRUCTURE	FAULT pc	SU tn ri at	Comments
						VoGPyCpPoGaSp	ILiAlChEpKfSeClSiCaJaBaMa	TyVoKoA	BaJaFm H	GgAng		
3.00	0.20		RVC	2	TRFDA	0			0			
4.00	0.30		RVC	2	TRFDA	0			0			
5.00	1.60		GWK	0	TRFDA	0			0			
5.40	1.00		RVC	2	TRFDA	0			0			
7.00	0.00		RVC	2	TRFDA	0			0			
9.00	0.70		MST	SHA 0	01FDA	0			0			
10.00	0.50		GWK	1	TRFDA	0			0			
11.10	0.60		GWK	1	TRFDA	0			0			
12.10	0.50		GWK	1		0			0			
13.00	0.50		GWK	SHA 1		0			0			
15.50	2.00		GWK	VCG 1	TRFDA	0			0			
16.90	0.50		VCG	1	TRFDA	0			0			
18.00	1.50		GWK	VCG 1	TRFDA	0			0			
20.60	1.30		GWK	VCG 1	TRFDA	0			0			
22.00	1.20		VCG	0	TRFDA	0		QC0105R	0			
23.00	1.60		VCG	0	05FDA	0		QC0105R	0			Q226m = A321421 T/S VITRIC LITHIC TUFF COMPOSED OF POORLY DEFINED ANGULAR TO SUB-ROUNDED FRAGMENTS OF FORMERLY GLASSY RHYOLITIC LAVA.
27.00	3.10		VCG	0	01FDA	0		QC0105R	0			
30.10	3.00		VCG	0	02FDA	0		QC0105R	0			
33.00	3.00		VCG	0	TRFDA	0		QC0105R	0			
34.00	0.00		RVC	0	05FDA	0		QC0105R	0			
37.00	3.00		VCG	RVC 0	01FDA	0		QC0105R	0			Q343m = A321423 T/S FORMERLY A GLASSY, FELSPAR PHYRIC RHYOLITIC LAVA WITH SPARSE CLINOPX PHENOXTS.
39.70	2.00		VCG	GWK 0	01FDA	0		QC0105R	0			
42.00	3.10		VCG	0	TRFDA	0		QC0103R	0			Q423m = A321424 T/S RHYOLITIC VITRIC XTAL TUFF
45.20	2.60		GWK	VCG 0	05FDA	0		QC0105R	0			
46.80	1.70		VCG	0	02FDA	0		QC0202R	0			
48.60	1.70		VCG	GWK 0	TRFDA	0		QCTR02R	0			
50.00	1.60		GWK	0	TRFDA	0		QC0110R	0			
51.50	1.40		GWK	VBX 0	TRFDA	0		QC0106R	0			
53.50	2.00		GWK	0	TRFDA	0		QCTR04R	3	0		
55.00	1.50		GWK	0	TRFDA	0		QCTR05R		0		
57.60	2.30		GWK	0	TRFDA	0		QC0104R		0		
60.70	3.10		VCG	GWK 0	TRFDA	0		QCTR03R		0		
63.00	3.10		VCG	GWK 0	TRFDA	0		QC0102R		0		
65.90	2.00		VCG	SHA 0	TRFDA	0		QCTR02R		0		
69.00	3.10		VCG	MST 0	03FDA	0		QC0102R		0		
72.10	3.10		VCG	MST 0	02FDA	0		QCTR02R		0		Q702m = A321425 T/S - EPICLASTIC COMPOSED OF PYROCLASTIC (FORMERLY GLASSY CRYSTAL LITHIC RHYOLITIC TUFFS) AND LAVA (RHYOLITIC) FRAGMENTS IN A MATRIX CONTAINING METAMORPHIC DERIVED QTZ AND MUSCOVITE GRAINS.
75.20	3.10		VCG	0	01FDA	0		QCTR02R		0		
78.30	3.10		VCG	0	05FDA	0		QCTR02R		0		Q77.2m = A321426 T/S - SLIGHTLY ALTERED LITHIC TUFF COMPOSED OF ABUNDANT ANGULAR FRAGMENTS OF FORMERLY GLASSY RHYOLITIC LAVA CONTAINING PHENOXTS OF ANKITE
81.20	2.90		VCG	0	05FDA	0		QCTR02R		0		Q82.0m = A321427 T/S - VITRIC LITHIC TUFF COMPOSED OF ABUNDANT ANGULAR FRAGMENTS OF FORMERLY GLASSY RHYOLITE AND RHYODACITIC LAVA
84.30	3.10		VCG	0	05FDA	0				0		
87.50	3.20		MST	VCG 0	05FDA	0		QC0103R		0		
89.30	1.90		MST	SHA 0	01FDA	0		QC1R033		0		
90.00	0.70		MST	SHA 0	01FDA	0				0		
93.10	3.10		MST	SHA 0	01FDA	0		QC0302R	7	0		
96.20	3.10		MST	SHA 0	01FDA	0		QC0309R		0		
98.50	2.30		SHA	MST 0	01FDA	0		QCTR05R		0		
100.00	1.50		SHA	0	01FDA	0		QCTR05R		0		
103.00	3.00		SHA	0	01FDA	0		QCTR03R	0	0		
106.00	3.00		SHA	MST 0	01FDA	0		QCTR03R		0		
109.00	3.00		MST	SHA 0	01FDA	0		QC01004	6	0		

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DEPTH TO	CORE RECOV	Sample Number	LITH'GY MAJ	MIN	I D	--SULPHIDES-- %	Vo	GP	yC	pP	oG	aS	p	------ALTERATION---------	TL	iA	lC	hE	pK	fS	eC	l	Si	Ca	Ja	Ba	Ma	VEINING	TyVoNoA	STRUCTURE	BaJaFa	H	FAULT	GgAng pc	SU ta ri at	Comments
111.20	2.20		SHA	MST	B	B1FDA																						QC0106R		B				
112.00	0.80		SHA		B	B1FDA																						QC0108R		B				
115.00	3.00		SHA		B	B1FDA																						QCTR05R	7	B				
118.00	3.00		SHA	MST	B	B1FDA																						QC0108R		B				
119.70	1.70		MST		B	B1FDA																						QC0108R		B				
122.10	2.40		MST		B	B1FDA																						QC0110R		B				
123.10	1.00		MST		B	B1FDA																						QC0110R		B				
124.90	1.80		MST	SHA	B	B1FDA																						QC0110R		B				
127.00	3.10		MST	SHA	B	B1FDA																						QC0110R		B				
130.00	3.00		MST	SHA	B	B1FDA																						QCTR07R	7	B				
133.00	3.00		MST	SHS	B	B1FDA																						QC0108		B				
136.00	3.00		MST	SHS	B	B1FDA																						QCTR063		B				
139.00	3.00		MST	SHA	B	B1FDA																						QCTR063		B				
142.00	3.00		SHA	MST	B	B1FDA																						QCTR05R	5	B				
143.20	1.20		SHA		B	B1FDA																						QC0110R	5	B				
144.70	1.50		SHA		B	B1FDA																						QCTR05R		B				
145.80	1.10		SHA		B	B1FDA																						QCTR083	5	B				
146.90	0.80		SHA		B	B1FDA																						QC0107R		B				
148.00	1.10		SHA	MST	B	B1FDA																						QC0110R		B				
149.50	1.50		SHA	MST	B	B1FDA																						QC0108R		B				
151.00	1.50		MST	SHA	B	B1FDA																						QC0108R		B				
154.00	3.00		SHA	MST	B	B3FDA																						QC0110R	6	B				
157.00	3.00		SHA		B	B3FDA																						QC0110R		B				
160.00	3.00		SHA		B	B3FDA																						QC0110R		B				
160.60	0.60		MST		B	B3FDA																						QC0110R		B				
163.00	2.40		MST	SHA	B	B1FDA																						QC0110R	6	B				
166.00	3.00		MST	SHA	B	B1FDA																						QCTR10R	5	B				
169.00	3.00		MST	SHA	B	B1FDA																						QCTR08R		B				
172.00	3.00		MST		B	B1FDA																						QC0114R		B				
175.00	3.00		MST		B	B1FDA																						QC0114R		B				
178.00	3.00		MST		B	B1FDA																						QC0550R		B				
181.00	3.00		MST		B	B1FDA																						QC0320R		B				
184.00	3.00		MST		B	B1FDA																						QC0310R		B				
187.00	3.00		MST		B	B1FDA																						QC0420R		B				
190.00	3.00		SHA		B	B1FDA																						QC0110R	7	B				
193.00	3.00		SHA	MST	B	B1FDA																						QC0115R	6	B				
196.00	3.00		SHA	MST	B	B1FDA																						QC0215R	7	B				
199.00	3.00		MST	SHA	B	B1FDA																						QC0112R	7	B				
202.00	3.00		MST		B	B1FDA																						QC0115A		B				
205.00	3.00		MST		B	B1FDA																						QC0112R		B				
208.00	3.00		MST	GWK	B	B5FDA																						QC021BR		B				Fault.
211.00	3.00		GWK	SHA	B	TRFDA																						QC021BR		B				
214.00	3.00		GWK	SHA	B	TRFDA																						QC0212R	4	B				
217.00	3.00		GWK		B	TRFDA																						QC0212R		B				
220.00	3.00		GWK	MST	B	B5FDA																						QC0110R	8	B				
223.00	3.00		GWK	MST	B	B5FDA																						QCTR06R		B				
226.00	3.00		MST	GWK	B	B2FDA																						QC021BR		B				
229.00	3.00		VBX	GWK	B	B3FDA																						QCTR10R		B				
232.00	3.00		GWK	VBX	B	B1FDA																						QCTR10R		B				
235.00	3.00		GWK	VBX	B	B1FDA																						QC0106R		B				

2332.0 = A321419 — RHYOLITIC VITRIC CYRSTAL TUFF + PYRITE.

DEPTH TO	CORE RECOV	Sample Number	LITH'GY MAJ	MIN	I D	%	--SULPHIDES-- VoGPyCpPoGaSp	n t	------ALTERATION---------- ILiAlChEpKfGeClSiCaJaBaMa	VEINING TyVoNoA	STRUCTURE BaJaFm	H	FAULT GgAng pc	tn ri at	Comments
238.00	3.00		GWK	SHA	0	02FDA	0			QCTR00R	7	0			
241.00	3.00		VBX	GWK	0	TRFDA	0			QCTR00R		0			ID 243·0 = A321420 – T/S EPICLASTIC SEDIMENT CONTAINING LARGE FRAGMENTS OF RH
244.00	3.00		VBX	GWK	0	01FDA	0			QCTR04R	7	0			DARK GREYWACKE MATRIX
247.00	3.00		VBX	GWK	0	02FDA	0			QCTR04R		0			ID 247·0 = A321421 – T/S EPICLASTIC IMMATURE QTZ ACENITE CONTAINING ANGULAR F
250.00	3.00		VBX	GWK	0	01FDA	0			QC0200R		0			FORMERLY GLASSY RHYOLITIC MAGMA
253.00	3.00		VBX	GWK	0	01FDA	0			QC0100R		0			ID 250·0 = A321422 – T/S EXTENSIVELY SERICITIZED RHYOLITIC VITRIC CRYSTAL TU
256.00	3.00		GWK	SHA	0	TRFDA	0			QC0110R		0			
259.00	3.00		GWK		0	TRFDA	0			QC0110R		0			
262.00	3.00		GWK	SHA	0	TRFDA	0			QC0100R		0			
265.00	3.00		GWK	VBX	0	TRFDA	0			QC0106R		0			
268.00	3.00		GWK	SHA	0	TRFDA	0			QC0110R		0			
271.00	3.00		GWK	MST	0	TRFDA	0			QC0100R		0			
274.00	3.00		GWK		0	TRFDA	0			QC0300R		0			
277.00	3.00		GWK	SHA	0	TRFDA	0			QC0100R	6	0			
280.00	3.00		GWK	SCG	0	TRFDA	0			QC0215R		0			
283.00	3.00		GWK		0	TRFDA	0			QC0210R		0			
286.00	3.00		GWK		0	TRFDA	0			QC0210R		0			
289.00	3.00		GWK		0	TRFDA	0			QC0525R		0			
292.00	3.00		GWK		0	TRFDA	0			QC0215R		0			
295.00	3.00		GWK		0	TRFDA	0			QC0210R		0			
298.00	3.00		GWK		0	TRFDA	0			QC0210R		0			
301.00	3.00		GWK		0	TRFDA	0			QC0100R		0			

HOLE : DDH BRD 05 Coords : 388834.0E 5394272.0N Collar RL : 653.06
Logged by: PDE Driller: ORTNER Rig id: J49 (mod)
Commenced: 3 December 1989 Completed: 24th March 1990
Start Log: 0.0m Total Depth: 1181.0m
Total Oxid Depth: 10.4m Part Oxid Depth: 54.0m

Target Description

To test the Que/Hellyer sequence 600m grid south of BRD 01 and below the Hellyer Basalt and allow downhole geophysics to be run to test the surrounding area within a 600m radius.

Mineralisation

None of significance - trace Sp-Gn associated with qtz-carb veining and vesicule infilling in the basalt horizons.

Significant Results

0	- 11.5m	Quartz-feldspar porphyry
11.5	- 24.4m	Shale
24.4	- 36.5m	Quartz-feldspar porphyry
36.5	- 48.4m	Interlayered shale and quartz-feldspar porphyry
48.4	- 92.5m	Shale (micaceous)
92.5	- 157.6m	Pyroclastics (mass flow unit with conglomeratic base)
157.6	- 530.6m	Que River Shale
530.6	- 530.7m	Basalt
530.7	- 531.8m	Que River Shale
531.8	- 570.7m	Hellyer Basalt (with py + qtz veins)
570.7	- 570.9m	Pyrite and Quartz
570.9	- 634.0m	Que River Shale
634.0	- 684.2m	Conglomerate
684.2	- 687.8m	Que River Shale

687.8 - 697.4m	Pepperitic Basalt and Shale
697.4 - 698.6m	Quartz-carbonate vein
698.6 -1045.9m	Hellyer Basalt
1045.9 -1055.0m	Polymict Breccia
1055.0 -1061.0m	Monomict Dacitic Breccia
1061.0 -1067.0m	Polymict Breccia
1067.0 -1181.0m	Dacitic Lavas and Breccias

Alteration Details

Fuchsite-carbonate alteration does occur as scarce zones in the basalt but carboate alteration is fairly strong and widespread but patchy. Stronger alteration tends to be at the top and bottom of the Hellyer Basalt.

General Comments

Fairly good drilling.

Geological Notes

Geochemistry confirms alteration.

DOWNHOLE SURVEY DATA

Depth	Dip	Azimuth		Core Size
		True	Mag	
0	-90	0	10.5	HQ
54	-90	0	10.5	HQ
60	-89.3	24.5	35.0	NQ
103	-89.0	134.5	145.0	NQ
151	-88.5	161.5	172.0	NQ
199	-89.0	184.5	195.0	NQ
247	-89.5	184.5	195.0	NQ
295	-89.5	324.5	335.0	NQ
355	-89.0	039.5	050.0	NQ

Depth	Dip	Azimuth		Core Size
		True	Mag	
403	-89.0	014.5	025.0	NQ
451	-88.0	012.5	023.0	NQ
499	-86.5	354.5	005.0	NQ
547	-86.0	349.5	000.0	NQ
583	-82.0	353.5	004.0	NQ
655	-82.0	001.5	012.0	NQ
692	-77.0	352.5	003.0	NQ
751	-76.0	353.5	004.0	NQ
806	-76.0	343.5	354.0	NQ
851	-76.0	343.5	354.0	NQ
899	-76.0	341.5	352.0	NQ
953	-76.0	339.5	350.5	NQ
1001	-76.0	343.5	354.0	NQ
1061	-76.0	343.5	354.0	NQ
1181	EOH			

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
3.0	.0	QTPO	5								
11.4	8.4	QTPO	5				10 3			704302	WR
4.4	1.0	QTPO	5								
7.4	1.7	QTPO	5				20 3				
10.4	2.6	QTPO	5				0511				
11.4)	3.0	QTPO	5				15 3				
13.4)		SLM	4	TRFEA			1513				
16.4	2.9	SLM	4	TRFEA			1513				
18.6)	3.6	SLM	4	TRFEA			1513				
18.8)		QTPO	4				1513				
19.4)		SLM	4	TRFEA			1513				
19.6)	2.7	SLM	4	TRFEA			513				
20.2)		QTPO	4				0413				
22.3)		SLMP	4	TRFEA			1013				
23.2)	3.3	QTPS	3	TRFEA			05 3				
24.6)		SLMP	3	TRFEA			1213				
25.4)		QTP	3	TRFEA			07 3				
36.7	10.1	QTP	3							704303	WR
28.4	3.2	QTP	3	TRFEA			07 3				
30.5)	2.9	QTP	3	TRFEA			07 3				
31.0)		QTPS	3	TRFEA			0713				
31.4)		QTP	3	TRFEA			07 3				
32.9	1.7	QTP	3	TRFEA			07 3				
34.4	1.5	QTP	3	TRFEA			07 3				
36.7)	3.0	QTP	3	TRFEA			07 3				
37.4)		SLM	3	TRFEA			1323				
38.3)	3.1	QTP	3	TRFEA			0513				
39.4)		SLM	2	TRFEA			06R3				
40.4)		SLMP	2	TRFEA			0613				
41.2)	2.5	SLMP	2	TRFEA			1013				
41.9)		QTP	3	TRFEA			0613				
42.9)		SLM	2	TRFEA			0713				

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number Ty
43.9)	2.1	SLMP	2	TRFEA			0713			
44.2)		QTP	2	TRFEA			06R3			
44.9)		SLM	2	TRFEA			71013			
45.7)	1.5	SLM	2	TRFEA			607R3			
48.5)	2.8	QTP	1							704304 WR
46.4)		QTP	1	TRFDA			03 3			
46.4	0.1									701501 TS
48.5)	3.0	QTP	1	TRFDA			03 3			
49.4)		SLMS	1	01FBA			603 3			
51.6	2.2	SLM	1	TRFBA			6 0 3			
54.0	2.5	SLMS	1	02FCA			620R3			
52.0	0.1									701502 TS
56.0	1.8	SLM	1	TRFBA			15 3			
59.0	2.9	SLM	0	TRFGA			12 3			
61.4	2.3	SLM	0	01FGA			815 3			
65.0	4.0	SLM	0	01FGA			815 3			
71.0	6.0	SLM	0	01FGA			7 3			
76.8	6.0	SLM	0	02FGA			804 4			
83.0	6.3	SLMT	0	01FGA			804 4			
89.0	6.0	SLM	0	01FGA			80524			
92.9)	6.1	SLMT	0	01FBA			90723			
95.0)		RVC	0	01FDA	2 1 P		704 5			704305 WR
119.0	23.4	RVC	0							704306 WR
101.0	6.2	RVC	0	TRFDA	1 1 P		804 5			
100.7	0.1									701503 TS
107.0	6.2	RVC	0	02FDA			0215			
112.5	5.7	RVC	0	02FDA		QC010102	0235			
119.0	6.7	RVC	0	01FDA		QC0104 R	03R5			
131.0	12.0	RVC								704307 WR
124.5	5.7	RVC	0	02FDA		QC0510 R	0465			
131.0	6.4	RVC	0	02FDA		QC0205 R	06 5	1028		
144.5	13.5	VCG	0							704308 WR
137.0	6.0	VCG	0	03FD9 1C			03 5	1028		
143.0	5.3	VCG	0	03FD9 1C			04R5			

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp		Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number Ty
144.5	2.6	VCG	0	02FCA				0325			
157.7	13.2	VCG									704309 WR
149.0	4.3	VCG	0	04FC6D3	C1			05 5			
152.8	4.3	VCG	0	02FC9D1				05 5			
157.7)	5.2	VCG	0	02FC9D1				05 5			
156.2)	0.1	VCG	0					05 5			701504 TS
158.0)	5.2	SLU	0	01FBA				1024			
161.2	3.6	SLB	0	01FBA			QC0308R	807R4			
163.3	1.7	SLU	0	TRFBA				20R4			
167.9	4.4	SLU	0	TRFDA				806R4			
170.8	2.9	SL	0	TRFDA			QC010503	806R4			
176.0	5.1	SLB	0	TRFBA			QC0101 R	805 4			
182.0	6.0	SLUB	0	TRFBA				805 4			
187.3	5.2	SLBU	0	TRFDA				05 4			
192.1)	6.5	SLTB	0	TRFBA				805 4			
193.8)		SLCU	0	01FDA				605 4			
194.7	6.4	SLCU	0	TRFDA				705 4			
200.0		SLTB	0	02FBA				805 4			
206.0	6.0	SLU	0	TRFDA			QC010B R	805 4			
212.0	6.0	SLUB	0	TRFDA				805 4			
218.0	6.0	SLU	0	TRFDA				05 4			
224.0	6.1	SLUB	0	TRFDA				805 4			
230.0	6.0	SLUB	0	TRFDA			QC0100 R	805 4			
236.0	6.3	SLU	0	TRFDA			QC010109	805 4			
242.0	6.2	SLU	0	TRFDA				05 4			
245.0	3.2	SLU	0	TRFDA			QC0103 R	0834			
248.0	3.0	SLV	0	TRFDA				05 4			
254.0	6.1	SLUB	0	TRFDA				805 4			
260.0	6.0	SLBU	0	TRFDA			QC030502	805 4			
266.0	6.3	SLBU	0	TRFDA				805 4			
272.0	6.2	SLUB	0	TRFDA			QC1205R	805 4			
278.0	6.0	SLUB	0	TRFDA			QC020202	05 4			
281.0	3.3	SLUB	0	TRFDA			QC0202 R	705 4			
287.0	5.6	SLU	0	TRFDA			QC0202 R	05 4			

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
290.0	3.2	SLU	0	TRFDA		QC0202 R	05 4				
296.0	5.9	SLUB	0	02FWA		QC061003	805 4				
299.7	3.8	SLB	0	03FWA		QC0207 R	805 4				
305.0	5.0	SLB	0	03FWA		QC0107 R	905 4				
311.0	6.0	SLB	0	03FWA		BX050301	905 4				
317.0	6.0	SLUB	0	TRFDA		QC010102	905 4				
323.0	6.0	SLU	0	TRFDA			05 4				
324.9	1.9	SLU	0	TRFDA			05 4	0332			
330.9	6.0	SLU	0	TRFDA		BX1003 R	05 4	0332			
336.5	5.6	SLBU	0	TRFDA			05 4				
341.0	4.4	SLB	0	01FBA			805 4				
347.0	6.0	SLUB	0	TRFDA			05 4				
353.0	6.0	SLUB	0	TRFDA			805 4				
359.0	6.0	SLU	0	TRFDA			805 4				
365.0	6.0	SLUB	0	TRFDA			805 4	0551			
371.0	6.1	SLBU	0	01FDA			805 4	0551			
377.0	6.2	SLB	0	04FWA			805 4				
383.0	5.8	SLU	0	01FDA			805 4				
389.0	6.0	SLUB	0	TRFDA			805 4				
395.0	6.3	SLU	0	TRFDA			05 4				
401.0	6.0	SLUB	0	TRFDA			90334				
402.3)	6.0	SLU	0	TRFDA			0334				
403.1)		SLTB	0	TRFDA			80334				
407.0)		SLU	0	TRFDA			0324				
412.0)	6.0	SLU	0	TRFDA			80324				
413.0)		SLTB	0	TRFDA			70324				
414.6)	6.0	SLU	0	TRFDA			0324				
417.1)		RVC	0	TRFDA		QC010202	70324				
415.9)	0.1	RVC	0							701505	TS
419.0)	6.0	SLU	0	TRFDA			0324				
425.0	6.0	SLUB	0	01FWA			70324				
431.0	6.0	SLB	0	03FWA			70324				
434.0	3.2	SLB	0	03FWA		QC0106 R	70324				

DEPTH To	Core Recov	LITH'GY MaMi	O. Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number Ty
440.0	6.0	SLBU	0 01FWA			70324			
443.7	3.8	SLBU	0 TRFDA			70324			
446.0	3.9	RVCS	0 TRFDA			705R4			
447.4		SLU	0			10R4			
448.2	0.8	SLU	0 TRFDA			10R4			
449.7	1.3	SLU	0 TRFDA		QC0107 R	03R4			
451.0	1.6	SLU	0 TRFDA			70534			
453.0	2.0	SLU	0 TRFDA			705R4			
456.2	3.3	SLUB	0 TRFDA			705R4			
458.0	1.8	SLUB	0 TRFDA			705R4			
459.0	0.9	SLU	0 TRFDA			1024			
460.8	1.7	SLU	0 TRFDA		QC0212 R	1024			
461.3	0.5	SLU	0 TRFDA		QC0212 R	1024			
464.1	3.1	SLUB	0 TRFDA		QC0212 R	0524			
466.8	2.5	SLUB	0 TRFDA			0524			
468.0	1.5	SLUB	0 TRFDA			0524			
470.5	2.5	SLU	0 TRFDA			70524			
472.8	2.4	SLU	0 TRFDA			0524			
475.4	2.8	SLUB	0 TRFDA			0524			
481.5	5.9	SLB	0 01FDA		QC010702	60524			
486.8	5.4	SLBU	0 01FDA			60524			
491.0	3.9	SLUB	0 TRFDA			0524			
497.0	6.0	SLU	0 TRFDA			0524			
503.0	5.9	SLU	0 TRFDA			0524			
509.0	6.1	SLBV	0 01FBA			60524			
512.6	3.8	SLUB	0 01FBA		QC0107 R	0524			
515.4	2.7	SLU	0 TRFDA			60524			
517.0	1.8	SLU	0 TRFDA			0524			
519.4	2.5	SLUB	0 TRFDA			60524			
521.0	1.6	SLU	0 TRFDA		QC0215 R	0524			
523.4	2.2	SLU	0 TRFDA			0524			
526.7	3.3	SLU	0 TRFDA		QC011002	0524			

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number Ty
530.8)	6.5	SLU	0	01FDA			0524			
530.9)		BSB	0	10FCA	1 2P		60524			
531.8)		SLU	0	05FWA	1 2P		60524			
533.0)		BSP	0	08FH9D1	2 2P	QC1020 R	03R5			
545.0	12.0	BSM	0							704310 WR
539.0	6.1	BSMP	0	06FH9D1	1 1P	QC1020 R	03R5			704311 WR
538.5	0.1	BS								701507 TS
545.0	6.1	BSM	0	03FB9D1	1 1P	QC0813 R	03R5			
539.1	0.1	BS	0							701508 TS
569.0	24.0	BSMV	0							704313 WR
551.0	5.9	BSMV	0	01FBA	1 1P	QC0813 R	03R5			
545.9	0.1	BS	0							701509 TS
549.0	0.1	BS	0							701510 TS
557.0	6.1	BSV	0	TRFDA	1 1P	TC0808 R	03R5			
555.0	0.1	BS	0							701511 TS
563.0	6.0	BSM	0	TRFDA	1 1A	QC0710 R	03R5			
558.7	0.1	BS	0							701512 TS
559.5	0.1	BS	0							701513 TS
561.5	0.1	BS	0							701514 TS
569.0	6.0	BSM	0	TRFDA	1 1P	QC0710 R	03R5			
570.8	5.7	BSM	0	03FH9H1		QC0710 R	03R5			704314 WR
569.3	0.1	BS	0							701515 TS
574.5		SLUB	0	03FH9H1		QC0215 R	604R4			
575.3	1.0	SLU	0	03FH9H1		QC010402	504R4			
576.0	0.7	SLU	0	TRFDA		QC010402	04R4			
581.0	4.8	SLU	0	TRFDA		BX1008 R	504R4			
586.0	4.9	SLU	0	TRFEA			04R4			
591.5	5.5	SLU	0	TRFDA			04R4			
596.0	4.2	SLU	0	TRFDA			60414			
599.0	3.3	SLU	0	TRFDA		QC0515 R	04 4			
605.0	6.0	SLU	0	TRFDA		QC1820 R	704 4			
609.0	4.7	SLUB	0	TRFEA			804 4			
609.9	0.9	SLU	0	TRFEA			04 4			

DEPTH To	Core Recov	LITH'GY MaMi	O. Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
614.0	4.0	SLUB	0 TRFEA			704 4				
616.3)	6.0	SLUB	0 TRFEA			04 4				
616.4)		VC	0 TRFEA			804 4				
620.0)		SL	0 TRFBA			04 4				
621.5	4.3	SLUB	0 TRFBA			704 4				
622.8		SLVB	0 TRFDA			804 4			701516	TS
624.2		SLU	0 TRFBA			704 4				
627.8	3.8	SLU	0 TRFDA			804 4				
631.1	3.5	SLU	0 TRFDA		QC0208 R	704 4				
634.7	3.2	SLUB	0 TRFDA			804 4				
636.6	2.0	SLU	0 TRFDA		QC0107 R	0724				
638.0	1.6	SLUB	0 TRFEA		QC0107 R	70724				
639.9	1.8	SLU	0 TRFDA		QC0107 R	04 4				
644.0	4.3	SLUB	0 TRFDA		QC0107 R	704 4				
647.0	3.0	SLVB	0 TRFDA			704 4				
648.2	1.3	SLU	0 TRFEA			0614				
650.4	2.5	SLUB	0 TRFEA			0614				
653.0	2.6	SLBU	0 TRFDA			70614				
658.0	5.2	SLUB	0 01FBA		QC0111 R	70614				
659.0	1.0	SLU	0 01FEA		QC0111 R	80614				
660.5	1.7	SLU	0 02FEA		QC0111 R	70614				
662.0	1.4	SLUB	0 02FWA		QC0111 R	70614				
668.0	6.0	SLB	0 02FWA			70314				
669.0	1.0	SLUB	0 TRFDA			70314				
674.0	4.9	SLUB	0 TRFDA			60314				
677.5	3.8	SLU	0 TRFDA			70314				
679.0	1.5	SLU	0 TRFDA		QC0108 R	70314				
681.0	2.1	SLUB	0 TRFDA			40634				
682.5	1.5	SLU	0 TRFDA		QC0610 R	30634				
683.4	4.8	SLU	0 01FDA		QC0410 R	70634				
685.2		SLBC	0 01FDA	1 1P	QC030304	02R4				
687.0		SLBS	0 01FDA	1 TP	QC0106 R	03R4			701517	TS
685.5	0.1	SLBC								

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
688.5)	5.0	SLBS	0	01FDA			03R4				
692.0)		BSPE	0	03FDA	3 1P2P	QC0104 R	03 5			704135	WR
690.0	0.1	TF	0							701518	TS
691.7	0.1	BS	0							701519	TS
698.0	6.1	BSPE	0	05FDA	3 1P2P	BX1008 R	03R5			704316	WR
710.0	12.0	BSMV	0							704317	WR
704.0	6.1	BSM	0	05FD8B2	2 1P1P	BX1008 R	03R5				
700.5	0.1	BS	0							701520	TS
710.0	6.0	BSVB	0	02FDA	1 1P1P	QC0515 R	07 5				
713.0	3.1	BSB	0	02FDA	3 1P2P	BX1205 R	03R5				
724.0	11.5	BSB	0							701319	WR
719.0	6.0	BSB	0	01FD9	3 1P2P	BX1205 R	03 5				
713.1	0.1	BSB	0							701521	TS
715.1	0.1	TSB	0							701522	TS
724.5	5.4	BSBM	0	TRFDA	3 1P2P	BX1205 R	10R5				
751.7	27.2	BSM	0							701320	WR
730.8	6.4	BSM	0	TRFDA	3 1P2P	QC1208 R	05 5				
727.5	0.1	BS	0							701523	TS
737.0	6.5	BSM	0	TRFDA	3 1P2P	QC0515 R	05 5				
743.0	5.9	BSM	0	TRFDA	1 2P1P	QC0408 R	02 5				
738.0	0.1	BS								701524	TS
749.0	6.2	BSM	0	TRFDA	1 2P1P	QC0408 R	03 5				
750.0	1.0	BSMB	0	TRFDA	1 2P1P	BX0712 R	03 5				
755.0	4.8	BSBM	0	01FDA		QC0306 R	05 5				
761.0	9.3	BSBM	0							704321	WR
751.5	0.1	PBC	0							701525	TS
754.0	0.1	BS	0							701526	TS
761.0	6.2	BSBM	0	TRFDA	2 1P1P	QC0309 R	02 5				
772.7	11.7	BSMB	0							704323	WR
766.2	5.2	BSMB	0	TRFD9D1	2 1P2P	Q50508 R	02 5				
772.7	6.4	BSBM	0	TRFD9D1	3 1P2P	QC0512 R					
797.0	24.3	BSM	0							704324	WR

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp		Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number Ty
779.0	6.3	BSM	0	TRFD9D1		2 2P1P	QC0512 R	02 5			
785.0	6.1	BSMB	0	TRFD9D1		2 2P1P	QC0512 R	02 5			
784.0	0.1	BSV	0								701526A TS
791.0	6.0	BSM	0			2 2P1P	QC0512 R				
797.0	6.2	BSM	0			3 1P2P	QC1020 R	02 5	1035		
823.9	26.9	BSM	0								704325 WR
801.1	4.3	BSMB	0	TRFVA		3 1P2P	QC1212 R	07 5	1035		
806.0	4.7	BSM	0			3 1P 1P1P	QC0715 R	02 5			
812.0	6.1	BSM	0			3 1P1P	QC0715 R	02 5			
818.0	6.0	BSM	0			3 1P1P	BC0915 R	02 5			
823.9	5.8	BSM	0			3 1P1P	QC1508 R	02 5			
821.5	0.1	BS	0								701527 TS
883.0	9.1	BSM	0								704326 WR
828.7	5.0	BSM	0	TCFFA		3 1P1P	QC0615 R	02 5			
833.0	4.3	BSM	0	TRFD8F2		3 1P 1P1P	QC0405 R	02 5			
857.0	24.0	BSM	0								704327 WR
839.0	6.1	BSMB	0	TRFFA		3 2P 1P1P	QC0508 R	02 5			
845.0	6.0	BSM	0			3 2P 1P1P	QC0508 R	02 5			
851.0	6.0	BSM	0			2 2P 1P1P	QC0508 R	02 5			
857.0	6.1	BSM	0			2 2P 1P2P	QC0508 R	02 5			
875.0	18.0	BSM	0								704328 WR
863.0	6.0	BSM	0			2 2P 1P2P	QC0508 R	02 5			
869.0	6.0	BSM	0	TRFDA		2 2P 1P2P	QC0508 R	02 5			
864.2	0.1	BS	0								701528 TS
875.0	6.0	BSM	0	TRFDA		2 2P 1P2P	QC0508 R	02 5			
893.0	1.8	BSV	0								704329 WR
881.0	6.1	BSVP	0	01FBA		2 1P2P	QC0508 R	02 5			
887.0	6.0	BSVM	0	TRFDA		2 1P2P	TC051208	02 5			
886.8	0.1	BS	0								701529 TS
893.0	6.1	BSV	0	01FD8V2		2 1P 1P2P	QC0103 R	02 5			
905.0	12.0	BSM	0								704330 WR
899.0	6.0	BSMV	0	TRFD9A1	AT	2 1P 1P2P	TC0308 R				

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp		Alteration ILiBiCyEpKfSeClSiCaJaBaMn					Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
905.0	6.0	BSMP	0	01FDA		2	1P	1P	1P2P		QC0205 R	0525				
904.9	0.1	BS	0												701530	TS
911.0	6.0	BSMV	0	01FDA		2		1P	1P2P		QC0205 R	02 5			704332	WR
929.0	18.0	BSMV	0												704333	WR
917.0	6.1	BSMB	0	01FDA		2		1P	1P2P		QC0205 R	02 5				
923.0	6.0	BSVM	0	TRFBA		2		1P	1P2P		QC0205 R	04R5				
929.0	6.2	BSVM	0			2		1P	1P2P		QS0308 R	02 5				
927.8	0.1	BSP	0												701531	TS
953.0	24.0	BSMV	0												704334	WR
935.0	6.0	BSVM	0	TRFVA		2		1P	1P2P		QC0308 R	02 5				
941.0	6.1	BSMV	0	TRFDA		2		1P	1P2P		QC0308 R	02 5				
947.0	6.0	BSMV	0	TRFBAAT		2		1P	1P2P		QC0308 R	02 5				
953.0	6.0	BSMV	0	02FDA		2		1P	1P2P		QC0302 R	02 5				
952.7	0.1	BSP	0												701532	TS
970.9	17.9	BSVB	0												704335	WR
959.0	6.0	BSBV	0	03FDA		2		1P	1P2P		QC0302 R	02 5				
964.4	5.5	BSVB	0	05FD9A1	AT	2		1P	1P2P		QC0302 R	02 5				
970.9	6.5	BSVB	0	03FDA		2		1P	1P2P		QC0302 R	02 5				
977.0	6.2	BSVP	0	02FDA		2		1P	1P2P		TC0205 R	02 5			704336	WR
995.0	18.0	BSVB													704337	WR
983.0	6.1	BSVB	0	TRFDA		3		2P	1P2P			02 5				
977.9	0.1	BS	0												701533	TS
982.9	0.1	BSVP	0												701534	TS
989.0	6.1	BSVB	0	TRFDA		3		2P	1P2P		TC031107	02 5				
995.0	6.1	BSVB	0	TRFDA		3		2P	1P2P		TC031107	02 5				
1007.0	12.0	BSVB	0												704338	WR
1001.0	6.0	BSVB	0			3		2P	1P2P		QC010508	02 5				
1007.0	6.0	BSVB	0			3		2P	1P2P		TC021207	02 5				
1031.0	24.0	BSV	0												704339	WR
1013.0	6.1	BSV	0	TRFD3A6	A1	4		2P	2P2P	1P	QC0308 R	02 5				
1019.0	6.0	BSVB	0	TRFVA		4		2P	2P2P	1P	QC0208 R	02 5				
1018.0	0.1	BS	0												701535	TS
1025.0	6.0	BSV	0			3		2P	1P2P		QC0208 R	02 5				

DEPTH To	Core Recov	LITH'GY MaMi	O.	Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
1031.0	6.1	BSVM	0		3 2P 1P2P	QC0308 R	02 5				
1045.9	14.9	BS	0							704340	WR
1037.0	6.0	BSVB	0		3 2P 1P2P	QC0208 R	02 5	0815			
1032.2	0.1	BS	0							701536	TS
1035.0	0.1	BS	0							701537	TS
1043.0	6.1	BSB	0		3 1P 2P 1P2P	QC0308 R	0625	0818			
1045.9)	6.2	BSM	0	01FDA	3 2P 1P2P	QC0108 R	0325				
1055.0)	9.1	PBC	0							704342	WR
1049.0)		PBC	0		3 1V 3P 2P2P	QC020608	0325				
1046.0	0.1	TFXD	0							701538	TS
1055.0	6.1	PBC	0	01FDA	3 1P 2P1P	QC0204 R	0325				
1053.7	0.1	DCL	0							701539	TS
1061.0	6.1	MBC	0	01FDA	3 1P 1P 2P1P		02 5			704343	WR
1067.0	6.0	PBC	0	TRFDA	3 2V1P2P 2P1P		02 5			704344	WR
1061.6	0.1	DCLB	0							701540	TS
1066.2	0.1	DCC	0							701541	TS
1079.0	12.0	MBCD	0							704345	WR
1073.0	6.0	MBCD	0		3 1P2P 1P2P	TC010808	02 5				
1069.8	0.1	TFXL	0							701542	TS
1072.2	0.1	DCL	0							701543	TS
1079.0	6.1	MBCD	0	TRFFA	1 1P 1P1P		02 5				
1089.1	10.1	DCLB	0							704346	WR
1085.0	6.2	DCLB	0	TRFFA	1 1P 1P1P	QC0106 R	80715				
1079.4	0.1	DCL	0							701544	TS
1081.8	0.1	DCL	0							701545	TS
1089.1	4.1	DCLB	0	TRFFA	1 1P 1P1P		03 5			704347	WR
1094.0	3.9	MBCD	0	TRFFA	1 1P 1P1P		805R5				
1090.3	0.1	DCL	0							701546	TS
1099.0	4.9	DCLB	0	TRFDA	1 1P 1P1P		15R5			704348	WR
1097.0	0.1	DCL	0							701547	TS
1112.0	13.0	MBCD	0							704349	WR
1105.0	6.4	MBCD	0	TRFDA	2 1P 1P1P		03R5				
1099.9	0.1	DCLB	0		1P 1P1P					701548	TS

DEPTH To	Core Recov	LITH'GY MaMi	O. Sulphides VoGPyCpPoGaSp	Alteration ILiBiCyEpKfSeClSiCaJaBaMn	Veining TyVoNoA	Structure BFnJH	Fault %IAn	SU	Sample Number	Ty
1112.0	6.6	MBCD	0	2 1P 1P1P	QC010707	703 5				
1130.0	18.0	MBC	0						704350	WR
1118.0	6.1	MBCD	0	2 1P 1P1P	QC010307	04 5				
1121.4	3.6	MBCD	0 TRFVA	2 1P 1P1P		02 5				
1118.4	0.1	DCLB	0						701549	TS
1127.0	5.4	MBCD	0	2 1P 1P1P	QC010207	02 5				
1130.0	3.0	MBCD	0 TRFFA	2 1P 1P1P		1015				
1136.0	6.3	DCLB	0	2 1P 1P1P		0325			704351	WR
1154.0	18.0	MBCD	0						704352	WR
1142.0	6.0	MBCD	0 TRFFA	2 1P 1P1P	QC010307	02 5				
1148.0	6.0	MBCD	0	2 2P 1P1P		04 5				
1154.0	6.1	MBCD	0	2 1P 1P1P	QC010207	03 5				
1160.0	6.0	DCLB	0	2 1P 1P1P	QC030307	03 5			704353	WR
1181.0	21.0	DCL	0						704354	WR
1166.0	6.0	DCL	0 TRFFA	2 1P 1P1P	QF050708	703 5				
1164.9	0.1	DCL	0						701550	TS
1171.0	5.2	DCL	0	2 1P 1P1P	QC0104 R	03 5				
1166.2	0.1	DCL	0						701551	TS
1176.5	5.6	DCL	0	2 1P 1P1P	QS030307	707R5				
1181.0	4.4	DCL	0	2 1P 1P1P	QC020607	03 5				
1180.4	0.1	DCC	0						701552	TS

EOH

APPENDIX V

THIN SECTION PETROLOGY -

DDH BRD 01/01A

SAMPLE NUMBER: 701348 BRD 01A (550.7m)

SUMMARY:

This is a rather strongly calcite-altered formerly glassy augite+olivine-phyric pillow basalt flow margin (rim).

HAND SPECIMEN:

This is a probably pillow margin of a porphyritic basaltic lava with distinct chlorite-rich areas originally very glass-rich.

THIN SECTION:

This is a formerly highly glassy augite+olivine-phyric basaltic lava that has suffered quite strong calcite alteration. Augite phenocrysts to around 1mm maximum length constitute around 15 modal% of this rock. They are single crystals or crystal clots of up to five or six crystals, mainly fresh, or partly replaced by calcite. Former olivine phenocrysts, somewhat less abundant than the augite phenocrysts, are mainly also less than 1mm long, but are entirely pseudomorphed by calcite and minor chlorite.

The groundmass of this sample varied from almost entirely glassy, to glass in which crystallites of dendritic to spherulitic augite and acicular plagioclase microlites were nucleating. The glass has been totally replaced by pale green chlorite, albite and quartz. FeTi oxide microphenocryts and groundmass granules are altered to leucoxene, and small spots of granular epidote are not uncommon in the rock.

The alteration of this sample takes two forms. Firstly, the glassy part of the sample has altered extensively to chlorite. Fracturing along this weakened zone has led to extensive pressure solution and volume loss of the chloritized groundmass between the augite phenocrysts, producing a zone very enriched in augite phenocrysts and leucoxene bleb; many of the augite phenocrysts in this zone are fractured and granulated. Overprinting the groundmass and phenocrysts is abundant calcite alteration, both as patches and veinlets. It is not associated with any disseminated pyrite.

SAMPLE NUMBER: 701349 BRD 01A (613.5m)

SUMMARY:

This is a well-preserved augite+olivine-phyric basaltic lava probably from a pillow rim.

HAND SPECIMEN:

This is a mid-grey augite-phyric well-preserved basaltic lava with a few calcite veinlets.

THIN SECTION:

This sample is a well-preserved augite+olivine-phyric basalt with a rapid change in groundmass texture across the slide, suggesting it is from a pillow rim or outer flow margin. Augite phenocrysts mainly occur as multi-crystal clots to around 3mm maximum length, but individual phenocrysts are rarely longer than 1mm. They are mainly fresh, euhedral to subhedral crystals, and make up around 15 modal% of most of the rock, but have been concentrated by volume loss of chloritic matrix in the pillow rim (as described for the previous sample). Former olivine phenocrysts probably constituted around 5-10 modal% of the rock, but are very difficult to discern due to total alteration to chlorite, and being immersed in a chlorite-rich groundmass, particularly in the outer pillow rim.

The groundmass of this sample varies from almost crystal-free chloritized glass at the pillow rim, to glass charged with acicular albitized plagioclase microlites and more stubby tiny augite crystals further into the pillow. In the latter area, interstitial glass has crystallized as fine-grained patchy quartz and albite, and granular almost colourless epidote-clinozoisite is not uncommon.

Several veinlets of fibrous quartz cut the sample, and occasional angular fracture fillings of relatively coarse-grained quartz and albite are present. As for the previous sample from 550.7m, this basalt is cut by a few micromylonite zones in which groundmass has recrystallized as sugary quartz and albite, and augite phenocrysts have been broken and granulated.

SAMPLE NUMBER: 701350 BRD 01A (632.0m)

SUMMARY:

This was an ankaramitic basaltic pillow rim with some marginal interpillow lapilli tuff of the same composition.

HAND SPECIMEN:

This is a mid-grey porphyritic massive basaltic lava with a dark, diffuse and discontinuous chlorite-rich band almost a cm wide in the middle of the sample.

THIN SECTION:

This sample shows some remarkable textural variations, probably reflecting that it come from a pillow margin, overlapping with some interpillow sediment or ash. The rock is essentially a strongly augite-phyric (ankaramitic) basaltic lava with a groundmass varying from (originally) entirely glassy to vitrophyric. The augite phenocrysts rarely occur singly, but mainly form clusters of five to ten euhedral crystals; most individual augite phenocrysts are less than 1mm long. They are entirely fresh, and form more than 25 modal% of the sample. Former olivine phenocrysts are rare, being replaced entirely by quartz and chlorite.

The groundmass of this lava is dominantly composed of former glass charged with albite microlites and tiny equigranular augite crystals. Many irregular rounded (vesicles?) to quite angular patches of groundmass are replaced by a striking variety of secondary assemblages, including the following: Coarse-crystalline quartz with acicular pumpellyite rims, masses of intergrown pale yellow epidote crystals, intergrown granular to prismatic yellow epidote and pale green chlorite, intergrown pinkish albite laths, and masses of almost botryoidal brown to bright green pleochroic pumpellyite.

Rapid transition into a beautiful basaltic lapilli tuff occurs within the slide. The tuff contains packed fragments of vesicular, strongly augite-phyric basaltic glass, in which the glass has recrystallized as rather coarsely crystalline albite and quartz with interstitial pumpellyite and minor chlorite. In another section of the slide, the basalt appears to grade into a very glassy piilow outermost rim, in which the glass has been entirely replaced by strongly pleochroic, vermiform to botryoidal and lamellar pumpellyite probably after an original smectite mica or other similar mineral such as celadonite.

This rock was probably an outer pillow rim, sampling some of the interstitial basaltic lapilli tuff generated during explosive eruption and fragmentation of pillows on the seafloor.

SAMPLE NUMBER: 701351 BRD 01A (648.5m)

SUMMARY:

This is a very distinctive lapilli tuff composed of formerly augite-phyric basaltic glass; the sample shows a strong calcite overprint.

HAND SPECIMEN:

This is a grey-green very patchy, altered fine-grained basaltic hyaloclastite or lapilli tuff.

THIN SECTION:

This is a distinctive, highly altered and recrystallized vesicular basaltic lapilli tuff. It is composed of packed fragments, mainly 2-5mm across, of fairly strongly augite-phyric basaltic glass characterized by an abundance of oval to round vesicles that are filled by a variety of secondary minerals. Augite phenocrysts are mainly quite altered to fine-grained calcite, and as calcite also replaces large areas of groundmass, it is difficult to determine the original modal abundance of augite. Similarly, it is near-impossible to determine whether olivine was a former phenocryst phase in this basalt.

The abundant former glass in this sample has crystallized as an albite-quartz mixture very strongly overprinted by calcite. The vesicles that make up at least 40 modal% of this glass are filled mainly by pale green chlorite, but also by calcite and quartz.

This is a most distinctive basaltic glassy lapilli tuff, and shows a strong similarity to the sample from 670.7m in the same hole. This explosive tuff unit is probably a useful horizon locally.

SAMPLE NUMBER: 701353 and 54 BRD 01A (701.8m and 713.7m)

SUMMARY:

701.8m: This is a beautifully preserved strongly augite-phyric basalt (ankaramite) lava from the interior portion of a flow.

713.7m: This is a very similar lava to that from 701.8m, but it has suffered much stronger alteration, implying proximity to a fault zone (fluid passageway).

HAND SPECIMEN:

These are massive quite strongly-augite-phyric grey-green basaltic lavas, but that from 713.7m shows stronger alteration and calcite veining.

THIN SECTION:

Sample 701.8m: This is one of the best-preserved Hellyer-type basalts that I have seen. It is composed of around 40 modal% of augite phenocrysts that mainly form multi-crystal clots up to several mm across. Most augite phenocrysts are fresh subhedral prisms, actually intergrown with other crystals in a manner suggesting that the crystal clusters may be disrupted cumulates plucked from the floors or walls of the magma chamber during ascent to eruption. The olivine phenocrysts in this sample probably constituted only 2-3 modal% of the rock. They are chloritized, and a few contain chromite inclusions.

The groundmass of this sample is the most coarse-grained (slowly-cooled) of any of the basalts I have seen in BRD 01 or 05. Its texture is subophitic to intergranular, with plagioclase (albite) laths partially penetrating granular augite crystals. Formerly glassy mesostasis and tiny FeTi oxides are replaced by chlorite and leucoxene respectively. This relatively coarse-grained groundmass is typical of the interior portions of a relatively thick flow compared to the clearly pillow-margin samples described from higher in the basalt sequence. This sample should be analyzed.

Sample from 713.7m was originally almost identical to that from 701.8m described above. However, it has suffered significantly more alteration, including more intense chlorite alteration of interstitial glass, and quite strong and variable calcite overprinting (and minor veining). As the grainsize of the groundmass of this sample is little different from that at 701.8m, this implies that both samples may be from a single relatively thick flow, and that a fault zone may exist in the vicinity of 713m.

SAMPLE NUMBER: 701355 BRD 01A (735.0m)

SUMMARY:

This is an augite+(sparse) olivine-phyric basaltic lava from close to a pillow rim.

HAND SPECIMEN:

This is a rather pale grey finely-porphyritic basaltic lava with common small black chlorite spots.

THIN SECTION:

This is an augite+olivine-phyric basaltic lava with a groundmass characterized by spherulitic plagioclase and augite growing from glass, typical of near pillow rim basalts. Augite phenocrysts make up around 20-25 modal% of this rock, and are mainly less than 1mm long, although most occur as fresh subhedral intergrown crystals in crystal clots. Scarce olivine phenocrysts are replaced by chlorite and quartz.

The groundmass texture of this sample is variable across the slide, and typical of a pillow rim. The most slowly-cooled part consists of albite microlites separating small equigranular augite grains, with interstitial mesostasis replaced by chlorite, albite and minor quartz. More rapidly cooled parts on the rim of the pillow are composed of sheaves and bundles of fan-like, spherulitic albitized plagioclase and interstitial chlorite. Minor calcite veining and small diffuse patches are present but the alteration is not very strong. Angular patches of green chlorite to several mm across, sometimes rimmed by epidote, are not uncommon, probably fill small tension gashes and fractures.

SAMPLE NUMBER: 701356 BRD 01A (766.0m)

SUMMARY:

This is an augite+(sparse) olivine-phyric basaltic lava that has suffered quite strong calcite alteration.

HAND SPECIMEN:

This is a grey, finely augite-phyric basaltic lava with minor calcite veining and some diffuse calcite alteration.

THIN SECTION:

This is a quite strongly altered augite+olivine-phyric basaltic lava composed of around 20 modal% of small (mainly <0.5mm long) augite phenocrysts, many of which are partially to totally altered to fine-grained calcite. The few identifiable former olivine phenocrysts are altered to fine-grained quartz and calcite, and olivine was probably volumetrically far subordinate to augite in the phenocryst assemblage.

The groundmass of this sample was originally vitrophyric, composed of tiny albite microlites and slightly larger laths in a matrix of glass that has crystallized to albite, chlorite and quartz, and that has in turn, been strongly overprinted by calcite.

SAMPLE NUMBER: 701357 BRD 01A (809.5m)

SUMMARY:

This was an augite+olivine-phyric basaltic lava that suffered intense calcite-chlorite alteration before being quite strongly deformed and stretched in a fault(?) zone.

HAND SPECIMEN:

This is a fairly strongly altered mid-grey basaltic lava in which phenocrysts and textural features are quite indistinct.

THIN SECTION:

This is an exceptionally strongly altered and deformed former basaltic lava. It shows a fairly well-developed foliation in thin section (although this is not evident in hand specimen), with pronounced flattening/ stretching of former phenocrysts and vesicles(?). The identity of the former phenocrysts cannot be established with certainty, although the presence of a few chromite euhedra suggest former olivine phenocrysts, and by analogy with other rocks described above, augite phenocrysts were almost certainly present.

The rock is now composed of an almost mylonitic integrowth of calcite and chlorite with minor albite and quartz. Tiny patches of groundmass left less altered by calcite overprinting and foliation development contain small albite laths and microlites. The deformation producing the foliation evident in this sample clearly was post-calcite alteration, and the intensity of the foliation relative to other samples examined suggests that this sample comes from a significant high-strain zone, possibly a significant fault.

SAMPLE NUMBER: 701305 (BRD 01A at 856m)

SUMMARY: This is a dacitic lava breccia composed of sparsely plagioclase-phyric largely (formerly) glassy dacitic fragments; hydrothermal alteration is insignificant.

HAND SPECIMEN:

Altered dark grey-green andesitic lava breccia with abundant white feldspar phenocrysts.

THIN SECTION:

The fragmental texture of this sample is obvious in thin section, with individual lava fragments recognizable due largely to local variations in groundmass texture. The dominant lava fragment type was a plagioclase-phyric formerly glassy dacite, in which the perlitically-cracked glass has devitrified to a very fine-grained quartz-albite mixture, with narrow seams of pale green chlorite picking out the perlitic cracks. Feldspar phenocrysts are blocky albitized plagioclase with slight sericite flecking, and are mainly less than 1mm long. They make up about 5 modal% of these perlitically-cracked lava fragments. Another fragment variety is essentially identical to that just described, except these lack the perlitic cracking. A third and quite abundant lava fragment type has a similar amount of blocky albite phenocrysts set in a formerly less glassy, vitrophyric groundmass riddled with tiny albite microlites. There is no sign of the former presence of mafic phenocrysts, but occasional leucoxenized microphenocrysts of FeTi oxide occur in most fragments. An irregular meshwork of sericite pervades this sample, but sericitization is not strongly developed. Minor late-stage calcite fills fractures and veins. The metamorphic assemblage is prehnite-pumpellyite facies, and the amount of hydrothermal alteration is insignificant.

There is nothing to say that the various lava fragments in this sample could not have come from the same flow unit, albeit from different parts of a flow. Textural variations simply reflect cooling rates; all fragments have similar amounts of similar looking plagioclase phenocrysts. The blocky shapes and relatively small modal amount of the plagioclase phenocrysts, the absence of mafic phenocrysts, plus the abundant glass that was present in most fragments, all suggest to me that this was a dacitic rather than andesitic flow. The relatively abundant chlorite in the sample suggests that either the sample is at the andesitic (ie low-Si, high-Mg) end of the dacite spectrum, or that it has been selectively chloritized. I favour the latter possibility, which would predict Ti/Zr ratios of around 15-20.

SAMPLE NUMBER: 701306 (BRD 01A at 862.8m)

SUMMARY:

This is a dacitic lava breccia very similar originally to sample 856m above. However, it has suffered much stronger hydrothermal calcite-sericite alteration, with a significant reduction in the amount of chlorite compared to 856m.

HAND SPECIMEN:

This is a grey, strongly altered dacitic to andesitic lava breccia with poorly-defined formerly glassy lava fragments up to at least several cm long.

THIN SECTION:

The lava fragments present in this sample show the same range of of textures and phenocryst mineralogy as that sample described above. Most were glassy, sparsely plagioclase-phyric dacites, many with perlitic cracking of the formerly glassy groundmass. In fact, the only major difference from the sample described above is that this sample (862.8m) shows considerably more sericite-calcite alteration, and correspondingly less chlorite. The sericite occurs both replacing most or all of the albitized plagioclase phenocrysts, and as a fairly dense but irregularly distributed mesh through the rock, and the abundant calcite occurs as dispersed patches and blebs throughout the section, overprinting all lava fragments.

The intensity of the calcite-sericite alteration in this sample is notably greater than shown by sample 856m, and also much more intense than ambient low-grade burial metamorphic alteration. It is therefore preseumed to be of local hydrothermal origin.

SAMPLE NUMBER: 701307 (BRD 01A at 865.6m)

SUMMARY:

This is a formerly highly glassy, sparsely plagioclase-phyric massive dacitic lava that has developed a weak banded appearance due to sericitization; hydrothermal alteration (sericite-calcite) is very weak.

HAND SPECIMEN:

This is a pale grey-green massive weakly flow-banded felsic lava with sparse altered feldspar phenocrysts.

THIN SECTION:

This is a massive very poorly plagioclase-phyric dacitic lava that was originally essentially entirely glassy. The plagioclase phenocrysts (<2 modal%) are totally sericitized blocky euhedra to about 1mm long, that blend at their marginsinto the highly sericitized groundmass. Sparse leucoxenized microphenocrysts of FeTi oxide are also present.

The groundmass of this sample was almost certainly wholly glassy at eruption. It has devitrified to the present extremely fine-grained quartz-albite-sericite mixture, and subsequent sericite alteration in discontinuous bands and streaks has imparted a flow-banded appearance to the sample. The sericite-rich bands are irregular and of variable thickness, and are 'dirty' relative to the 'cleaner' sericite-poor quartz-albite bands and streaks. Calcite is a minor alteration phase occurring together with sericite both replacing former albite phenocrysts and as small blebs and stringers in the groundmass. Chlorite is rare in this sample, occurring only as occasional small fracture fillings.

The amount of sericite in this sample is only a little more than might be expected from the regional low-grade degradation of a glassy dacitic lava; therefore, hydrothermal alteration of this sample is weak, if any.

SAMPLE NUMBER: 701308 (BRD 01A at 867.8m)

SUMMARY:

This is a plagioclase-phyric formerly glassy dacitic lava with very weak sericite-calcite alteration.

HAND SPECIMEN:

This is a mottled pale brown and dark grey-green formerly glassy felsic lava with and chlorite-poor areas dominant, and patchy, more chlorite-rich areas scattered irregularly through the sample.

THIN SECTION:

This is a fairly uniform-textured, plagioclase-phyric formerly glassy dacitic lava with a few slightly flattened veicles filled with sericite, quartz and calcite. Plagioclase phenocrysts are more abundant, and rather more elongate-prismatic than the typically blocky phenocrysts in the previous two samples. The albite phenocrysts are sericite-free through most of the section, but contain sericite-calcite alteration in more altered areas of the sample. Small leucoxenized FeTi oxide microphenocrysts are not uncommon, butformer mafic silicate phenocrysts were not present in this sample.

The groundmass has a classic quartz-albite patchy mosaic texture developed from the devitrification of glass. Chlorite is not abundant, but is common enough as small tufts and spots patchily developed in the groundmass. Dominant alteration minerals are sericite and calcite; although these are not strongly developed, they occur in broad bands and patches of more altered groundmass. In the few vesicles, sericite and calcite are both quite coarsely crystalline, and sometimes contain euhedral crystals of secondary quartz.

This is a reasonably well-preserved dacitic lava, with very mild, if any hydrothermal overprint, dominated by sericite-calcite.

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SAMPLE NUMBER: 701309 (BRD 01A at 871.0m)

SUMMARY:

This is a well-preserved formerly fairly glassy plagioclase-phyric low-Si dacite or acid andesite lava, with minimal hydrothermal alteration.

HAND SPECIMEN:

This is a dark grey-green massive, even-textured plagioclase-phyric andesitic to dacitic lava.

THIN SECTION:

This is a texturally and mineralogically well-preserved plagioclase-phyric andesitic to dacitic lava. It contains about 10 modal% of tabular albitized plagioclase phenocrysts to almost 2mm long that show very slight sericite alteration, and often contain rows of chloritized melt inclusions. Five or six small (<0.5mm long) euhedral shapes now composed of chlorite were almost certainly augite microphenocrysts. Small leucoxenized FeTi oxide microphenocrysts are not uncommon. Several multi-crystal clots of tiny intergrown plagioclase phenocrysts are also present.

The groundmass of this sample was glassy to vitrophyric; it contains tiny albite microlites set in a coarse patchy quartz-albite mosaic after devitrified glass. Very fine-grained chlorite is quite common dispersed in the groundmass, and sericite is more localized in broad bands of more intense alteration. Calcite and sericite also occur as sparse, narrow meandering veinlets.

The abundance of chlorite in the groundmass of this sample, and the more elongate (rather than blocky equidimensional) plagioclase phenocrysts suggest that this is a low-Si dacite or acid andesite. It is well preserved and should be analyzed to compare with the Que-Hellyer 'Mixed' sequence lavas.

SAMPLE NUMBER: 701310 (BRD 01A at 885.1m)

SUMMARY:

This is a polymict lava breccia dominated by formerly glassy dacitic lava and vitric tuff fragments that vary from chlorite-rich to sericite-rich; this alteration is hydrothermal rather than due to burial metamorphism.

HAND SPECIMEN:

This is a polymict lava breccia containing light coloured formerly glassy, sparsely plagioclase-phyric dacitic lava fragments, and darker, more plagioclase phenocryst-rich and more chloritic andesitic or dacitic lava fragments.

THIN SECTION:

The largest fragment in this section is typical of the light coloured formerly highly glassy fragments obvious in the hand specimen. It consists of sparse (<1 modal%) blocky albite phenocrysts that have been totally sericitized, set in a patchy quartz-albite mosaic-textured intergrowth after glass. Virtually all of the albite in the groundmass has been replaced by exceptionally fine-grained sericite that renders the groundmass 'cloudy'. This fragment has been strongly sericitizedrelative to most of the samples described above.

The other fragments making up this section are more chloritic, and vary from perlitically-cracked sparsely plagioclase-phyric dacites identical to sample 856m, to samples of vitric tuff with clearly preserved outlines of glassy shards that have recrytallized to fine-grained quartz-albite. Some fragments show pervasive and intense chloritization of the groundmass, whereas others are intensely sericitized. Calcite overprints sericite in many fragments.

It is important to note that the sericite and chlorite alteration is clearly localized in separate otherwise identical fragments, and must therefore have formed pre-burial metamorphism of the sample. I suggest that the fragments making up this rock were variably hydrothermally altered when the rock was formed by explosive submarine volcanic activity.

SAMPLE NUMBER: 701311 (BRD 01A at 888.3m)

SUMMARY:

This is a dacitic crystal lithic vitric tuff, with a high proportion of comminuted glassy material in the matrix, and variable chloritic-, or sericite-calcite alteration, of local hydrothermal origin.

HAND SPECIMEN:

This is a strongly altered massive plagioclase-phyric dacitic lava(?) with streaks of dark chlorite-rich material through more massive diffuse pale-grey-green strongly calcite-sericite altered lava.

THIN SECTION:

The first thing that strikes me about this sample is that it is quite obviously fragmental, a fact not obvious to me from the hand specimen. The sample is composed of small lava fragments and abundant broken albite phenocrysts set in a heterogeneous matrix that was originally highly glassy. Albite phenocrysts are generally less than 1mm long, and are nearly all crystal fragments, except for a few well-formed phenocrysts in clear dacitic lava fragments.

The groundmass of this sample is unusual in texture, changing rapidly over very small distances, with a very uneven distribution of chlorite and sericite. In many places, relic glass shard textures are poorly preserved in ghost outlines. I think this sample is a crystal lithic vitric tuff of dacitic composition, although small formerly glassy lava fragments are more abundant than the glassy shard material. The abundant broken albite crystals support this tentative interpretation. The matrix may have been largely composed of comminuted dacitic glass.

Alteration is variable in intensity and composition, being either chloritic, or sericite-calcite dominated. The sample is not strongly altered, but the alteration present is hydrothermal rather than pervasive regional burial metamorphic alteration.

SAMPLE NUMBER: 7013012 (BRD 01A at 902.0m)

SUMMARY:

This is a polymict lava breccia dominated by formerly glassy dacitic lava fragments identical to sample 856m, but it also contains not uncommon chlorite-rich andesitic lava fragments. Hydrothermal sericite-calcite alteration is fairly weak.

HAND SPECIMEN:

This is a dark green lava breccia dominated by chloritic, sparsely feldspar-phyric dacitic to andesitic lava fragments to around 1cm long.

THIN SECTION:

The fragmental nature of this sample is obvious in thin section. The dominant lava fragment variety is beautifully perlitically-cracked sparsely plagioclase-phyric dacite identical in every way to sample 856m. Chlorite picks out the perlitic cracks and is quite abundant in most fragments. A somewhat less abundant fragment type is very distinctive in having a rare albite phenocrysts set in a pilotaxitic textured groundmass composed of elongate plagioclase microlites embedded in bright green chlorite; the latter probably forms more than 50 modal%of these fragments. These chloritic fragments also contain common small FeTi oxide granules in the groundmass, and were probably andesitic in composition. Calcite and sericite are common overprinting both chloritic and chlorite-poor lava fragments, but the intensity of alteration is not strong. This is a polymict lava breccia dominated by formerly glassy dacitic lava fragments, but containing also an andesitic lava fragment component.

SAMPLE NUMBER: 701313 (BRD 01A at 903.0m)

SUMMARY:

This is a highly altered dacitic glassy lava breccia showing development of a zoned epidosite alteration assemblage probably developed around a conduit through which oxidizing hydrothermal fluids were moving.

HAND SPECIMEN:

This is a highly altered dark green lava breccia with a patch of intense alteration at least 10cm across, showing intense zoned alteration from a black chloritic rim to a pale grey-green sericite- and epidote-rich core.

THIN SECTION:

The least-altered part of this sample is dominated by poorly defined lava fragments that are sparsely plagioclase-phyric formerly highly glassy dacites. Some of the fragments have preserved excellent perlitic cracking in the glassy groundmass, and are essentially identical to sample 856m. Alteration within this 'least-altered part of this rock is nevertheless quite strong, with sericite, chlorite and calcite all common through the matrix of the lava fragments. This 'least-altered' zone passes into a zone about 1cm wide composed almost entirely of sericite that lacks any relict texture whatsoever. This sericite zone contains sparse small pyrite cubes, and tiny chlorite spots. This sericitic zone passes abruptly into a zone in which a few relic albite phenocrysts replaced almost completely by coarse-grained sericite are set in a structureless matrix composed almost entirely of exceptionally fine-grained, dirty, almost isotropic epidote.

This excellent example of epidosite alteration is characteristic of quite oxidizing hydrothermal fluids. The same zonation on a scale of tens of meters rather than centimeters, commonly occurs in footwall sequences in andesites below hematite-rich VMS orebodies, such as at the Cadia deposit in central W NSW. It is not, however, restricted to occurrences associated with (footwalls of) VMS mineralization.

SAMPLE NUMBER: 701314 (BRD 01A at 908.6m)

SUMMARY:

This is a strongly sericite-calcite altered polymict dacitic lava breccia containing abundant formerly glassy sparsely plagioclase-phyric dacitic lava fragments, and subordinate fragments of crystal vitric tuff.

HAND SPECIMEN:

This is a pale grey lava breccia containing sparsely plagioclase-phyric lava fragments to at least 6cm across, and smaller, more angular strongly sericitized yellowish lava fragments.

THIN SECTION:

In thin section, this sample is seen to be a very strongly altered fragmental volcanic, dominated by strongly sericitized formerly glassy sparsely plagioclase-phyric dacite lava fragments, most of which show preserved perlitic cracking. Other fragments are less easy to identify; they have occasional albite phenocrysts, but very heterogeneous groundmases, with rapid local variations in texture and amount of chlorite and sericite. They were certainly glass-rich, and there are several areas in which there are strong suggestions of the former presence of glassy shards. These clasts may have been crystal vitric tuffs. Irregular slightly rounded areas of intergrown pale pink albite crystals have probably developed in situ, rather than being crystalline clasts. Calcite is common overprinting the groundmass and phenocrysts alike. The strong calcite-sericite alteration of this sample is definitely of hydrothermal origin.

SAMPLE NUMBER: 701315 (BRD 01A at 917.9m)

SUMMARY:

This is an olivine+augite+chromite-phyric basaltic lava similar to the more primitive Hellyer basalts; it has been overprinted by epidote-sericite alteration, that in turn was overprinted by a calcite-sericite-fuchsite alteration assemblage.

HAND SPECIMEN:

This is a massive grey mafic (?) lava transected by a 5mm-wide calcite vein that has a well-developed pink halo of intense sericite-epidote(?) alteration containing abundant small green fuchsite patches to about 2mm across.

THIN SECTION:

The least altered part of this section is petrographically strikingly different from all the foregoing samples, in that it is a metabasic lava, with altered phenocrysts of olivine and augite, anf minor plagioclase. It contains at least 25 modal% of phenocrysts set in a murky vitrophyric groundmass. The dominant phenocryst phase is now replaced by a pale brown almost isotropic very fine-grained epidote mixture. These have shapes that suggest that they were augite originally. A second set of former mafic phenocrysts with very different outlines and replacement assemblages are clearly former olivine phenocrysts; several contain small euhedral red chromite inclusions, and all are altered to calcite and quartz. A few former plagioclase phenocrysts are altered totally to sericite.

The groundmass of this lava was vitrophyric, with epidotized augite and plagioclase microlites set in a sericite-epidote-altered formerly glassy matrix.

The pinkish bleached halo surrounding the coarsely-crystalline calcite vein is texturally identical to the unbleached area further out, but contains very little fine-grained dirty epidote, and much more abundant sericite-calcite alteration. Only a single small patch of fuchsite was intersected in this thin section; it looks like rather coarsely-crystalline and high-birefringent muscovite, but shows no green colour in plane polarized light.

This sample was definitley a fairly primitive basaltic lava, with the olivine-augite-chromite phenocryst assemblage typical of many of the more primitive Hellyer basalts. Intense alteration with epidote-sericite dominant has been overprinted by a calcite-sericite alteration assemblage associated with calcite veins.

SAMPLE NUMBER: 701358 BRD 01A (918.5m)

SUMMARY:

This was an olivine+augite-phyric basaltic lava, more olivine-rich than the basalts from the sequence of basalts above 850m. It has suffered quite strong calcite alteration.

HAND SPECIMEN:

This sample, from the top of the lower basalt sequence in this hole, is a somewhat altered grey-green finely porphyritic basaltic lava.

THIN SECTION:

This rock was originally an olivine+augite-phyric, quite primitive basaltic lava. It has suffered quite strong alteration, leaving no fresh olivine or augite in the sample, but the primary texture is preserved. Olivine phenocrysts, many with small euhedral chromite inclusions, make up about 10 modal% of this sample, and are altered to fine-grained granular quartz with a smattering of calcite. Some are almost 2mm long. In contrast, former augite phenocrysts, making up around 5-8 modal% of the rock, are mainly less than 0.8mm long, and are almost exclusively replaced by patchy pale brown calcite.

The groundmass of this sample was originally vitrophyric, composed of scattered elongate albite laths and microlites in glass. The glass has altered to quartz and albite, with interstitial chlorite, and small angular patches of chlorite are not uncommon throughout the section. Fine-grained calcite overprints probably more than 40% of the groundmass.

This basalt was notably more olivine-rich than those in the overlying sequence of basalts, and is quite strongly calcite-altered, perhap due to its proximity to the top of this basalt sequence.

SAMPLE NUMBER: 701359 BRD 01A (938.7m)

SUMMARY:

This is a relatively evolved basaltic lava with less abundant mafic phenocrysts and more plagioclase and FeTi oxides than other basalts from this hole. It has suffered mild calcite alteration.

HAND SPECIMEN:

This is a massive grey-geen finely porphyritic basaltic lava.

THIN SECTION:

This is a finely augite-phyric basaltic lava in which former augite phenocrysts, mainly less than 0.5mm across, make up about 10 modal% of the rock, and altered olivine phenocrysts, also very small, make up much less than 1 modal%. The augite phenocrysts are small mainly subhedral grains, often partially replaced by albite. They show a grainsize continuum into groundmass augite. Former olivine phenocrysts are replaced by fine-grained quartz.

The groundmass of this sample was vitrophyric, composed of abundant albite laths in glass. Many albite laths attain the size and blocky prismatic shape of microphenocrysts. The glass has altered to chlorite- quartz-albite intergrowths, much of which is overprinted by patchy calcite. Luecoxene grains after former FeTi oxides are relatively large and numerous compared with the other basalts described from this hole.

Three features of this sample indicate that it was very probably a much more evolved (toward, but not reaching andesitic composition) basalt than the others described from this hole. These are
1. the relative paucity and fine grainsize of both augite and olivine,
2. the relatively large size and abundance of the plagioclase in the groundmass, and 3. the abundance and size of the former FeTi oxides. This sample should be analyzed.

SAMPLE NUMBER: 701316 (BRD 01A at 943.1m)

SUMMARY:

This is a sparsely olivine-phyric matabasaltic lava with strong calcite alteration overprinting grondmass and phenocrysts.

HAND SPECIMEN:

This is a grey, uniform-textured intermediate aphyric lava with a few rounded patches of calcite (vesicles?).

THIN SECTION:

This is a poorly porphyritic lava with scattered former mafic phenocrysts set in a highly altered vitrophyric groundmass. The phenocrysts make up around 2-3 modal% of the sample, and have shapes typical of an olivine precursor, and are replaced by a very fine-grained quartz aggregate that is overprinted by calcite. Many of the former olivine phenocrysts contain tiny euhedral red chromite crystals. Rare small albite phenocrysts are partially replaced by granular yellow epidote.

The groundmass of this sample is strongly calcite-altered, but clearly was composed of abundant tiny plagioclase and augite microlites set in a glassy mesostasis replaced by pale green chlorite and dirty, very fine-grained epidote; tiny former FeTi oxide granules are altered to leucoxene.

This sample is a metabasaltic lava, rather unusual (for Hellyer-type basalts) in being relatively phenocryst-poor. It has suffered strong calcite alteration, but a sample from this unit should be altered for the Mount Read Volcanics data base if possible.

SAMPLE NUMBER: 701317 (BRD 01A at 952.9m)

SUMMARY:

This sample was a sparsely olivine-phyric metabasaltic lava that has been strongly calcite-altered; it is essentially identical to the previous sample.

HAND SPECIMEN:

This is a massive, dark grey uniform-textured almost aphyric metabasic lava cut by common calcite veins up to 1cm wide.

THIN SECTION:

This sample is almost the same as the previous sample in most respects. The only major points of difference are that the groundmass of this sample was more glassy than that of 943.1m; this glassy was riddled by larger plagioclase microlites than in the groundmass of the previous sample, and has altered to abundant green chlorite. Olivine phenocrysts are totally replaced by calcite, and calcite as abundant small patches and blebs overprints at least 60 modal% of the groundmass. The extent of the calcite alteration demands local hydrothermal alteration.

SAMPLE NUMBER: 701318 (BRD 01A at 958.0m)

SUMMARY:

This is a dacitic lava breccia basically identical to most of those described from above the lower basalt unit. Alteration of this sample is hardly more than regional burial alteration.

HAND SPECIMEN:

This is a dark grey lava breccia dominated by plagioclase- phyric dacitic(?) lava fragments mainly less than 1cm across.

THIN SECTION:

This sample is a dacitic lava breccia very similar in every respect to most of those lava breccias described above. It is composed of abundant plagioclase-phyric formerly glassy dacitic lava fragments, many of which show well-developed perlitic cracking. Occasional euhedral microphenocrysts replaced by chlorite have shapes suggestive of augite precursors. One significant difference between this sample, and the other dacitic lava breccias described above is that this sample has well-defined fragment margins, due to their being highlighted by narrow rims composed of tiny crystals of FeTi oxides that have probably recrystallized from leucoxenized FeTi oxides in the groundmass during stylolitic pressure solution of adjacent fragments. Calcite alteration is not well-developed in these fragments.

Occasional chlorite-rich andesitic(?) lava fragments are also present , with less glassy groundmasses and larger plagioclase microlites.This sample clearly indicates a return to the dominant explosive dacitic volcanism in that part of the sequence under the lower basalt unit. There are no bassaltic fragments in any of the dacitic breccias above or below the lower basalt.

SAMPLE NUMBER: 701319 (BRD 01A at 971.3m)

SUMMARY:

This is a plagioclase+(sparsely) augite-phyric dacitic lava with poorly defined autobrecciation, and very weak alteration, dominated by mild silicification; it contains very little calcite.

HAND SPECIMEN:

This is an unusual textured dacitic lava autobreccia with fragments of dark grey sparsely plagioclase-phyric formerly glassy dacite in a heterogeneous matrix that shows pronounced bleaching and concentrated calcite alteration.

THIN SECTION:

This is a plagioclase+augite-phyric dacitic or andesitic lava that shows little evidence in thin section of a fragmental texture. It is composed of about10 modal% of albitized plagioclase phenocrysts to about 2mm long, and slightly sericitized. Much less abundant are small (<0.5mm long) chloritized augite phenocrysts, and leucoxene-altered FeTi oxide microphenocrysts.

The dark groundmass in the hand specimen is composed of almost isotropic devitrified glass in which are set abundant tiny plagioclase microlites (albitized) and less common small spots and streaks of chlorite. The dark area contains a fine network of subparallel sericite veinlets. In the more pale-coloured bleached areas of the hand specimen, the groundmass is composed of a quartz-albite-sericite assemblage after glass, that is basically chlorite-free. In the msot intensely altered light coloured areas, angular quartz veinlets and segregations indicate that silica-soaking is responsible for the bleaching.

This sample is probably a slightly autobrecciated dacitic lava. It differs from most of the dacites described above in that it contains rather more abundant former augite phenocrysts, and more plagioclase phenocrysts.

Tha alteration of this sample is no different from the less megascopically altered (or more homogeneously-textured and coloured in hand specimen) dacites described above. It is dominated by weak silicification that is scarcely more intense than regional burial metamorphic alteration, and calcite is scarce in this sample.

SAMPLE NUMBER: 701320 (BRD 01A at 987.6m)

SUMMARY:

This is a dacitic lava breccia made up of sparsely plagioclase-phyric fragments of formerly glassy dacite; the alteration assemblage is calcite-chlorite-sericite, but is not strongly developed.

HAND SPECIMEN:

This is a mottled grey-green highly altered lava breccia with dark dacitic lava fragments to at least 2cm long, and common calcite patches and veinlets.

THIN SECTION:

The brecciated fragmental texture obvious in the hand specimen is far less obvious in the thin section of this sample, although abrupt changes in the groundmass texture probably mark fragment boundaries. All fragments are of very similar formerly glassy dacitic lavas that carry sparse small (<1mm) albitized plagioclase phenocrysts that are slightly speckled with sericite. The groundmass of these fragments has devitrified and crystallized as patchy mosaics of quartz- albite-sericite-chlorite. The abundance of chlorite varies across the sample from fragment to fragment, although it is never a common phase. Angular patches of quartz, calcite and coarse-grained sericite are present, and appear to be fracture fillings. Calcite is quite common as small blebs and patches overprinting the groundmass.

This sample is a dacitic lava breccia little different from those described above occurring above the lower basalt. The alteration of this sample is fairly mild, although more intense than regional alteration.

SAMPLE NUMBER: 701321 BRD-01A, 534.6m

SUMMARY:
This is one of the best preserved 'Hellyer-type' basalts that I have seen. It is a primitive augite+olivine-phyric basalt, with a microporphyritic groundmass dominated by augite microlites in former glass.

HAND SPECIMEN:
This is a very fresh black, speckled mafic lava with abundant augite(?) phenocrysts, and a few large calcite-filled vesicles.

THIN SECTION:
This sample is an extremely well-preserved basaltic lava with more than 25 modal% of well-formed augite phenocrysts and around 2-3 modal% of pseudomorphed olivine phenocrysts, set in a microporphyritic groundmass. The augite phenocrysts average around 1mm long, but some crystals are at least 3mm long; they are generally colourless euhedral crystals that frequently occur in multi-crystal clots. They are perfectly fresh. Former olivine crystals are now represented by pale green chlorite pseudomorphs that sometimes enclose small chromite euhedra. They are mainly 0.5-1.5mm long euhedral crystals, and are also partly replaced by minor calcite in places.

The groundmass of this sample is quite distinctive. It consists of abundant tiny stubby fresh augite crystals set in a chlorite-albite matrix, the latter possibly after former glass. Several vesicles are filled by massive calcite, and occasional discontinuous meandering calcite veinlets cut the slide. Also, en echelon tiny fractures filled with seconday quartz, albite and chlorite are quite common. Possible prehnite patches in some chlorite pseudomorphs after olivine, and the absence of actinolite, indicate that this sample contains a prehnite-pumpellyite grade metamorphic assemblage.

SAMPLE NUMBER: 701322 BRD01A 996.8m

SUMMARY:
This is a well-preserved plagioclase-phyric dacitic lava.

HAND SPECIMEN:
This is a massive dark green plagioclase-phyric dacitic lava.

THIN SECTION:
This is a texturally well-preserved plagioclase-phyric dacitic lava. It contains around 5 modal% albitized plagioclase phenocrysts set in a formerly largely glassy groundmass. The plagioclase phenocrysts are mainly euhedral blocky laths with common multi-crystal clots. The crystals average around 1mm long, and show minor speckling by sericite and less abundant pale green chlorite. Several pseudomorphs after former mafic crystals are present, now composed mainly of chlorite; these were probably originally small augite phenocrysts. Former FeTi microphenocrysts are present but not common, and are always replaced by messy leucoxene.

The groundmass of this sample consists of tiny acicular albite microlites showing a broad general alignment of long axes, and far less abundant but not uncommon chlorite pseudomorphs after rather elongate slender augite microlites, all set in a mosaic-textured quartz-albite patchy matrix, originally clearly glassy. Tiny patches of rather coarse-grained sericite are common. Calcite occurs as small irregular patches overprinting the groundmass, as as narrow, discontinuous streaks and veinlets that cut the rock.

This sample was a dacitic lava; the relatively common (former) augite pseudomorphs in the groundmass suggest that it was a relatively low-Si dacite. It is well-preserved, and should be included in the wholerock analysis group.

SAMPLE NUMBER: 701323 BRD01A, 999.6m

SUMMARY:
This is a plagioclase-phyric originally largely glassy dacitic lava very similar to the preceding sample, except for more intense (but still not strong) sericitization.

HAND SPECIMEN:
This is a massive, weakly flow-banded pale grey plagioclase -phyric dacitic lava, probably originally highly glassy.

THIN SECTION:
The general diagnosis of this sample is essentially the same as the preceding sample. This was a formerly plagioclase-phyric dacitic lava with a largely glassy groundmass; it contains a few phenocrysts of chloritized augite, and somewhat more common former FeTi oxide phenocrysts that are altered to leucoxene. Major differences from the preceding sample are:

1. this sample is notably more sericitized, with sericite occurring both in the albite phenocrysts and scattered throughout the groundmass.
2. this sample contains more chlorite in the groundmass, where it occurs as an irregular mottling throughout the groundmass, as as speckles in the albite phenocrysts.
3. an unusual feature of this sample is the presence of common tiny very elongate former FeTi oxide crystals in the groundmass.
4. this sample contains some small patches of relatively coarse-grained intergrown green chlorite and secondary quartz.

The very weakly-defined banding in the hand specimen is not observed texturally or mineralogically in the hand specimen.
This is clearly a dacitic lava, and as for the preceding sample, the relative abundance of chlorite in the groundmass suggests that it is a low-Si dacite (possibly around 64-66% SiO_2). I will analyze this dacite also.

SAMPLE NUMBER: 701324 BRD01A, 1008.6m

SUMMARY:
This is a well-preserved plagioclase-phyric massive dacitic lava.

HAND SPECIMEN:

This is a massive dark grey plagioclase-phyric felsic to intermediate lava.

THIN SECTION:

This is a well-preserved dacitic lava with around 5 modal% of albitized plagioclase phenocrysts in a vitrophyric groundmass. It is very close texturally to the two preceding samples, but probably contains rather more chlorite in the groundmass, and certainly contains more chloritized small former augite phenocrysts (albeit much less than 1 modal%). The groundmass was originaly a glass, charged through with tiny plagioclase microlites that show a broad flow alignment. Sericite and calcite occur together as fairly uncommon extremely narrow meandering veinlets. Calcite occurs as small blebs and patches overprinting the groundmass. It is notable that the degree of alteration in these dacitic lavas is much less than those described from higher in the hole (from between the basalt units). It is considered that this is not simply due to the fact that the upper dacites were mainly lava breccias, and therefore more permeable to alteration fluids. This sample could also be analyzed.

SAMPLE NUMBER: 701325 BRD01A, 1017.8m

SUMMARY:

This is a massive sparsely plagioclase-phyric dacitic lava with slightly more calcite alteration than the preceding samples, but otherwise essentially the same.

HAND SPECIMEN:

This is a dark grey, very sparsely plagioclase-phyric extremely fine-grained felsic lava.

THIN SECTION:

This sample is also a massive, plagioclase-phyric dacitic lava. It contains more albitized plagioclase phenocrysts than expected from the hand specimen, probably because many albite phenocrysts are partially altered to chlorite and sericite. A few small former augite phenocrysts are replaced by chlorite, while former FeTi oxide microphenocrysts altered to leucoxene are not uncommon.

The groundmass of this sample is extremely fine-grained, and consists of flow-aligned and sericitized tiny plagioclase microlites in a formerly glassy matrix. It shows rather more calcite in the groundmass than the preceding samples, mainly as small irregular patches and spots, and also commonly as rims on albite phenocrysts.

SAMPLE NUMBER: 701326 BRD01A, 1025.1m

SUMMARY:

This is a more Si-rich plagioclase-phyric dacite than the preceding samples, containing notably less chlorite, and rather more calcite than the four previously-described masive dacitic lavas.

HAND SPECIMEN:

This is a massive plagioclase-phyric dacitic lava with diffuse patches and narrow veinlets of calcite.

THIN SECTION:

This is a plagioclase-phyric dacitic lava with around 5-8 modal% of albitized plagioclase-phenocrysts set in a devitrified glassy groundmass with a fine-grained snow-flake (mosaic) texture defined by patchy albite and quartz. Most of the plagioclase phenocrysts are actually multi-crystal clots of smaller phenocrysts. Mafic phenocrysts are rare, and are small chloritized augite crystals.

The groundmass of this sample contains irregular patches that are composed of quite coarsely-crystalline quartz enclosing rosettes of pale yellow sericite. This sample contains less former mafic phenocrysts and less chlorite in the groundmass, and is probably a more Si-rich dacite (68-70%SiO2) than the preceding samples. It contains quite common calcite veins and small spots and patches throughout the groundmass.

SAMPLE NUMBER: 701327 BRD01A, 1027.2m

SUMMARY:

This sample is a formerly largely glassy lava breccia or hyaloclastite derived from a plagioclase-phyric dacitic lava similar to the first four dacitic samples described above.

HAND SPECIMEN:

This is a pale grey highly altered fragmental dacitic lava breccia, with most fragments being less than 0.5cm across.

THIN SECTION:

The fragmental nature of this sample is well-displayed in thin section, mainly defined by notable differences in the groundmass textures of adjacent lava fragments. All the textural varieties of plagioclase- phyric dacites as described for the preceding five massive dacitic lavas are present, including formerly highly glassy snowflake-textured fragments, through to microporphyritic-textured varieties with flow-aligned albite microlites. A large majority of the samples were highly glassy, and are now composed of devitrified glass crystallizing to patchy albite-quartz intergrowths.

Angular interstices between lava fragments contain calcite, streaks and trains of very fine-grained sericite, and minor chlorite. I suggest that this sample is probably a flow-top breccia or hyaloclastite composed mainly of small glassy lava fragments spalling of a quenching flow of plagioclase-phyric dacitic lava identical to the first four described above.

SAMPLE NUMBER: 701328 BRD01A, 1040.9m

SUMMARY:

This is a strongly altered plagioclase-phyric dacitic lava breccia with common silicification of the matrix, and relatively abundant chlorite and calcite alteration. It contains altered disseminated pyrite.

HAND SPECIMEN:

This is a dark grey felsic lava breccia with angular fragments of plagioclase-phyric lava up to 1cm across in a lighter coloured, highly altered matrix.

THIN SECTION:

This sample shows a fragmental texture in thin section, but rather extensive alteration between fragments has rendered the texture more difficult to determine than in the previous samples. The clearly defined lava fragments are definitely formerly highly glassy plagioclase-phyric dacites, little different to those dacites described above. In these, the glass has devitrified to a dark coloured, almost isotropic material from which small spots of secondary quartz are crystallizing. Many of these fragments show perlitic cracks preserved by highlighting with fine-grained chlorite and sericite.

Most of the matrix between lava fragments is strongly recrystallized, although flattened shapes composed of a rim of quartz and cores of chlorite are common, and could have been either vesicles or less likely perhaps, flattened pumice fragments. Silica alteration is abundant in the inter-fragment areas, and calcite overprinting is also common. Small trains of tiny altered pyrite (?) grains are not uncommon in this sample, and altered disseminated pyrite occurs in both fragments and matrix, but is a very subordinate component of this sample.

SAMPLE NUMBER: 701329 BRD01A, 1052.2m

SUMMARY:

This sample is a massive formerly largely glassy plagioclase-phyric dacitic lava (probably 66-68% SiO2) with a distinctive groundmass texture.

HAND SPECIMEN:

This is a dark grey massive sparsely plagioclase-phyric dacitic lava.

THIN SECTION:

This sample is a dacitic lava that contains around 5 modal% of albitized plagioclase phenocrysts in an unusual textured formerly glassy matrix. Plagioclase (albite) phenocrysts are generally clustered in multi-crystal clots and show very slight sericite flecking. Occasional FeTi oxide microphenocrysts are altered to leucoxene, and a few former mafic phenocrysts in this rock.

The groundmass shows a most unusual texture. It is basically divided into subrounded to flattened, pillow-like domains by stylolite-like concentrations of tiny Fe oxide or leucoxene grains. Within each domain, which are much less than 1mm long, are either patches of devitrifed glassy lava containing small patches of secondary quartz, or more coarse-grained areas of secondary quartz and chlorite. This sample was a dacitic lava similar to the more chlorite-rich samples described above. It is a good sample to analyze for major and trace elements.

SAMPLE NUMBER: 701330 BRD01A,1053.6m

SUMMARY:

This is an almost aphyric formerly highly glassy low-Si dacitic to andesitic lava.

HAND SPECIMEN:

This is a massive dark grey-green almost aphyric felsic to intermediate lava with small subrounded spots of black chlorite to about 2mm abundant common in the groundmass, and at least one distinct lava fragment about 1cm across.

THIN SECTION:

This is an almost aphyric formerly glassy lava. It contains less than 2 modal% of albitized plagioclase phenocrysts. These are small (<1mm) and partially to completely sericitized. A few small blocky chlorite pseudomorphs after augite are also present, and leucoxenized FeTi oxide microphenocrysts are not uncommon.

The groundmass of this sample was clearly originally vitrophyric, with tiny albite microlites showing broad flow alighment set in a devitrified glassy matrix from which are crystallizing quite coarse-grained (0.2-0.5mm across) patches composed of polycrystalline quartz growing into green chlorite. Tiny leucoxene spots are common in the altered groundmass. Calcite occurs as small spots and patches overprinting the groundmass. The lava fragment in one corner of the section is a very sparsely plagioclase-phyric lava with an almost isotropic devitrified glassy groundmass. It is essentially a quenched version of the rock making up the remainder of this sample, and probably represent a fragment of glassy crust of this flow incorporated into the lava during convective or flow overturn.

This lava is rather different from those massive dacites described above. The fewer plagioclase phenocrysts and the relatively abundant chlorite and tiny groundmass FeTi oxides suggests that it may be transitional to an andesitic lava.

SAMPLE NUMBER: 701331 BRD01A, 1058.1m

SUMMARY:

This is a sparsely plagioclase-phyric andesitic lava with a distinctive patchy light and dark groundmass representing more glassy, and more crystallized areas respectively.

HAND SPECIMEN:

This is a massive dark grey aphyric lava with an unusual texture defined by diffuse but abundant spots of lighter colured grey-green material mainly less than 1mm across in a darker grey groundmass.

THIN SECTION:

This is a rather distinctive sample due to its unusual alteration texture. It is composed of less than 1 modal% of totally sericitized plagioclase phenocrysts to about 1mm long set in a most unusual groundmass. FeTi oxide phenocrysts altered to leucoxene are relatively common, and occasional chloritized augite(?) microphenocrysts are also present.

The groundmass of this sample has a most unusual texture. Basically, it is composed of light coloured and dark coloured domains, each up to a few millimeters across. These are clearly formed during devitrification or alteration of the groundmass, since single plagioclase phenocrysts may be seen extending from one domain into another. The lighter coloured domains are sericite-rich quartz-albite intergrowths after glass, with no plagioclase microlites, and the dark areas are more chloritic, but distinctive in having abundant plagioclase microlites embedded in the devitrified glass. Yellow epidote occurs as small grains in the darker domains, and as small amorphous patches.

The texture of the groundmass (ie 98+%) of this sample is due to patchy quench crystallization of the rock, with more crystallized (dark areas with microlites) areas embedded in more glassy areas. It is not obvious to me why the latter areas should be more sericitized. The presence of quite common epidote in this sample indicates a relatively high CaO content (probably>3-4%), and strongly suggests an andesitic precursor for this rock. I will analyze this sample.

SAMPLE NUMBER: 701332 BRD01A, 1059.7m

SUMMARY

This is an almost aphyric andesitic lava that had a glassy to vitrophyric groundmass that shows the light and dark variably crystalline domains described in detail for the preceding sample.

HAND SPECIMEN:

This is a massive apyric grey intermediate to felsic lava with patches of light and dark devitrification texture as described in the preceding sample. It is cut by relatively abundant very thin calcite veinlets at a high angle to the core.

THIN SECTION:

This is a virtually phyric lava containing about 1 modal % or less of small albitized plagioclase microphenocrysts that have been almost totally altered to sericite, set in a devitrified vitrophyric groundmass. It contains a few chloritized mafic microphenocrysts and not uncommon FeTi oxide microphenocrysts. It is texturally midway between those textures described for the preceding two samples, and contains diffuse sericite-rich domains lacking microlites of plagioclase and darker domains charged with microlitic plagioclase, although this texture is not as well-developed as in the previous sample. Amorphous yellowish epidote occurs intergrown with green chlorite in both the matrix and in veinlets and fracture fillings.

Most veinlets are quartz fibre veins overprinted by coarsely-crystalline calcite. This sample is clearly related to the two previous samples, and is probably andesitic, for the reasons given for the preceding sample.

SAMPLE NUMBER: 701333 BRD01A, 1060.3m

SUMMARY:
This is a massive aphyric andesitic lava related to the two previous samples, but slightly more slowly cooled.

HAND SPECIMEN:

This is a mid-grey almost aphyric intermediate lava with sparse feldspar phenocrysts set in a fine-grained formerly glassy matrix.

THIN SECTION:

In thin section, this sample is essentially identical to the preceding sample in most ways, except for the very minor differences noted below:

1. this sample shows less well-developed light and dark domains that typify the previous two samples. The groundmass was glassy, but charged with tiny plagioclase acicular microlites.
2. there is more very fine-grained, dirty brown microcrystalline epidote inthis sample than in the previous two samples, and less granular yellow epidote.

There is little doubt that this sample was a massive aphyric andesitic lava related to the previous two samples. The less abundant glassy areas in the groundmass of this sample might suggest that it comes from deeper within a single andesitic cooling unit (flow) than the more typical flow-margin samples 1059.7m and 1058.1.

SAMPLE NUMBER: 701334 BRD01A, 1065.6m

SUMMARY:
This is a very sparsely plagioclase-phyric andesite lava identical to the preceding sample in every way. It contains a few very fine-grained lava fragments probably derived from the glassy crust of the same flow, and has a distinctive 'false-cleavage' texture.

HAND SPECIMEN:

This is a massive almost aphyric grey intermediate to felsic lava. The rock contains a few lava fragments that are rather rounded, very fine-grained lavas darker than the matrix, and rarely more than 7mm across. They constitute only about 10 modal% of the sample. The remainder of the sample shows a cleavage-like devitrification texture that isn't penetrative.

THIN SECTION:

In thin section, this sample is seen to be an andesitic lava identical in every way to the previous sample. Unfortunately, the thin section prepared did not intersect one of the lava fragments noted in the hand specimen. I have no doubt, however, that they are simply spalled-off fragments of glassy flowtop incorporated into the lava during flow. The slight rounding of the lava fragments indicates that they suffered marginal melting during incorporation into the andesite flow.

SAMPLE NUMBER: 701335 BRD01A, 1066.6m

SUMMARY:

This is an unusual lava formed by felsic blebs of devitrified glassy dacite hosted within an almost aphyric more andesitic lava. It is suggested that this unit may be a useful marker horizon in the region.

HAND SPECIMEN:

This is a dark grey intermediate aphyric lava with two textural domains, one uniform fine-grained, and the other composed of subcircular light-coloured blebs to about 5mm across, set in a darker matrix.

THIN SECTION:

The texturally uniform part of this sample is a sparsely-phyric andesite essentially identical to the preceding few andesites. However, the texture of the heterogeneous areas is most intriguing, and strongly suggestive of magma mixing. The almost rounded light coloured blebs obvious in the hand specimen of the drill core show a quenched texture defined by a mosaic textured quartz-albite intergrowth after glass, in which are embedded tiny albite microlites. Sparse totally sericitized plagioclase phenocrysts occur in these felsic blebs. The host material in which the felsic blebs are set contains about 5 modal% of small albitized plagioclase phenocrysts, and several modal% of chlorite-quartz pseudomorphs after augite set in a quite chloritic fine-grained matrix containing albite microlites. A notable feature of the darker areas is the presence of relatively common crystals of sphene, probably produced during breakdown of leucoxene (itself after FeTi oxide microphenocrysts). Sphene also occurs as discontinuous crystals aligned along veinlets and microshears, clearly supporting the secondary origin for sphene in this rock.

Perhaps the most simple explanation for the unusual texture shown by this sample is that it formed by commingling of dacitic magma into andesitic (or less siliceous than the dacitic blebs) magma, probably during evacuation of a magma chamber. The texture is unusual and distinctive, suggesting that this unit may be a useful marker horizon in the "Hellyer area" stratigraphy.

SAMPLE NUMBER: 701336 BRD01A, 1070.7m

SUMMARY:

This is a lava composed of darker andesitic areas in which are set more than 50 modal% of subrounded felsic blebs of formerly glassy sparsely plagioclase-phyric dacitic lava. It presumably formed by mixing of a dacitic and an andesitic magma, and is part of the same distinctive unit as the preceding rock.

HAND SPECIMEN:

This is a mottled grey-green intermediate lava with the same felsic blebs set in a darker matrix as described for the preceding sample.

THIN SECTION:

The division into two textural-compositional domains is even more pronounced in this rock than in the previous sample. The darker areas are very fine-grained and composed of about 5 modal% of small (<0.5mm) albite microphenocrysts, and less than 1 modal% of chloritized augite microphenocrysts set in an almost isotropic groundmass dominated by microcrystalline epidote. The felsic blebs are up to 5mm across and composed of a mosaic-textured intergrowth of quartz and albite after glass, containing a few modal % of blocky albitized plagioclase phenocrysts, most of which are totally sericitized. The felsic blebs also contain uncommon leucoxenized FeTi oxide microphenocrysts.

This sample is essentially similar to the preceding sample, although the differentiation into felsic and more mafic blebs is even more pronounced in the present sample.

SAMPLE NUMBER: 701337 BRD01A, 1074.8m

SUMMARY:

This is a formerly sparsely plagioclase-phyric, vitrophyric andesitic lava closely similar to 1065.6m; both have a distinctive streaky devitrification texture that should enable easy identification of this type of rock in other drillcore.

HAND SPECIMEN:

This is a massive dark grey andesitic to dacitic lava with a few altered plagioclase phenocrysts; it has a distinctive streaky devitrification texture resembling a foliation, but lacking the penetrative nature typical of true cleavage. It is identical texturally to sample 1065.6m.

THIN SECTION:

This is a formerly glassy andesitic lava containing about 5 modal% of altered plagioclase phenocrysts and around 1 modal% of chloritized former mafic phenocrysts in a devitrified vitrophyric groundmass. The plagioclase phenocrysts, mainly less than 1mm long, are albitized but contain abundant dirty brown micro- crystalline epidote. Much less abundant are former mafic (augite) phenocrysts replaced by pale green chlorite, and leucoxenized FeTi oxide phenocrysts.

The groundmass of this sample consists of tiny acicular albite microlites set in former glass that has devitrified to a quartz-albite-chlorite-microcrystalline epidote intergrowth. The streaky 'cleavage-like' texture notable in hand specimen is due to weakly developed devitrification banding, with adjacent bands characterized by slightly different textures and abundances of mainly chlorite and epidote. A calcite veinlet about 2mm thick cuts the sample, and is bordered by a zone of fairly intense calcite-sericite alteration that extends out at least 5mm either side of the vein. Except for the minor difference that this sample does not contain quenched glassy crust fragments that are present in 1065.6m, it is otherwise identical to that sample.

SAMPLE NUMBER: 701338 BRD01A, 1080.0m

SUMMARY:

This is an mixed andesitic-dacitic lava identical originally to 1066.6m and 1070.7m (with felsic blebs in a more andesitic host magma), but showing much stronger calcite-sericite alteration.

HAND SPECIMEN:

This sample is a dark grey andesitic lava showing the distinctive mottled texture seen in some of the preceding samples (1066.6m,1070.7m) in which light coloured blebs of a felsic magma are incorporated in a darker, more andesitic lava.

THIN SECTION:

This sample is texturally and mineralogically identical to 1066.6m and 1070.7m, in being dominated by subrounded blebs to about 5mm across composed of plagioclase-phyric devitrified dacitic lava, set in a darker more andesitic lava containing more elongate, smaller plagioclase phenocrysts in a microcrystalline epidote-rich dark, almost isotropic matrix. The sample is slightly more altered than either of the aforementioned samples, with fairly intense sericite-calcite alteration occurring both as veinlets and as pervasive alteration overprinting the rock.

SAMPLE NUMBER: 701339 BRD01A, 1085.1m

SUMMARY:

This is a plagioclase-phyric dacitic lava that shows variable intensities of calcite(± sericite) alteration on either side of a quartz veinlet. The amount of calcite alteration is much greater than seen in most samples from deeper in the core than 996m, except for the preceding lava.

HAND SPECIMEN:

This sample appears to be a contact between a dark grey plagioclase-phyric dacitic lava and a less porphyritic lighter grey dacitic or andesitic lava. A quartz veinlet occurs along the contact.

THIN SECTION:

In thin section it is apparent that the two lavas noted in the hand specimen are in fact, probably the same lava showing different intensities of alteration. The lava was a plagioclase-phyric dacitic lava containing around 10 modal % of plagioclase phenocrysts that have been albitized; many occur as multi-crystal clots, and most are partially to completely replaced by pale brown calcite and subordinate epidote. No mafic phenocrysts were present in this sample, but microphenocrysts of leucoxenized former FeTi oxide are not uncommon.

The groundmass of this sample is extremely fine-grained and probably composed of quartz and feldspar, although it is irresolvable. Small subcircular patches of quartz are crystallizing from the groundmass, which was probably largely glassy. Chorite is not common., and epidote occurs only as rare granular inclusions in altered plagioclase. The quartz vein separates domains that show very different amounts of calcite overprinting, producing the apparent different 'lavas' noted in the hand specimen description. Of course, these may represent two flows, but they would have been essentially identical originally, with the present difference in appearance being due to variable alteration.

The paucity of chlorite and altered mafic phenocrysts, the scarce epidote, and the generally blocky plagioclase phenocrysts suggest that this lava was dacitic.

SAMPLE NUMBER: 701340 BRD01A, 1086.6m

SUMMARY:

This is a banded, strongly calcite-sericite-altered dacitic crystal tuff containing several narrow bands of sulphide (pyrite) concentrated in the more cleaved, finer grained shaley bands in the sample.

HAND SPECIMEN:

This is a uniform-textured fine-grained aphyric lava or tuff containing at least one very 'syngenetic-looking' band of fine-grained sulphide to about 4mm wide that cuts the core almost perpendicular to its length.

THIN SECTION:

This sample shows a strong fine-grained fragmental texture, and is quite clearly a crystal tuff, with several bands of variable grainsize being obvious. The dominant crystalline component in the sample is made up of broken and euhedral blocky crystals of albitized plagioclase, many of which have been totally replaced by sericite or calcite or both. Formerly glassy dacitic lava fragments are less abundant, and harder to distinguish due to the similar strong sericite-calcite alteration affecting the glassy groundmass of the tuff itself and its contained glassy lithic fragments. Although the coarser-grained (medium sandstone-textured) bands of tuff are uncleaved, finer-grained bands show a well-developed cleavage defined by calcite streaks and sericite along cleavage planes. In the finest-grained band of the rock, tiny disseminated sulphides and possibly some carbonaceous material show a strong development along the cleavage. About 5mm from this sulphide-rich band, a second band of larger (to 0.4mm across) and much more dispersed sulphide grains occurs. Without a polished section, it could not be determined which sulphide(s) is represented in this sample, although grain shapes strongly suggest pyrite.

This incoming of fragmental (tuffaceous)rocks, although still dacitic in nature, marks a notable change in the nature of the volcanism occurring in this basin, which has been dominated by dacitic and andesitic lava flows.

SAMPLE NUMBER: 701341 BRD01A, 1090.5m

SUMMARY:

This is a dacitic tuff breccia, dominated by angular fragments of dacitic tuff and glassy dacitic lava, but also containing tuffaceous shale fragments; it shows quite strong sericite-calcite alteration.

HAND SPECIMEN:

This sample is a distinctive polymict lava breccia dominated by plagioclase-phyric dacite, but also containing long, flat black shale fragments and fine-grained formerly glassy aphyric lava, with strong calcite alteration in the areas between lava fragments. Some clasts immersed in quartz-calcite veins are bright yellow-green and may contain fine-grained epidote. Fragments are up to 3cm long.

THIN SECTION:

This sample in thin section is seen to be composed dominantly of angular fragments of crystal tuff and tuffaceous shale, although several dacitic lava fragments are also present. The tuff fragments are dominated by albitized plagioclase phenocryt debris, mainly broken crystals, in a formerly glassy matrix that has devitrified and been strongly altered to fine-grained calcite=sericite assemblages. A few fragments contain detrital quartz grains, although it is not possible to tell from the small grains whether they are derived from pelitic metamorphics or were phenocrysts from rhyolitic volcanics. One fragment contains several bands of sulphide only a fraction of a mm wide. Dacitic lava fragments are similar in mineralogy to the tuffs, but are easily distinguished from them by their notably less abundant feldspar phenocrysts and their more uniform textures, especially of the groundmass. The fine-grained very dark grey to black elongate fragments obvious in the hand specimen appear to be tuffaceous shale. They probably contained a fairly high component of vitric ash, and occasional small albite crystal fragments are visible, plus disseminated very fine-grained sulphides.

The areas between angular fragments have been replaced by coarse-grained calcite, and as for the two preceding samples, the intensity of calcite-sericite alteration in this sample is much greater than in the dacites and andesites described from 996m to 1085m.

SAMPLE NUMBER: 701342 BRD01A, 1093.8m

SUMMARY:

This sample was a dacitic crystal lithic tuff; it shows strong calcite alteration and veining, but less intense sericite alteration than the preceding two samples.

HAND SPECIMEN:

This is a uniform, unbedded fine-medium-grained tuff containing abundant altered plagioclase crystals and small formerly glassy lava fragments.

THIN SECTION:

In thin section, this sample is clearly a dacitic crystal lithic tuff. Almost all lithic fragments, which dominate this rock, are sparsely plagioclase-phyric dacitic lavas that were highly glassy, and that suffered devitrification followed by crystallization of the altered glass to albite-quartz mosaics. Blocky albite phenocrysts and crystal fragments are probably also a major detrital component. A few very fine-grained tuffaceous shale-siltstone fragments are present. The matrix of the sample was probably originally silty vitric ash, but it too has recrystallized as quartz-albite (±sericite±minor chlorite). Bands and veins of coarsely-crystalline calcite are common in this sample, and sericite development is not as strongly developed as in the previous few samples. This sample was clearly a dacitic crystal lithic tuff.

SAMPLE NUMBER: 701343 BRD01A, 1095.2m

SUMMARY:

This is a relatively fine-grained dacitic lithic tuff, showing fairly strong calcite-minor sericite overprinting.

HAND SPECIMEN:

This is a mid-grey altered fine-grained lava breccia or lithic tuff, with distinct but not abundant small ((<6mm across) lava fragments set in a very similar-looking matrix. A few small dark lava fragments are probably tuffaceous shale, as noted in the previous two samples described above.

THIN SECTION:

Although close examination shows this sample to be a lithic tuff, the fragmental nature of this rock is less distinct than the previous two samples due to a much more limited range in the nature of the lithic clasts in this sample. Most lava fragments are less than 1mm across, and were sparsely plagioclase-phyric glassy dacitic lava. Glass has invariably devitrified and crystallized as ragged mosaics of quartz, albite and sericite, speckled by tiny dots of dirty, isotropic microcrystalline epidote(?) in places. The textural range in the dacitic lava fragments observed is a reflection of their original 'glassiness', and their varying response to devitrification-crystallization of the former glass. Generally blocky albite phenocrysts are partly altered to calcite and sericite, and altered (leucoxenized) FeTi oxide microphenocrysts are not uncommon. Calcite-sericite alteration is fairly strong in this sample, and veinlets of both calcite and sericite occur.

SAMPLE NUMBER: 701344 BRD01A, 1097.6m

SUMMARY:

This is a massive holocrystalline andesitic dyke rock that shows minimal calcite-sericite alteration relative to the preceding rocks.

HAND SPECIMEN:

This is a grey, massive, uniform intermediate aphyric lava

THIN SECTION:

This sample in thin section is very clearly a completely aphyric, almost holocrystalline andesitic rock, composed almost entirely of interlocking slightly elongate plagioclase (albite) laths with interstitial chlorite after augite, and small leucoxenized FeTi oxide grains abundantly dispersed throughout the sample. Occasional small blebs of clear secondary quartz are present in the rock. Plagioclase is only very rarely altered to sericite, and small calcite pools and patches are uncommon in this sample.

This sample lacks a former glassy component, and is most unlikely to be a lava. It is almost certainly an andesitic dyke rock. The fact that the calcite -sericite alteration that is strongly developed in the preceding three or four samples (at least) is absent in this sample could be interpreted in two ways. Either the dyke was massive and impervious to the alteration fluids, or the alteration occurred before the dyke was emplaced in this sequence. I have no doubt that the dyke is Cambrian, and tend to favour the first option. A careful examination of the core over this interval might help understand this problem. This sample should be analyzed.

SAMPLE NUMBER: 701345 BRD01A, 1102.8m

SUMMARY:

This rock is a lithic tuff-breccia of dacitic composition, basically identical to sample 1090.5m.

HAND SPECIMEN:

This sample is a green-grey felsic to intermediate tuff breccia composed of polymict lithic fragments mainly less than 1cm long.

THIN SECTION:

In thin section, this sample is seen to be a dacitic lithic tuff-breccia, *essentially identical to the sample from 1090.5m in this core.* Almost all lithic fragments, mainly 1-2mm across, are of sparsely plagioclase-phyric formerly glassy dacite. The calcite-sericite alteration overprinting the devitrified glassy groundmasses of these lava fragments is quite intense, and albitized plagioclase phenocrysts are almost totally altered to sericite.

SAMPLE NUMBER: 701346 BRD01A, 1107.0m

SUMMARY:

This sample is of the contact between a strongly carbonate-sericite altered dacitic lava and a formerly ash-rich epiclastic siltstone or fine-grained tuff that contains a small component derived from the Precambrian metamorphics. Pyritic bands and veinlets are common in the tuff.

HAND SPECIMEN:

This sample appears to be the contact between a highly altered dacitic lava and a fine sandstone or tuff. The latter contains discontinuous narrow (to 3mm thick) pyrite bands and also veinlets of exceptionally fine-grained pyrite along fractures. A dark chlorite-rich band up to 4mm wide marks the contact between these two lithologies.

THIN SECTION:

The lava section of this sample is very strongly calcite-sericite altered, making identification of the original rock rather difficult. However, dispersed blocky phenocrysts of totally calcite- sericite± chlorite-altered albitized plagioclase, to about 2mm long, and the devitrified glassy nature of the groundmass suggest that this was broadly dacitic in composition. Calcite and dirty brown sericite strongly overprint much of the groundmass.

The other part of this section is composed of a structureless fine-grained tuff or epiclastic silt in which detrital muscovite flakes are not uncommon, and a large altered vitric ash component was probably present. Small cubes of pyrite are abundant disseminated through this rock, and form thin layers (<<1mm) parallel to the contact (bedding?) and also veinlets that are almost perpendicular to the contact. This rock was probably a glass-rich water-worked tuff that received a small input (the muscovite flakes) derived from Precambrian pelitic metamorphics.

The chloritic region developed between the tuff/epiclastic and the dacitic lava is charged with leucoxene and corroded relics of feldspar crystals; it probably represents a fluid passageway along which intense dissolution occurred of the Si-rich parts of the rock, concentrating less soluble leucoxene and low-Si chlorite.

SAMPLE NUMBER: 701347 BRD01A, 1112.6m

SUMMARY:

This is a quartz- and detrital muscovite-rich greywacke derived entirely from a pelitic metamorphic source. I suggest it is a corrleate of the Animal Creek Greywacke. It contains large red chromite grains showing that the ophiolites were emplaced and being eroded before eruption of the Que-Hellyer Volcanics.

HAND SPECIMEN:

This sample is a massive, medium-grained greywacke containing a black shale interbed at least 1cm thick.

THIN SECTION:

Most of this thin section consists of a quartz-rich greywacke, dominated by angular grains of mono- and polycrystalline quartz to at least 1mm across.Most of the quartz shows irregular extinction, and is clearly not phenocrysts from rhyolitic lavas. An abundant detrital component is well-formed muscovite flakes, clearly derived from a peltici metamorphic source. A few lithic fragments vary from very fine-grained polycrystalline quartz, possibly chert fragments, to coarser-grained quartz-muscovite schists. Small grains of accessory green, zoned tourmaline are present. A most important component of this sample is the not uncommon quite large grains of red chromite, which indicate that the ophiolitic rocks were being eroded and transported **before** eruption of the Que-Hellyer Volcanics. The matrix of this greywacke has been entirely replaced by coarsely crystalline secondary calcite.

The shale in contact with the greywacke is composed of very fine-grained quartz and muscovite flakes, and probably carbonaceous material.

I have no hesitation in correlating this greywacke with the Animal Creek Greywacke. It is derived entirely from a Precambrian pelitic source, and lacks any volcanic component, a feature typical of the Animal Creek Greywacke.

SAMPLE NUMBER: 701360 BRD 01A (1133.0m) Base of hole.

SUMMARY:

This is a very sparsely albite-phyric basaltic andesite lava unlike the Hellyer basalts, but perhaps similar to the andesites from this hole around 1058-1066m, and also to the aphyrix basaltic to andesitic lavas from BRD 05.

HAND SPECIMEN:

This is a relatively pale grey almost aphyric andesitic to basaltic lava.

THIN SECTION:

This sample is petrographically very different from basalts higher in this drillhole. It consists of abundant very small albitized plagioclase microphenocrysts, all less than 0.3mm long, grading into groundmass lath crystal dimensions, in a formerly vitrophyric groundmass composed of plagioclase microlites and some granular, altered interstitial augite in former glass. The albite microphenocrysts contain minor chlorite and sericite flecking, but are mainly unaltered. Much of the groundmass glass has altered to albite, quartz and chlorite, and the quartz has recrystallized as discrete blebs up to almost half a mm across, producing a distinctive texture in this rock under the microscope. Small patches of calcite overprint the groundmass, but calcite is not abundant. Although it is difficult to say without an analysis, this sample may be related to the aphyric basalts (dykes?) in BRD 05

SUMMARY:

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HAND SPECIMEN:

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THIN SECTION:

SAMPLE NUMBER:

SUMMARY:

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PROJECT 258

PLACER EXPLORATION LIMITED

REPORT TAS 2/90
EXPLORATION LICENCE NO. 39/85

BULGOBAC RIVER, TASMANIA

CURRENT STATUS AT THE COMPLETION OF BRD 05

VOLUME 4

TCR 91-3214
Vol. 516

HOBART
MARCH 1990

P.D. ELLIS

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APPENDIX VI

THIN SECTION PETROLOGY -

DDH BRD 05

SAMPLE: 701501 (BRD 5, 46.4m)

SUMMARY:

This is a plagioclase+quartz-phyric rhyolitic lava with strongly rounded and reacted phenocrysts.

HAND SPECIMEN

This is a fresh, grey plagioclase+quartz-phyric rhyodacitic to rhyolitic lava with white sericite-altered plagioclase phenocrysts making up around 15 modal% of the sample..

THIN SECTION DESCRIPTION:

This sample is a texturally very well-preserved felsic lava with around 12-15 modal% of altered plagioclase phenocrysts and around 8-10 modal% of quartz phenocrysts fairly uniformly distributed through a formerly glassy groundmass that has devitrified and crystallized to quartz and feldspar. The phenocrysts are quite large, mainly 1-3mm across, and both quartz and feldspar phenocrysts show pronounced rounding and reaction with transporting melt. Patches of fresh albite are preserved in the largely sericite-altered former plagioclase phenocrysts. Quartz phenocrysts are remarkably rounded, and many contain tiny melt inclusions of devitrified glass. A few elongate pseudomorphs after a mafic phase, now composed of chlorite, Fe oxide granules and quartz, are almost certainly after primary biotite. Small microphenocrysts of FeTi oxide are common, and are largely replaced by leucoxene.

The groundmass of this sample was almost certainly glassy originally. In several places, convincing curved cracks through the devitrified and recrystallized glass suggest perlitic cracking in former glass. The groundmass is now composed of a variably-textured, fairly fine-grained intergrowth of quartz, minor albite (sericitized) and pale green chlorite. Through most of the groundmass the texture is a very fine-grained mosaic intergrowth; however patches are developed in which more coarse-grained patchy chalcedonic quartz with radial extinction is developed. The sample is essentially calcite-free, and the only veining present is very minor, discontinuous sericite veinlets in the groundmass. The metamorphic assemblage is almost certainly very low-grade prehnite pumpellyite facies, and the alteration is entirely regional metamorphism-induced; no sign of local hydrothermal alteration is present.

SAMPLE: 701502 (BRD 5, 52m)

SUMMARY:

This is a contact between a detrital muscovite-bearing shale and an epiclastic sandstone dominated by angular felsic volcanic-derived quartz and albite crystal fragments. Small pyrite concretions are forming mainly along the contact, by replacement of shaley matrix.

HAND SPECIMEN

This is a contact between a pale grey laminated shale and a quartz+feldspar-rich epiclastic sandstone in which small concretions of pyrite are growing.

THIN SECTION DESCRIPTION:

Thin section examination shows that the shale in this sample consists of a microcrystalline clayey aggregate in which detrital grains of muscovite and volcanic quartz are able to be distinguished. The muscovite implies a contribution from a nearby pelitic metamorphic source. The coarse-grained epiclastic sandstone is very well sorted, and consists of subequal proportions of angular volcanic quartz phenocryst fragments (and entire crystals) and sericitized phenocrysts of albitized plagioclase. Most are from 1-3mm across, and are set in a shaley matrix, although the sample is very close to being framework grain-supported. Several 1-2mm long chlorite pseudomorphs after probable olivine were also noted.

The sample is notable for the incipient development of pyrite concretions to about 5mm diameter, forming mainly along the contact of the shale and the sandstone, but also occurring within the sandstone itself. These concretions consist of aggregates of small pyrite cubes coalescing into subspherical bodies that incorporate detrital quartz and feldspar grains, but totally replace the shaley matrix of the rock. Clearly, the contact between the shale and the sandstone was a chemically favourable site for migrating Fe and S to precipitate.

This sample is clearly derived from a mixed pelitic metamorphic (distal) and proximal felsic volcanic source.

SAMPLE: 701503 (BRD5, 100.7m)

SUMMARY:

This is a vitric crystal tuff of rhyolitic composition, containing a small percentage of felsic lava fragments.

HAND SPECIMEN

This is a grey felsic crystal tuff, with a few lithic fragments to almost a cm long of probable felsic volcanics, and a devitrified glassy groundmass.

THIN SECTION DESCRIPTION:

This sample is clearly tuffaceous, and is dominated by broken crystal fragments of quartz and albite in a very strongly recrystallized formerly glassy groundmass in which relic pumiceous and glass shard textures are abundant. Albite and volcanic quartz phenocryst fragments make up about 5 modal% of this rock, and are mainly less than 1mm long. Several lithic fragments are obvious, all being mosaic-textured quartz-albite intergrowths after glassy felsic lava. These are mainly 2-5mm long, and at least two contain small albitized plagioclase phenocrysts.

The groundmass texture of this sample is exceptionally heterogeneous. The rock was clearly largely glassy, with most of the matrix being composed of vitric ash (shards) and comminuted pumice that has completely devitrified to quartz, albite and minor chlorite and sericite. Some almost stylolitic fractures through the rock are enhanced by concentrations of insoluble Fe oxides embedded in masses of wispy sericite. As for the previous sample, calcite is absent and there is no sign of hydrothermal alteration. The rock was a vitric crystal tuff containing a small percentage of felsic lava fragments.

SAMPLE: 701504 (BRD 5, 156.2m)

SUMMARY:

This is a polymict lava breccia derived from felsic volcanics it also contains abundant altered vitric ash and flattened pumice fragments.

HAND SPECIMEN

This is a coarse polymict lava breccia dominated by fragments of felsic lava from 0.5 -2cm across.

THIN SECTION DESCRIPTION:

This sample consists of a diversity of felsic lava fragments in a devitrified felsic ash matrix. The lava fragments are mainly 0.5-1cm across, and constitute probably 70-80 modal% of the sample. They are mainly angular fragments of plagioclase + quartz-phyric rhyolite lava in which the formerly glassy groundmass has devitrified to a very fine-grained quartz-albite±chlorite mosaic intergrowth. Felsic vitric crystal tuff fragments are also very common, and contain some of the best-preserved glass shard textures that I have seen in the Mount Read Volcanics. Flattened, partly sericitized and chloritized pumice fragments are distinctive, and crystal fragments of quartz and albite are common between lava fragments in the matrix. A distinctive dark lava fragment type is characterized by abundant flow-textured, elongate, altered plagioclase laths and considerably less devitrified interstitial glass; these fragments contain sparse albite phenocrysts and are probably dacitic to andesitic composition.

The matrix of this sample is difficult to discern from the groundmass of many of the formerly glassy lava fragments, but it appears to have been a felsic glassy ash.

This sample is clearly a polymict felsic lava breccia with a significant vitric component, both as vitric ash and pumice fragments.

SAMPLE: 701505 (BRD 5, 415.9m)

SUMMARY:

This is a felsic vitric crystal tuff.

HAND SPECIMEN

This is a fine-grained, uniform-textured dark grey tuff or epiclastic fine sandstone.

THIN SECTION DESCRIPTION:

This is an even-textured vitric crystal tuff with an average crystal fragment grainsize in the fine sand range. The rock consists of around 20 modal% of crystal fragments, dominated by broken volcanic quartz and albitized and partially sericitized feldspar, and perhaps 5-10 modal% of lithic clasts of formerly glassy felsic lava. These are set in a devitrified and strongly sericitized formerly glassy matrix that may have had a fragmental/clastic vitric shard texture, although this is largely obliterated by devitrification and sericitization. It is now traversed by innumerable dark, convoluted stylolitic bands formed probably during compaction and devitrification.

Calcite spots and patches are common in this sample, and the alteration assemblage is dominated by albite-quartz-chlorite-calcite, typical of low grade degradation of felsic glassy lavas. Sparse disseminated pyrite cubes are present in this sample.

SAMPLE: 701506 (BRD 5, 425m)

SUMMARY:

This is a weakly laminated black shale derived from pelitic metamorphics.

HAND SPECIMEN

This is a weakly laminated black shale.

THIN SECTION DESCRIPTION:

Thin section examination shows this shale to have three major identifiable detrital components. Most obvious are abundant detrital muscovite flakes, mainly lying in the bedding plane, with an average length around 0.1mm, although occasional flakes reach 0.5mm long. Detrital quartz grains also averaging around 0.1mm across are common; these are mainly angular to subrounded, and show uneven extinction and sometimes, polycrystalline grains that suggest most of the quartz is from the same pelitic metamorphic source that supplied the detrital muscovite.

SAMPLE: 701507 (BRD 5, 538.5m)

SUMMARY:

This is an aphyric basaltic to basaltic andesite lava cross-cut by calcite-quartz-pyrite veins in which the pyrite shows strong association with the quartz and an antipathetic relation to calcite abundance in the veins.

HAND SPECIMEN

This is a very fine-grained aphyric basaltic lava cut by several zoned veins up to 6mm wide composed of calcite and pyrite.

THIN SECTION DESCRIPTION:

This sample is an unusual aphyric lava of basaltic andesite to basalt composition, with only a few very small and rather reacted albitized plagioclase microphenocrysts. The rock is composed largely of a very uniform-textured intergrowth of elongate plagioclase laths and much less abundant and less easily distinguished former augite plates now altered to chlorite and quartz, set in a matrix that was probably glassy mesostasis that has altered to albite, quartz and chlorite. Tiny FeTi oxide granules throughout the rock have altered to leucoxene. Narrow veinlets of sericite transect the rock, but are crosscut by the calcite-pyrite veinlets.

The veins of calcite and pyrite are compositionally zoned, being composed of core regions of quite coarse-grained calcite, and rims composed of intergrown ribbon quartz and pyrite cubes. In places, the quartz in the veins forms coarse polygonal grains intergrown with pyrite. The pyrite is clearly associated with quartz, and shows pronounced drops in modal abundance in those parts of the vein in which calcite is dominant.

This sample is an unusual aphyric basaltic or basaltic andesite lava.

SAMPLE: 701508 (BRD 5, 539.0m)

SUMMARY:

This is an aphyric basaltic lava that has been extensively veined and replaced by quartz-pyrite-calcite veins.

HAND SPECIMEN

This is a very fine-grained aphyric mafic or intermediate lava that is brecciated and veined by quartz-calcite-pyrite veins up to at least 2cm wide.

THIN SECTION DESCRIPTION:

This sample is an aphyric basaltic to andesitic lava dominated by acicular to elongate prismatic albite laths set in pale green chlorite replacing glassy mesostasis and probably interstitial augite plates. Small leucoxene spherules are abundant in the interstitial chlorite and clearly replace tiny FeTi oxide grains. Weak sericite and calcite alteration is scattered through this lava, which was probably basaltic originally.

The sample is transected by notable veins containing quartz, pyrite and calcite. The quartz shows a variety of habits. The most common habit is as interlocking almost spherulitic chalcedonic silica showing radial extinction, whereas less commonly, quartz forms interlocking polygonal crystals lacking the spherulitic habit. Quartz adjacent to masses of pyrite crystals shows strong ribbon texture development, and often forms fringes on larger pyrite crystals. The pyrite is clearly concentrated at the boundaries between the quartz veins and the aphyric basalt, and occurs as masses that reach several mm across, and bands of well-formed discrete crystals. Calcite definitely post-dates and overprints the pyrite-quartz mineralization, but occurs as curved and bladed crystals intergrown with ribbon quartz in the fringes around bigger pyrite grains.

In reflected light, the pyrite is seen to contain resonably common tiny inclusions of chalcopyrite and much rarer pyrrhotite, and the chalcopyrite has migrated extensively to fractures and boundaries between adjacent pyrite grains

SAMPLE: 701509 (BRD 5, 545.9m)

SUMMARY:

This is an aphyric basaltic lava, essentially identical to the previous sample, taken from the very margin of a cooling unit, possibly a pillow.

HAND SPECIMEN

This is probably either a pillow margin or a flow margin, composed of aphyric basaltic lava grading toward the flow margin into increasingly glassy (and devitrified) lava with interstitial quartz and calcite after glass.

THIN SECTION DESCRIPTION:

This sample was originally almost identical to the previous lava in being a non-vesicular aphyric, probably basaltic lava composed of abundant elongate albitized plagioclase laths with a very uniform glassy mesostasis that has largely devitrified and crystallized to quartz, albite and chlorite. A few small albitized plagioclase microphenocrysts are present, and one small subhedral chlorite phenocryst possibly after olivine was also noted. The groundmass becomes increasingly finer-grained toward one end of the slide, and the ratio of plagioclase laths to glass decreases, while at the same time the laths become more acicular and quench-like. Pale brownish calcite overprints about 10 modal% of the sample, especially the more crystalline end of the sample. This is clearly a flow margin sample, possibly the edge of a pillow, although interpillow cherty material was not sampled. It is almost certainly derived from the same flow that yielded the previous sample (at 538.5m).

SAMPLE: 701510 (BRD 5, 549.0m)

SUMMARY:

This is a sparsely augite-phyric basaltic lava.

HAND SPECIMEN

This is a massive, non-vesicular, almost aphyric grey basaltic lava

THIN SECTION DESCRIPTION:

This is a sparsely augite-phyric basaltic lava, in which small augite phenocrysts are set in a rapidly cooled, vitrophyric groundmass. The augite phenocrysts make up around 3 modal% of this rock, and are fresh, small (<0.5mm) colourless subhedral prisms frequently cracked and broken.

The groundmass of this sample was composed largely of elongate acicular to prismatic plagioclase (albitized) laths, ranging to microphenocryst dimensions (0.2mm long), with subordinate formerly glassy mesostasis and abundant tiny FeTi oxide granules throughout. The latter has altered to green chlorite, albite and quartz. Several fractures and gashes filled by quartz are lined by chlorite. Larger FeTi oxide granules appear to be altered to pale brown sphene. Very minor calcite flecks the groundmass, and a few larger patches are also present, although mainly less than 1mm across; a single narrow veinlet of calite traverses this sample. The metamorphic assemblage is typically very low-grade burial metamorphic, and there is no evidence in this sample for local hydrothermal alteration.

SAMPLE: 701511 (BRD 5, 555.0m)

SUMMARY:

This is a very well-preserved finely augite-phyric basalt.

HAND SPECIMEN

This is a pale grey massive, non-vesicular aphyric basaltic or andesitic lava with a few veinlets of calcite and chlorite.

THIN SECTION DESCRIPTION:

This sample is a finely augite-phyric basalt composed of around 5 modal % of relatively small euhedral augite phenocrysts set in a vitrophyric groundmass. The augite phenocrysts are mainly 0.3-0.5mm long, well-formed colourless euhedra. They show no sign of any alteration, and commonly occur in multi-crystal aggregates. Many crystals show simple twinning.

The groundmass of this sample is composed of randomly-orientated laths of albitized plagioclase, mostly around 0.1-0.3mm long, and granular anhedral augite, set in devitrified subopaque glass. Much of the devitrified glass has recrystallized as albite and secondary quartz with minor interstitial chlorite and blebs of leucoxene.

Vein assemblages include polygonal secondary quartz, often intergrown with clear albite, and overprinting fibrous calcite that contains sparse small pyrite grains. A number of elongate tension gashes are filled with very low-birefringent pale green chlorite, and one almost round former vesicle(?) is filled by polygonal quartz intergrown with sheaflike colourless prehnite. The metamorphic grade of this rock is prehnite-pumpellyite facies, and the extent of superimposed hydrothermal alteration is minimal.

SAMPLE: 701512 (BRD 5, 558.7m)

SUMMARY:

This is an aphyric basalt or basaltic andesite strikingly similar to those from 538.5 to 545.9m, and that from 561.5m.

HAND SPECIMEN

This is a massive aphyric dark grey basaltic lava.

THIN SECTION DESCRIPTION:

This is a massive, essentially aphyric basalt or basaltic andesite lava composed of interlocking and randomly-orientated laths of albitized plagioclase with granular augite entirely altered to calcite. Most albite laths are around 0.2-0.4mm long. The interstitial areas consist of albite, quartz and pale green to unusual brown chlorite, and tiny grains of FeTi oxide. It is very difficult to judge how much of the sample was originally glassy, although evidence suggests not much glass was present. Both calcite and secondary quartz occur as spots and veinlets. The texture of this sample is coarse enough to suggest that this might be a dyke rather than a flow. This sample is essentially identical to the aphyric basalts from around 538 - 545.9m.

SAMPLE: 701513 (BRD 5, 559.5m)

SUMMARY:

This sample is a quite primitive augite-phyric basaltic lava.

HAND SPECIMEN

This is a massive, non-vesicular, pale grey finely porphyritic basalt.

THIN SECTION DESCRIPTION:

In thin section, this sample is seen to be a very well-preserved augite-phyric basaltic lava. The main feature of this rock is the abundant (~ 15 modal%) rather small (<0.5mm) colourless augite phenocrysts, most of which are unzoned euhedral prisms that occasionally occur in multi-crystal clots. These are set in a uniform groundmass that originally had a vitrophyric texture, composed of acicular plagioclase laths in a largely glassy mesostasis peppered with tiny FeTi oxide grains. Tiny granular augite microphenocrysts and groundmass grains are abundant, and some plagioclase (albitized) laths approach microphenocryst dimensions.

The formerly glassy component of the groundmass of this basalt has crystallized to albite, quartz and pale green chlorite. Several fractures through this sample have been filled with an aphyric andesitic lava, very reminiscent of 545.9 and 538.8, that may have bled into fractures in the surface of this augite-phyric basalt flow. Alternatively, they may represent cooling cracks into which more andesitic composition residual liquid was squeezed, or migrated during solidification of this basalt.

SAMPLE: 701514 (BRD 5, 561.5m)

SUMMARY:

This is a distinctive, aphyric basalt with pronounced similarities to those around 538.5 - 545.9m in this core.

HAND SPECIMEN

This is a dark grey aphyric massive fine-grained basaltic lava.

THIN SECTION DESCRIPTION:

This sample is a distinctive virtually aphyric basaltic lava. It is composed of a densely interlocking intergrowth of albite laths, chlorite after granular augite, FeTi oxide granules, and interstitial albite, quartz and chlorite after glass. A few phenocrysts around 1mm long are replaced by polygonal aggregates of secondary quartz, and have shapes suggestive of mafic precursor crystals, although on the available evidence it is impossible to choose between augite and olivine. The plagioclase laths show a weak but definite flow alignment, and are frequently separated by low-birefringent tiny patches of intergrown chlorite and albite, commonly with small calcite blebs. These patches probably represent former interstitial glass and small anhedral augite granules. Occasional tension gashes filled by bright blue anomalously birefringent chlorite show parallel, almost en echelon alignment. The metamorphic grade of this sample is prehnite-pumpellyite facies, and the relatively abundant but dispersed fine-grained calcite suggests limited more local hydrothermal alteration of this basalt.

This sample is essentially identical to the similarly distinctive aphyric basalts at 538.5m to 545.9m in BRD 05, and is quite unlike the strongly porphyritic basalts above it in the core around 559.5m.

SAMPLE: 701515 (BRD 5, 569.3m)

SUMMARY:

This is a weakly foliated, very strongly calcite-sericite -altered aphyric basaltic lava similar to those less altered rocks at 539-545 and 558-561.5m. The rocks contains disseminated pyrite, and probably comes from a fault zone.

HAND SPECIMEN

This is a massive, aphyric dark grey basaltic lava.

THIN SECTION DESCRIPTION:

The texture of this sample has been fiarly thoroughly destroyed by strong and pervasive calcite alteration, and the development of a weak foliation. The rock was almost certainly aphyric. Probably around half of the sample was composed of albite laths that have been almost totally replaced by fine-grained sericite and calcite. Granular augite has also been totally replaced by fine-grained dirty calcite. Interstitial areas of this sample consist of very fine-grained calcite, secondary quartz, sericite, and subopaque brownish leucoxene after tiny FeTi oxide granules. The weak foliation is defined by tiny veinlets of calcite and a definite elongation of the brown leucoxene spots throughout the rock. Disseminated pyrite grains, mainly less than 0.5mm across, constitute much less than 1 modal% of the sample, are quite ragged-edged and appear to have suffered some marginal resorption. They have well-developed pressure fringes of fibrous quartz.

This sample is probably a very strongly altered version of the aphyric basaltic lavas occurring around 538-549, and 558-561.5m

SAMPLE: 701516 (BRD 5, 622.2m)

SUMMARY:

This is a interbedded sandstone-shale unit in the Que River Shale, in which the sandy units are composed of felsic-volcanic derived detritus, especially altered formerly glassy felsic lava fragments.

HAND SPECIMEN

This is a fairly thinly-bedded sediment composed of pale grey arenite units showing weak grading separated by dark grey shale or siltstone layers. Very local soft sediment deformation buckling of layers is evident, and small-scale cross-bedding.

THIN SECTION DESCRIPTION:

The most coarse-grained of the arenitic units in this sample is composed of densely packed, fairly well-sorted fragments of devitrified lava, with sparse quartz crystal fragments, common leucoxenized FeTi oxide grains, and albite grains. The average grainsize of these fragments is around 0.2-0.4mm, and they are generally angular, and packed together by pressure solution at grain boundaries. The lithic fragments in these sandy layers are almost exclusively devitrified, formerly glassy fragments of probably dacitic to andesitic lava. Occasional albite phenocrysts are preserved in the devitrified glass, tending to rule out the likelihood that they are Hellyer basalt fragments, since the basalts lack plagioclase as a phenocryst phase. The devitrified glass in most fragments has crystallized as a very fine-grained mixture of albite, quartz and sericite.

Finer-grained silty to shaley interbeds contain much less abundant formerly glassy lithic fragments, and more detrital quartz and albite grains, plus a notable amount of detrital muscovite. These layers show a fairly well-developed foliation almost perpendicular to the bedding, with closely-spaced foliation planes being defined by concentrations of dark Fe oxides and/or carbonaceous material.

The fragments in this lithic sandstone interbed in the Que River Shale indicate derivation from a dominantly felsic volcanic source, leading to a dilution of the pelitic metamorphic detritus dominant in the shale itself. It presumably represents a turbidity current or mass flow deposit derived from volcanism or tectonic-induced slumping on the basin margins.

SAMPLE: 701517 (BRD 5, 685.5m)

SUMMARY:

This is a contact rock between a shale and basaltic glass, composed of clasts of shale and calcite-altered basaltic glass in a remobilized shaley matrix.

HAND SPECIMEN

This is a mixed contact rock from the contact between the base of the Que Rv shale and the Hellyer basalts. It consists of shale clasts up to several cm long set in a matrix of silt filled with angular clasts of polycrystalline white calcite.

THIN SECTION DESCRIPTION:

The large shale clast in this section is composed of small flakes of detrital muscovite and quartz, and some rather larger grains of subrounded albite and volcanic quartz clearly derived from a felsic volcanic source. This volcanic component separates this sample from Que River shales from higher in the sequence, which are apparently volcanic-free.

The dark matrix of the remainder of the sample appears to be mobilized shale very similar to the big shale clast in mineralogy, except that the volcanic component, dominated by albite and quartz crystal fragments, is more concentrated. Quite a strong foliation is present very locally in the thin section. The pale coloured clasts in this rock are clearly composed mainly of polycrystalline calcite. The nature of the rock they are replacing is equivocal, but ghost volcanic textures and chlorite patches are preserved in a few less altered spots in the calcite clasts. Most of the relic volcanic textures are composed of tiny crystallites of plagioclase in devitrified and chloritized glass. They probably represent basaltic glass fragments from the uppermost chilled surface of the top basalt flow, worked into the shale during movement along the contact between the shale and the basalt sequence due to pronounced ductility contrasts. Extensive pressure solution around many of the calcite clast margins, leading to concentrations of opaques in these regions and weak foliation development, supports the argument that the calcite clasts have been mobilized within the shale. Although it is difficult to be sure, it appears that calcite replacement of basaltic glass occurred syn- or pre-deformation. Minor pyrite or hematite-altered pyrite occurs disseminated in some calcite clasts.

SAMPLE: 701518 (BRD 5, 690m)

SUMMARY:

This is a breccia composed of a very fine-grained ash or tuff that has been blasted apart by olivine-phyric basalt erupting through the tuff and being quenched to glass in the process.

HAND SPECIMEN

This is shows a most unusual texture, being composed of broken up extremely fine-grained tuff or ash in which abundant quite large 'fragments', to 1cm, of strongly chloritized formerly glassy basalt are embedded.

THIN SECTION DESCRIPTION:

This sample exhibits a texture that I have not seen before. It is composed of a disaggregated exceptionally fine-grained tuff or ash in which no primary minerals are large enough to identify, being intruded and broken up by a glassy, strongly chloritized basaltic lava. The ash is breaking along a weak parting and being digested and somewhat rounded by the basalt. A single 6mm across lithic fragment of aphyric basalt or basaltic andesite identical to samples from 538.5m and 545.9m, consists of albitized plagioclase laths in a chloritized formerly glassy mesostasis. This lithic fragment is clearly embedded in the tuff, and not related to the olivine-phyric glassy lava that is exploding this tuff/ash.

Approximately half of this rock consists of pale green chlorite containing a variety of unusual textures, and chlorite-magnetite-quartz -calcite pseudomorphs after quite large (1-3mm long) olivine phenocrysts. Abundant small ovoid spots of chlorite in differing optical orientation to surrounding chlorite at first glance resemble vesicles, but are unlike vesicles I have seen in other glassy lavas.

This sample shows strong calcite alteration of both the chloritized glass and the tuff; this is, in my opinion, more intense than might be expected from regional low-grade alteration, and may be due to local hydrothermal alteration. I think the best explanation for the origin of this unusual sample is that it represents the (altered) product of basaltic lava blasting through water-lain, water-saturated very fine-grained ash or tuff. The abundant water in the tuff would effectively quench the basalt to glass, and the basalt would disaggregrate the tuff. This could probably be checked from the core.

SAMPLE NUMBER: 701519 BRD 05 (691.7m)

SUMMARY:

This was a brecciated glassy olivine-rich mafic basalt or hyaloclastite. It has suffered intense chlorite-carbonate alteration and weak foliation development, and contains quartz-calcite veinlets that crosscut the foliation, in which quite abundant fine-grained pyrite occurs.

HAND SPECIMEN:

This is a sample of a large (~15cm max dimension) volcanic fragment in a coarse lava breccia or hyaloclastite. It is a strongly chlorite-altered formerly highly glassy, rather vesicular lava charged with abundant carbonate-altered mafic phenocrysts.

THIN SECTION:

This is an exceptionally strongly altered formerly highly glassy lava breccia or hyaloclastite. The rock is streaked out into 1-2mm long domains of devitrified glass with occasional altered microlites of olivine and or augite, all immersed in a very pale green, strongly anomalous blue birefringent chlorite. Most of the devitrified glass has been replaced by very fine-grained pale brown carbonate (siderite?). The intensely chloritized areas retain no original texture, and in fact, seem almost foliated. Former olivine phenocrysts, some up to several mm long, are occasionally discernible, and often contain small chromite euhedra. The former olivines are replaced by very fine-grained aggregates of quartz and calcite. Almost euhedral, very small magnetite or hematite grains are abundant in the devitrified glassy areas, but are uncommon within chlorite. Former vesicles are calcite-filled, and have been bluntened at the ends intersecting the weak foliation.

A 5mm wide vein of quartz-carbonate-pyrite crosscuts the foliation at a high angle. The cores of these veins have coarse-grained polygonal calcite intergrown with each other, whereas the marginal areas of veins are formed of curved ribbon quartz riddled with fine-grained pyrite; the latter almost forms continuous bands in places.

This sample was a brecciated glassy picritic (olivine-rich) basalt.

SAMPLE: 701520 (BRD 5, 700.5m)

SUMMARY:

This is a strongly altered, formerly highly glassy olivine+augite-phyric primitive basaltic lava with minor calcite-quartz-pyrite alteration.

HAND SPECIMEN

This sample is an altered porphyritic basalt that shows the typical mottled texture resulting from incipient (quench) crystallization of glassy margins of basalt flows and pillows. It contains calcite veinlets with minor pyrite mineralization.

THIN SECTION DESCRIPTION:

In thin section, this sample is seen to be highly altered and extensively replaced by fine-grained silica and calcite. It was clearly a strongly olivine+ augite--phyric highly glassy basalt. Olivine phenocrysts make up at least 15 modal% of this sample and are perfectly formed euhedra up to about 1.5mm long; they have, however, been entirely replaced by an aggregate of fine-grained granular quartz. Small red chromite inclusions are present in occasional olivine pseudomorphs. Former augite phenocrysts are also well-formed euhedra that are somewhat less abundant than olivine. They have been pseudomorphed by dirty brown calcite and some patchy albite, and frequently have very narrow rims of colourless chlorite.

The groundmass of this sample was originally highly glassy, with spherulitic patches of incipient crystallization of acicular and dendritic augite in altered glass. The glass has altered to either a messy isotropic brown aggregate peppered with secondary quartz and calcite and fairly common euhedral pyrite(?) cubes, or else heterogeneous pale green chlorite spattere with calcite. Quite large patches of secondary quartz and calcite are present, and both are associated with minor pyrite.

This sample was clearly a highly glassy flow margin of a very primitive olivine+augite-phyric basalt. It would be worth sampling this important unit further away from the flow margin to avoid the extensive alteration of this formerly highly glassy sample.

SAMPLE: 701521 (BRD 5, 713.1m)

SUMMARY:

This is a formerly glassy lava breccia derived from olivine-phyric basalt erupting explosively through water-laden very fine-grained tuff.

HAND SPECIMEN

This sample is a very strongly chloritized and calcite-veined autobrecciated, formerly glassy basaltic lava with two types of fragments, fine-grained pale grey, and more coarse-grained dark grey, to around 2cm long in a matrix apparently composed of the lighter grey material.

THIN SECTION DESCRIPTION:

In thin section, this sample is seen to be a complex and highly altered lava breccia composed of two types of fragments. The darker clasts are composed almost entirely of chlorite replacing glass, and contain abundant but poorly defined (due to extensive calcite overprinting) pseudomorphs after olivine and augite phenocrysts. These fragments show bizarre textures, similar to those noted for sample 690m, in which ovoid spots of chlorite, initially seeming like filled vesicles, are in fact probably chloritized glassy lapilli beads spalled of the cracking and sputtering flow as it erupts through water-saturated fine tuff. Streaky calcite overprints more than 50 modal% of these chloritic fragments.

The lighter grey fragments and matrix areas are composed of a very even-textured, exceptionally fine-grained material that may be either tuff, or devitrified and altered basaltic glass; I favour the former. Several quite large chromite phenocrysts are also present in this sample.

The texture of this sample, complicated as it is by extensive calcite overprinting, is difficult to interpret. I suggest a similar scenario to that proposed for sample 690m, involving olivine-phyric basalt intruding explosively through water-laden fine-grained tuff or ash. The extensive calcite alteration is far more than might be expected from regional alteration, and may be of local hydrothermal origin.

SAMPLE: 701522 (BRD 5, 715.1m)

SUMMARY:

This is possibly a highly chlorite-carbonate altered formerly glassy lapilli tuff derived possibly from fountaining of primitive olivine-phyric basaltic lava into shallow water.

HAND SPECIMEN

This is a complex, messy rock composed of chlorite-carbonate altered formerly glassy lava fragments in a chloritic matrix. Narrow meandering pyrite veinlets are present.

THIN SECTION DESCRIPTION:

In thin section, this sample is seen to be essentially identical to the darker fragment variety in the previous sample, being composed of totally chlorite+calcite-altered glass in which abundant former olivine phenocrysts are replaced by aggregates of fine-grained quartz. The texture of this sample is most unusual, and is dominated by ovoid and flattened bodies of chloritized glass in a matrix composed of angular chloritized glassy lava fragments and probably glassy basaltic ash. The texture is best assigned to an origin in which olivine-phyric primitive basaltic lava is erupting explosively in shallow water, leading to quenching, spalling and sputtering of the glassy lapilli produced by the basalt-water reaction, and the accumulation of this material as a lapilli tuff. Abundant calcite overprints this sample, occurring as veins and small patches throughout the chlorite-rich matrix.

SAMPLE: 701523 (BRD 5, 727.5m)

SUMMARY:

This is a very well-preserved olivine+augite-phyric primitive basalt cut by a foliated calcite vein with marginal pyrite cubes.

HAND SPECIMEN

This is a massive, non-vesicular finely porphyritic basalt with a prominent calcite veinlet.

THIN SECTION DESCRIPTION:

This is a well-preserved olivine+augite-phyric basaltic lava with around 10-12 modal% of altered olivine phenocrysts and a similar amount of fresh augite phenocrysts in a vitrophyric matrix. The olivine phenocrysts are well-formed euhedra to about 2mm long that have totally altered to aggregates of fine-grained secondary quartz. Some contain tiny reddish chromite euhedra. The augite phenocrysts are mainly less than 1mm long stubby prisms that are entirely fresh.

The groundmass of this sample is a vitrophyric intergrowth of acicular plagioclase (albitized) and products of devitrification of basaltic glass, mainly pale green chlorite, albite and secondary quartz, riddled with tiny leucoxene granules after FeTi oxide grains.

The calcite vein in this sample shows pronounced foliation, with the calcite crystals growing in a pronounced parallel orientation, with pyrite cubes growing irregularly distributed along the contact between the calcite and the altered lava.

SAMPLE NUMBER: 701524 BRD 05 (738.0m)

SUMMARY:

This is a distinctive sparsely olivine+augite-phyric basaltic lava with notably less phenocryst content than the other porphyritic basalts described in this report.

HAND SPECIMEN:

This is a porphyritic, well-preserved basaltic lava cut by a few calcite veinlets, and containing small (mm-sized) spots of black chlorite. It is clearly separated by a flow margin from the sample described from 729m (field notes).

THIN SECTION:

This is a well-preserved augite+olivine-phyric basaltic lava that differs from many other porphyritic basalts from this hole in several respects. Firstly, it contains far less abundant phenocrysts, particularly of augite, than other basalts such as that at 727m. Secondly, it contains a rather more crystalline, less glassy groundmass than most of the other basalts, although still clearly a volcanic (not dyke-type) texture.

The augite phenocrysts make up around 2-3 modal% of the sample, and are mainly less than 0.5mm long. Most are small euhedral prisms with altered margins and alteration along cracks and cleavage planes through the crystals. Olivine phenocrysts probably constituted more than 5 modal% of this sample, and are totally altered to fine-grained aggregates of quartz and chlorite; many contain small chromite inclusions.

The groundmass is composed of sericitized small laths of albite, with interstitial plates of augite (much of it altered), with interstitial quartz and chlorite. It clearly contained less glass than many of the Hellyer-type basalts described from this hole. Small, flattened streaks of chlorite are probably fracture fillings rather than chlorite-filled vesicles.

This sample is notably different from the other basalts in thishole, and should be analyzed.

SAMPLE: 701525 (BRD 5, 751.5m)

SUMMARY:

This is a small mass flow unit in basalt that consists of black shale and angular dacite lava fragments in a silty ash or epiclastic matrix.

HAND SPECIMEN

This is a coarse polymict epiclastic breccia within a thick basalt sequence. Clasts of shale to 10 cm long, with thin pyritic layers, and also small clasts of pyrite aggregates are notable.

THIN SECTION DESCRIPTION:

The largest clast in this section is a very fine-grained micaceous shale with detrital muscovite flakes and small quartz grains visible in a dark cleaved matrix; this is indistinguishable from samples of the Que River Shale (eg sample 701502). It contains a single centimeter-sized clast of a quenched dacitic lava with sparse albite phenocrysts. The matrix of the remainder of the rock is a silty tuff or ash in which are set abundant sericitized quite large feldspar crystals, and very angular fragments of the same sparsely plagioclase-phyric dacite that occurs as a clast in the shale. These are all composed of less than a couple of percent of albite phenocrysts set in a swirling mesh of plagioclase (albitized) laths with interstitial secondary quartz and albite after devitrified glass. Some dacite fragments show an extraordinary concentration of small granular opaques, but without reflected light examination, it is impossible to tell whether these are pyrite or magnetite-hematite. Another large clast in this rock is a totally chlorite+quartz-altered formerly very primitive, olivine-phyric glassy basalt essentially identical to basalts and basalt breccias higher in the hole around 690-715m.

Although this is only a guess, I suggest that this sample is a small mass flow unit dumped during a break in the eruption of the abundant basalt flows in this part of the sequence. It probably derived by a violent dacitic eruption into the thick shale unit accumulating elsewhere (and earlier) in this basin, leading to brecciation of the dacite and mobilization of the sloppy shale across the local basin floor. This picked up all sorts of things in its passage, but mainly felsic crystal detritus and fragments of glassy olivine-phyric basaltic lava.

SAMPLE NUMBER: 701526 BRD 05 (754.3m)

SUMMARY:

This was an olivine+augite-phyric basaltic lava similar to that from 738.0m, but showing much more intense calcite alteration.

HAND SPECIMEN:

This is a somewhat vesicular basalt from immediately below a polymict mass flow unit in the basalt sequence.

THIN SECTION:

This is quite strongly altered basaltic lava with several notable features unlike the other basalts in this hole. It is fairly strongly vesicular (10-20 modal%), with the vesicles, which are mainly small er than 1mm across, being filled by fine-grained polygonal calcite, or palr green chlorite with no adjacent or intergrown calcite. Former olivine phenocrysts are altered to very fine-grained quartz and minor calcite aggregates, and sometimes contain small chromite inclusions. Former augite phenocrysts are less easily iddentified with certainty, but are almost certainly present, replaced almost entirely by pale-brownish fine-grained calcite.

An interesting and unusual feature of this sample is the presence of three albite xenocrysts. These are strongly rounded and reacted crystals to about 2mm across. They are presumably derived from felsic volcanics and incorporated into this basalt by mixing with felsic magma, or as accidental inclusions picked up during eruption.

The groundmass of this sample is also distinctive, being notably more feldspar-rich and glass poor (ie. more crystalline) than other basalts described herein, except that from 738.0m. The groundmass consists of albite laths and microlites that show sweeping flow lines around altered phenocrysts. Interstitial to the albite laths are chloritized augite plates and tiny leucoxenized FeTi oxides.

This was probably an olivine+augite-phyric basaltic lava, related to that from 738.0m. It has, by contrast to the latter, suffered quite strong calcite alteration, perhaps related to the proximity to the porous mass-flow unit above it.

SAMPLE: 701526A (BRD 5, 784.0m)

SUMMARY:

This is a slightly vesicular augite+olivine-phyric basaltic lava.

HAND SPECIMEN

This is a massive grey porphyritic, weakly vesicular basaltic lava.

THIN SECTION DESCRIPTION:

This is a texturally well-preserved porphyritic basaltic lava with abundant phenocrysts of fresh augite and altered olivine, in a vitrophyric groundmass in which rounded, filled vesicles are not uncommon. Augite phenocrysts make up around 20 modal% of this sample; they are dominantly euhedral prisms to around 1mm long, that often occur intergrown or in clots of four or five crystals. They are mainly perfectly fresh, except for a few crystals that have pleochroic pumpellyite in their cores. Several modal% of this sample is made up of altered euhedral olivine crystals, some up to 1.5mm long, that are totally replaced by calcite, prehnite, pumpellyite and dirty brown-green chlorite. Many of these contain chromite inclusions.

Vesicles make up around 1-2 modal% of the rock and are filled by several different asemblages of secondary minerals. The dominat vesicle filling is crystalline calcite, although vesicles filled by either radiating bundles of colourless prehnite, or green to colourless pleochroic pumpellite are common. Several vesicles are filled by fibrous yellow epidote.

The groundmass of this lava is composed of albitized plagioclase laths with interstitial, much less abundant augite grains, set in a devitrified glassy mesostasis. The metamorphic grade of this sample is clearly prehnite-pumpellyite facies, and very mild hydrothermal overprinting is probably responsible for the calcite alteration and vesicle-fillings.

SAMPLE: 701527 (BRD 5, 821.5m)

SUMMARY:

This sample was a glassy olivine-rich basaltic lava that has suffered extensive devitrification of the groundmass glass.

HAND SPECIMEN

This is an altered mafic lava with abundant altered mafic phenocrysts.

THIN SECTION DESCRIPTION:

This is a very strongly altered formerly glassy picritic (very olivine-rich) lava. The extent of alteration makes it difficult to estimate the abundance of former olivine phenocrysts, although it was almost certainly more than 20 modal%. Also, alteration precludes determining if any of the former mafic phenocryst population was augite, although I suggest that very little augite was present. The former olivine phenocrysts are up to 2mm long, and most occur as single euhedral crystals, although some multi-crystal aggregates are present. Small reddish chromite euhedra are present as inclusions in many olivines. The former olivine phenocrysts are variably replaced by an irregular intergrowth of very low-birefringent chlorite or serpentine, and fine-grained calcite and minor patchy secondary quartz.

The matrix of this sample was glass in which tiny acicular plagioclase microlites are scattered irregularly and abundantly. The glass has devitrified to a subopaque microcrystalline intergrowth in which small spots of chlorite and very fine-grained messy, almost isotropic epidote are dispersed in a manner almost defining a foliation. Parallel with this weak foliation are a few narrow veinlets of quartz and crystalline pale yellow epidote, intergrown with an opaque mineral, probably hematite.

SAMPLE: 701528 (BRD 5, 864.2m)

SUMMARY:

This is a very well-preserved fairly primitive augite+ olivine-phyric basaltic lava.

HAND SPECIMEN

This is a massive mid-grey finely porphyritic basaltic lava.

THIN SECTION DESCRIPTION:

This is a very well-preserved augite+olivine-phyric basaltic lava with a vitrophyric groundmass. It is composed of about 20 modal% of fresh augite phenocrysts and 2-3 modal% of altered olivine phenocrysts. The augite phenocrysts are mainly 0.5-1mm long, but some crystals up to 2mm long are present. They are perfectly fresh euhedral crystals, often in multi-crystal clots, that show significant compositional zoning from cores to rims, as indicated by uneven extinction. They are free of opaque inclusions, but some crystals contain small chloritized melt inclusions. The olivine phenocrysts are totally altered to a very fine-grained aggregate of secondary quartz with subordinate chlorite and calcite. Many former olivine crystals contain small chromite inclusions.

The groundmass of this sample is fairly even-textured, composed of small granular augites and sericite-altered albite microlites set in devitrified glass that occasionally contains small yellow epidote grains. The sample is very slightly vesicular, with the vesicles now being filled by a zoned assemblage from very fine-grained chalcedonic quartz at the margins, to coarse-grained quartz and albite, and sometimes chlorite in the cores. The sample is cut by some very narrow veinlets of quartz in which possible barite was tentatively identified in several places.

SAMPLE: 701529 (BRD 5, 886.8m)

SUMMARY:

This is a finely augite+olivine-phyric basalt.

HAND SPECIMEN

This is a massive dark grey, finely porphyritic basaltic lava ; it is cut by very narrow calcite veinlets.

THIN SECTION DESCRIPTION:

This sample consists of around 20 modal% of small, equidimensional augite phenocrysts and sparse totally altered olivine phenocrysts in a vitrophyric groundmass. The olivine phenocrysts are altered to quite variable assembalges in which very fine-grained secondary quartz and prehnite are dominant. The augite phenocrysts mainly occur as small clots of euhedral, equidimensional crystals, each generally less than 0.5mm long. Over part of the section, the augite crystals are wholly replaced by fine-grained dirty brown calcite. A number of 1mm-sized quartz grains with very fine-grained reaction boundaries are present in the sample, and may represent xenocrysts picked up during ascent of the magma.

The groundmass of this sample is charged by acicular albite microlites interspersed by calcite-altered small granular augite crystals and leucoxene blebs after tiny FeTi oxide grains. Interstitial glass is altered to fine-grained albite and quartz, with minor chlorite and yellow epidote. The sample is cut by a thin veinlet of devitrified basaltic glass that clearly intruded along a cooling crack in the crystallizing lava, suggesting proximity to a flow (pillow?) rim. Narrow calcite veinlets cut the sample.

SAMPLE: 701530 (BRD 5, 904.9m)

SUMMARY:

This is an augite+olivine-phyric basaltic lava.

HAND SPECIMEN

This is a massive dark grey porphyritic basaltic lava with calcite alteration as small patches and veinlets.

THIN SECTION DESCRIPTION:

This sample is a porphyritic basaltic lava composed of clots of small augite phenocrysts and single totally altered olivine phenocrysts set in a vitrophyric matrix. The augite phenocrysts make up around 20 modal% of this sample. They occur mainly as small clots to about 0.6mm across of subhedral to anhedral crystals that show incipient alteration to dirty subisotropic brown epidote(?). Former olivine phenocrysts are altered to very fine quartz- or quartz-calcite aggregates, and make up about 2-4 modal% of the sample.

The groundmass of this rock is composed of randomly-orientated albite microlites as laths to about 0.1mm long maximum, and granular small augite grains set in a very low-birefringent chlorite-dominated matrix after glassy mesostasis. Several rounded patches filled by secondary quartz are probably former vesicles. Two or three subparallel shear zones transect the sample. These are about 1mm wide and are composed of granulated basalt in which alteration has proceeded to a much greater degree than in the remainder of the rock, with formation of abundant epidote and chlorite.

SAMPLE: 701531 (BRD 5, 927.8m)

SUMMARY:

This is a pillow margin sample of an augite+olivine-phyric basaltic lava; it is somewhat more altered (mainly calcite-quartz) than the previous sample.

HAND SPECIMEN

This is a somewhat vesicular porphyritic basaltic lava with common calcite spots and variable texture suggestive of a pillow margin; the sample contains relatively common veinlets of calcite.

THIN SECTION DESCRIPTION:

This sample was clearly an augite+olivine-phyric basaltic lava with a vitrophyric groundmass. The augite phenocrysts form around 20 modal% of this sample and are small (<1mm long) equidimensional crystals that mainly occur in clots containing several crystals. The augite is fresh. Former olivine phenocrysts are rarely larger than 1mm long, and are replaced, as in the previous sample, by microcrystalline quartz aggregates with minor calcite and chlorite; many contain small euhedral chromite inclusions. The olivine crystals probably made up less than 5 modal% of this sample.

Unlike the previous sample, this rock contains a relatively strongly altered groundmass, and not uncommon vesicles. The latter are filled by a variety of minerals; the most common vesicle filler is coarse-grained polygonal quartz, often intergrown with yellow epidote that may be either crystalline, or as fans and sheaves with radiating extinction. Several vesicles contain abundant pumpellyite as pale green to pale brown pleochroic masses with fan like extinction. Granular hematite is common in vesicle minerals. The groundmass is composed of devitrified glass in which are embedded tiny acicular albite microlites and small anhedral augite plates. The amount of glass clearly varies across the slide, as does the abundance and size of the plagioclase microlites growing in the glass. A veinlet of devitrified glass transects part of this rock, probably representing a crack through the pillow margin into which lava oozed out and quenched.

This sample was certainly a pillow margin, as indicated by the rapid change in groundmass texture and crystallinity, plus the glassy veinlet cutting the sample.

SAMPLE: 701532 (BRD 5, 952.7m)

SUMMARY:

This is an augite+olivine-phyric pillow basalt with weak pyrite mineralization along a formerly glassy veinlet. It is essentially identical to sample 701528.

HAND SPECIMEN

This is a massive finely porphyritic basalt cut by a dark band containing disseminated pyrite, and weak calcite alteration.

THIN SECTION DESCRIPTION:

In most respects, this sample is a very well-preserved basalt essentially identical to sample 701528 from a depth of 864m in this core. The augite is perfectly fresh, but the olivine is altered to colourless to very pale green chlorite or serpentine (and not polycrystalline very fine-grained quartz as in the two previous samples).

The groundmass of this sample varies slightly texturally across the slide from almost completely devitrified glass free of microlites, to devitrified glass charged with tiny albite microlites. This again probably indicates proximity to a pillow rim, as does the presence of a meandering veinlet of devitrified glass containing augite phenocrysts. Pyrite grains to almost 1mm occur within the basalt along the margins of the glassy veinlet

SAMPLE: 701533 (BRD 5, 977.9m)

SUMMARY:

This is an excellent basaltic hyaloclastite composed of formerly glassy fragments less than 4mm across derived from an augite+olivine-phyric lava erupted into water.

HAND SPECIMEN

This is a massive rather mottled dark grey-green porphyritic basalt.

THIN SECTION DESCRIPTION:

Thin section examination shows that this sample is a beautifully preserved basaltic hyaloclastite. It consists of angular fragments of devitrified basaltic lava fragments, mostly less than 4mm long. The phenocryst assemblage in the formerly glassy basalt fragments is dominated by perfectly euhedral augite phenocrysts to a maximum of 2mm long. A few large olivine phenocrysts are altered to albite, quartz and chlorite.

The formerly glassy groundmass of this sample has completely crystallized as patchy, fairly coarse-grained albite and quartz. A prominent feature of this sample is the relatively abundant and large filled vesicles in the former glass. These are up to almost 2mm across, but most are o.5-1mm across. They are mainly filled with albite and quartz, and only a very dark film of Fe oxide around the vesicle margins enables them to be distinguished from the recrystallized matrix. A small percentage of vesicles are filled by chlorite.

This sample is clearly a product of highly explosive brecciation of basaltic lava in water, with subsequent compaction and devitrification/crystallization of glass and filling of vesicles during low-grade burial metamorphism.

SAMPLE: 701534 (BRD 5, 982.9m)

SUMMARY:

This is vesicular pillow margin of an augite+olivine-phyric basalt; it has suffered rather stronger calcite alteration than many of the other basalts in this hole.

HAND SPECIMEN

This is a pale grey-green strongly altered basaltic lava with calcite patches and veinlets, and dark patches of chlorite (?).

THIN SECTION DESCRIPTION:

This sample is the pillow margin of a flow of vesicular augite+ olivine-phyric basalt. The phenocryst assemblage in this sample consisted of around 15 modal% of euhedral augite crystals, and 2-4 modal% of totally altered olivine. The largest augite phenocrysts are around 2mm long, and augites commonly occur in clots of several crystals, often intergrown. Olivine phenocrysts are replaced entirely by calcite that appears to be overprinting an earlier alteration phase dominated by patchy quartz.

The groundmass texture changes across the slide from dense, isotropic devitrified glass free of crystallites, to isotropic devitrified glass charged with tiny dendritic and spherulitic crystallites. This reflects increasing proximity to a pillow margin, in which the glass chilled without crystallization of quench pyroxenes or plagioclase. The sample contains around 5-10 modal% of vesicles, clearly concentrated in the pillow rim, and mainly less than 1mm across, that are filled by patchy to fibrous quartz strongly overprinted by calcite.

The sample contains small veinlets of quartz intergrown with pale yellow epidote-clinozoisite rhombs and minor hematite, and overprinted by calcite. Calcite also occurs as small patches in the groundmass, and one large (>3mm long) patchy of dusty prehnite overprints an area of formerly glassy groundmass. The concentration of augite phenocrysts in the groundmass is clearly greater in the pillow rim than slightly further in the sample, suggesting that some dissolution of glassy matrix has occurred, concentrating the phenocrysts.

The alteration in this sample is dominated by a strong calcite overprint upon the simple burial metamorphic assemblage. This probably reflects the increased porosity of the flow margin to migrating fluids, even well after burial.

SAMPLE: 701535 (BRD 5, 1018.0m)

SUMMARY:

This is a strongly altered augite+olivine-phyric basaltic lava in which the largely glassy groundmass has been extensively replaced by epidote followed by calcite.

HAND SPECIMEN

This is an extensively altered and brecciated former mafic lava with intense epidote-calcite alteration

THIN SECTION DESCRIPTION:

The brecciated texture of this sample evident in hand specimen is much less evident in thin section. However, the sample was very clearly an augite+olivine-phyric basaltic lava with a a largely glassy groundmass in which elongate plagioclase microlites occur commonly. The augite phenocrysts are fresh euhedral crystals mainly 0.5-1.5mm long, that make up around 10-15 modal% of this sample. Considerably less abundant olivine phenocrysts are altered to quartz and calcite.

The groundmass of this sample is extensively altered to fine-grained epidote, growing with fibrous to patchy prehnite and rare bright green pumpellyite in an albite-quartz base, the entire assemblage replacing devitrified glass. Abundant calcite overprints large areas of groundmass and phenocrysts, and often occurs as intergrowths of coarse crystals that show rather ragged grain boundaries between adjacent rhombs.

The intense epidote-dominated alteration of this sample is also characteristic of permeable flow-boundary alteration involving quite oxidizing fluids. The brecciated texture in hand specimen is probably the result of intensive alteration and crack-sealing rather than primary volcanic brecciation.

SAMPLE: 701536 (BRD 5, 1032.2m)

SUMMARY:

This is a well-preserved augite+olivine-phyric basaltic lava pillow rim.

HAND SPECIMEN

This is a massive dark grey porphyritic basaltic lava with abundant small black chloritic spots and streaks.

THIN SECTION DESCRIPTION:

This sample is a well-preserved pillow rim of an augite+olivine-phyric pillow lava flow. The fresh augite phenocrysts make up around 20 modal% of the rock and occur as well-formed crystals mainly from 0.5-1mm long, but commonly occurring as intergrown crystals in crystal clots. Former olivine crystals made up about 5 modal% of the rock, and are now replaced by intergrowths of very low-birefringent chlorite, minor quartz and calcite. They occasionally contain small euhedral chromite inclusions.

The groundmass of this sample changes texture across the slide from devitrified glass free of crystallites to devitrified glass charged with small augite microlites and much less abundant albitized plagioclase microlites. This textural change is characteristic of that from the outer margin of a pillow rim. Narrow chlorite-epidote-quartz veinlets cut this sample, but the extent is much less than the two preceding samples.

This is an excellent example of the pillow basalts that dominate this drillhole from around 690-1035m, and would be ideal for an isotopic study of the well-preserved abundant augites.

SAMPLE: 701537 (BRD 5, 1035.0m)

SUMMARY:

This is a pillow rim of an augite+olivine-phyric basalt flow that has suffered variable but intense calcite alteration.

HAND SPECIMEN

This is a grey, vesicular porphyritic basalt cut by a wide patch or vein of bleaching and calcite alteration.

THIN SECTION DESCRIPTION:

The less altered section of this sample is an augite+olivine-phyric basaltic lava mineralogically identical to the preceding sample. It is however, strongly vesicular, with at least 20 modal% of large vesicles filled by coarse-grained calcite that is overprinting much finer-grained quartz and albite intergrowths. Almost colourless chlorite fills manyangular tension gashes and small vesicles in the sample.

The groundmass of this part of the rock is clearly evitrified basaltic glass free of crystallites, implying proximity to a pillow margin.

The bleached part of this sample is simply the same lava thoroughly soaked in calcite. The groundmass of this section of the lava shows abundant small altered pyroxene microlites in the devitrified glass, implying it was slightly further into the pillow than the other half of this section. Not only is calcite abundant in the vesicles, but it occurs as finely-crystalline grains throughout the groundmass, and also as anastomosing veins and blotches.

This sample, from close to the base of the thick basalt unit, has been strongly calcite-altered, with carbonate-precipiting fluids probably having easy access to the basal basalts along the lower contact between the basalts and the dacites.

SAMPLE: 701538 (BRD 5, 1046.0m)

SUMMARY:

This is a albite-phyric felsic vitric crystal tuff with a matrix of very fine-grained devitrified glass and patchy quartz-albite, and chlorite alteration.

HAND SPECIMEN

This is a massive dark grey sparsely plagioclase-phyric dacitic lava (?) with a feint flow(?) banding and cloudy patches of more intense albite-quartz±pyrite alteration.

THIN SECTION DESCRIPTION:

Thin section examination of this sample shows that it is most probably a crystal tuff with an exceptionally fine-grained recrystallized glassy groundmass. It contains around 5 modal% of albite crystal fragments mainly less than 1mm long. These commonly occur as clots still with angular and broken outlines.

The groundmass is mainly almost isotropic devitrified glass probably of silt size originally, although the devitrification has obscured the original texture of the matrix. Highly irregular patches, some up to 5mm long, have recrystallized as relatively coarse-grained quartz and albite containing disseminated fine-grained pyrite. Less abundant are quite large patches of green chlorite-dominated alteration, with small islands and almost prismatic patches of albite and quartz immersed in it. Veinlets of quartz transect the sample, and highly irregular convoluted stylolitic seams defined by concentrations of altered opaques are common.

This sample almost certainly was a felsic vitric crystal tuff with a silty matrix dominated by glassy grains and shards(?) that have entirely devitrified.

SAMPLE: 701539 (BRD 5, 1053.7m)

SUMMARY:

This is a formerly glassy, sparsely plagioclase-phyric dacitic lava with occasional felsic or andesitic lava fragments; it has suffered fairly strong chloritic alteration.

HAND SPECIMEN

This is a dark green, chloritic heterogeneous-textured felsic rock containing a few pale grey felsic lava fragments up to at least 1cm long.

THIN SECTION DESCRIPTION:

This rock appears to be a rather chloritized dacitic lava that contains several exoticfragments of dacitic or andesitic lava. The main body of the sample consists of formerly glassy dacite lava containing around 3-5 modal% of albite phenocrysts to about 1mm long. These are mainly quite strongly altered, with chlorite flakes and patches, and dirty brown patches of microcrystalline epidote forming up to 80% of many crystals. Small FeTi oxide microphenocrysts are not uncommon, but are totally altered to leucoxene.

The groundmass of this sample was almost certainly glassy. The glass has crystallized as a texturally variable mosaic intergrowths of quartz, albite and green chlorite, laced in places by very fine-grained sericite.

The sample is cut by several types of veinlets, including fibrous quartz veins, very coarse-grained quartz-green chlorite veins, and a single cm-wide vein with a zoned assemblage from epidote-chlorite rimes to a polygonal quartz core overprinted by calcite.

The single exotic fragment sampled in this section is of an aphyric dacitic to andesitic lava composed of an intergrowth of acicular albite microlites and granular augite that has altered to dirty brown microcrystalline epidote. These are set in a devitrified formerly glassy matrix now composed of exceptionally fine-grained quartz and albite.

The extent of chlorite alteration of this sample is greater than typically seen in MRV dacites, and implies local hydrothermal alteration. To understand the significance of the lithic fragments in this dacitic lava, evidence from the core above and below the sample would be more informative than the thin section.

SAMPLE: 701540 (BRD 5, 1061.6m)

SUMMARY:

This is a strongly sericite-altered formerly glassy dacitic lava breccia cut by strong quartz-epidote-chlorite veining.

HAND SPECIMEN

This is a strongly altered felsic lava breccia composed of small (<1cm) lava fragments and feldspar crystal debris, most altered to brick red colour. The sample is cut by a wide vein of fibrous quartz-epidote.

THIN SECTION DESCRIPTION:

In thin section, it is difficult to perceive the original texture of this sample, due to the strong alteration. However, it is clear from the hand specimen that the rock has a fragmental texture, and it is quite obvious in several places in the thin section that at least some of these fragments have excellent perlitic cracking through felsic glass. Quite large albitized and strongly sericitized plagioclase phenocrysts make up around 5 modal% of these fragments; the altered albite is quite strongly stained reddish, possibly by submicroscopic Fe oxide grains; the red feldspar so obvious in hand specimen is clearly not Kspar. Much of the formerly glassy groundmass of these fragments has altered to quartz and albite, then been strongly sericitized. Irregular patches of messy almost isotropic epidote and minor pale geren chlorite occur scattered through the sericite-rich groundmass.

The sample is cut by ribbon quartz veins that contain elongate yellow crystalline epidote and patchy bright green chlorite. The quartz-epidote-chlorite alteration clearly post-dates the sericite alteration.

SAMPLE: 701541 (BRD 5, 1066.2m)

SUMMARY:

This is a formerly glassy, sparsely plagioclase-phyric dacitic lava.

HAND SPECIMEN

This is a patchy green and cream strongly altered sparsely plagioclase-phyric felsic lava.

THIN SECTION DESCRIPTION:

This is a formerly glassy dacitic lava that contained around 3-5 modal% of albitized plagioclase phenocrysts mainly less than 1mm long. These have a dusty appearance, and are charged in many instances by messy isotropic microcrystalline brown epidote. The albite crystals commonly occur in clots of several crystals; they are mainly subhedral to slightly rounded. Fairly common tiny FeTi oxide microphenocrysts are all altered to leucoxene.

The groundmass of this sample was largely glassy. It has crystallized extensively during alteration to a rather heterogeneous textured mosaic intergrowth of quartz, albite and chlorite. Chlorite occurs in very variable concentrations, tending to patchy development. Calcite occurs as diffuse patches and discontinuous veinlets.

SAMPLE: 701542 (BRD 5, 1069.8m)

SUMMARY:

This is a felsic lithic tuff or relatively fine-grained polymict lava breccia composed of fragments of formerly glassy albite-phyric dacitic lava. The sample shows quite strong chlorite alteration.

HAND SPECIMEN

This is a dark green relatively porphyritic albite-phyric dacite lava or crystal tuff containing several cm-sized lithic clasts of very fine-grained felsic lava.

THIN SECTION DESCRIPTION:

This rock consists of about 10-12 modal% of pinkish albite phenocrysts and clusters of phenocrysts up to 3mm across, and several lithic clasts, set in a most unusual, heterogeneous-textured groundmass. The albite crystals are often slightly rounded, and are pinkish due to submicroscopic Fe oxide dust dispersed through the sample. Several quite large lithic clasts are present in the sample. These are formerly glassy felsic lava with diffuse, fine-grained snowflake devitrification textures and albite microlites and sparse microphenocrysts; the lithic fragments are notably chlorite-poor relatively to the remainder of the rock, but contain abundant tiny leucoxenized FeTi oxides.

The groundmass of this sample is very variable in texture and grainsize, and quite strongly chloritized. In several areas, devitrification has produced a very unusual texture of small-scale almost concentric zoning of quartz-albite, and chlorite. These probably represent enhancement of alteration that started along curved perlitic cracks in former glass. Yellow epidote is quite common as small patches and veinlets in the groundmass.

The texture is almost certainly fragmental, although the groundmass was clearly glassy. It is possible that the rock was composed of albite-phyric glassy lithic fragments and interstitial glassy ash, and that devitrification of the glass accompanying compaction and burial metamorphism produced a texture resembling a formerly glassy lava.

SAMPLE NUMBER: 701543 BRD 05 (1072.2m)

SUMMARY:

This was a glassy dacitic lava that has suffered strong silicification, with the result that a 'false pyroclastic' texture, rather like a lava breccia, has been produced.

HAND SPECIMEN:

This is a mottled, strongly altered green and greyish lava breccia with a few distinct dark green felsic lava fragments to at least 2cm long, and abundant albite phenocrysts and crystal debris. It is cut by several calcite veinlets to 15mm thick, and contains some pyrite aggregates about 3-4mm across. Extensive areas of the groundmass of this sample are strongly silicified, and the effect of this is to enhance or impart a 'brecciated' texture to the rock.

THIN SECTION:

This sample is a formerly very glassy felsic, probably dacitic lava or lava breccia. It contains around 5-8 modal% of albite phenocrysts in an entirely recrystallized formerly glassy groundmass. The albite phenocrysts occur both singly and in clusters of several crystals, and are mainly less than 0.5mm long. Many have very ragged margins, and appear to have reacted with the groundmass during devitrification-crystallization-silicification. They are free of alteration, but have a rather dusty appearance in plane polarized light, probably due to submicroscopic Fe oxide inclusions.

The groundmass of this sample is very clean, and almost chlorite-free, and has undoubtedly been strongly silicified. It consists of fine-grained intergrown quartz and very minor albite, with a sugary texture characteristic of extensive recrystallization-silicification. Weak spotty and diffuse calcite alteration overprints areas of groundmass, and quite a few euhedral pyrite cubes to about 1mm across occur through the groundmass..

This section has not sampled parts of the hand specimen obviously richer in chlorite. I suggest that this was a glassy dacitic lava or lava breccia in which the 'false pyroclastic' texture of Allan (1989) has been induced by extensive silicification, during which chlorite is eliminated from much of the rock, leaving only diffuse islands of original dacite that appear to be lava fragments.

SAMPLE NUMBER: 701544 and 701545 BRD 05 (1079.4m, 1081.8m)

SUMMARY:

These are essentially identical formerly quite glassy sparsely plagioclase+(sparse) augite-phyric dacitic lavas.

HAND SPECIMEN:

These are both massive, uniform dark green-grey, sparsely plagioclase-phyric dacitic lavas.

THIN SECTION:

These are very well-preserved sparsely plagioclase-phyric dacitic lavas containing around 5 modal% of albite phenocrysts and much less than 1 modal% of small chloritized augite phenocrysts. The albite phenocrysts occur as single crystals and also as multi-crystal clots, with most crystals being much less than 1mm long. They contain abundant chlorite inclusions parallel to crystal faces, replacing glassy melt inclusions. Small former augite phenocrysts to around 0.5mm max. length are totally replaced by bright green chlorite, and small FeTi oxide microphenocrysts are leucoxenized.

The groundmass of these samples was probably vitrophyric, composed of tiny feldspar crystallites and microlites set in glass. The glass has devitrified to quartz-albite±chlorite, and in the sample from 1079.4m an unusual blebby texture has developed in which equidimensional to almost rounded discrete blebs of quartz have grown from the very fine-grained groundmass quartz. Minor patchy calcite overprints parts of the groundmass, and a few very narrow calcite veinlets cut the sample.

These are both well-preserved dacitic lavas, essentially identical to those described from 1054-1066m.

SAMPLE: 701546 (BRD 5, 1090.3m)

SUMMARY:

This is a well-preserved sparsely albite-phyric dacitic lava with significant but not strongly developed chlorite alteration.

HAND SPECIMEN

This is a dark green mottled felsic lava with sparse albite phenocrysts and a distinct patchy devitrification texture characteristic of formerly glassy felsic lavas.

THIN SECTION DESCRIPTION:

This sample is a formerly glassy dacitic lava containing around 3-5 modal% of albite phenocrysts. These are mainly slightly rounded euhedral single crystals and subordinate crystal clots composed of slightly pinkish, and often quite strongly sericitized albite; chloritic spots aligned along growth zones in many crystals replace former glassy melt inclusions. Several small euhedral crystals about 0.5mm long now composed of chlorite were probably former augite crystals. Leucoxenitized former FeTi oxide microphenocrysts are not uncommon.

The groundmass of this sample is mainly a very uniform fine snow-flake textured albite-quartz±chlorite intergrwoth after glass. However in several places narrow chlorite veinlets flare out into quite coarse-grained albite-chlorite-quartz intergrowths that probably represent tension gash fillings. The sample is transected by abundant narrow veinlets of green chlorite that intersect and form quite large rather spots to 3 or 4 mm across of intergrown radiating chlorite.

SAMPLE: 701547 (BRD 5, 1097.7m)

SUMMARY:

This is a dark green well-preserved sparsely albite-phyric dacitic lava.

HAND SPECIMEN

This is a dark green mottled felsic lava with sparse albite phenocrysts and a distinct devitrification texture characteristic of formerly glassy felsic lavas. Chloritic fracture planes contain common disseminated pyrite.

THIN SECTION DESCRIPTION:

This is a fairly well preserved formerly glassy dacitic lava. It contains around 5 modal% of albitized plagioclase phenocrysts that are mainly less than 1mm long, slightly rounded euhedra that occur most frequently in clots of crystals. Chlorite inclusions paralleling crystal faces define rows of former melt inclusions. The albite phenocrysts are patchiliy altered to sericite and dirty brown submicroscopic epidote aggregates. A few small chlorite-calcite pseudomorphs after augite microphenocrysts are also present, and the relatively abundant former FeTi oxide microphenocrysts are replaced by leucoxene.

The groundmass of this sample was formerly glassy. It has devitrified, then crystallized originally to a snowflake texture very similar to that shown by the preceding sample. However, further recrystallization has resulted in growth of quartz from the snowflake textured groundmass, so that the grainsize of quartz in this rock's groundmass is notably coarser than in the previous sample. The final appearance of this sample is blebs of quartz and subordinate albite separated by narrow curving screens of messy green chlorite containing abundant tiny former FeTi oxides.

This sample is very similar indeed to the previous sample, the only difference being the degree of (re)crystallization of the formerly glassy groundmass. This, and the sample from 1090.3m, might well be from the same flow unit. As for the previous sample, the amount of chlorite is somewhat greater than many dacites from the MRV, but not enough to say that the sample has been strongly chloritized.

SAMPLE: 701548 (BRD 5, 1099.9m)

SUMMARY:

This is probably an autobrecciated dacitic lava; it has been quite strongly chloritized, particularly in veins.

HAND SPECIMEN

This is a dark green polymict felsic lava breccia with most lava fragments less than 1cm across, but including a fractured fine-grained pale coloured felsic fragment traversed by dark chloritic veinlets.

THIN SECTION DESCRIPTION:

As is typical for autobrecciated formerly glassy felsic lavas, the brecciated texture is far more pronounced in hand specimen than in thin section. Most of the lava fragments discernible in this rock appear to be from a single flow, with the exception of the large pale coloured fragment noted in the hand specimen description. The dominant fragment type in this rock is a dacitic to andesitic lava containing around 3-5 modal% of albitized plagioclase phenocrysts in a very fine-grained groundmass that probably was much less glassy than in the dacitic lavas described above. The feldspar phenocrysts are mainly less than 1mm long and are fairly strongly sericitized. Small FeTi oxide microphenocrysts are leucoxenized. Angular fillings between lava fragments are filled by clumps of albite phenocrysts immersed in green chlorite with common small ragged pyrite and yellowish-brown epidote granules. Veinlets of chlorite are abundant, some reaching 5-6mm wide.

The pale coloured clast is a formerly glassy sparsely plagioclase-phyric dacitic lava with an extensively devitrified and crystallized groundmass now composed dominantly of ragged intergrown mosaics of quartz and albite, almost chlorite-free.

This sample is probably an autobrecciated or hydrofractured dacitic lava in which a few exotic clasts have been incorporated. In fact, given that the dominant fragments have less glassy groundmasses than most dacites in this set of samples, these may represent the interior portions of a thicker cooling unit; the pale-coloured formerly glassy fragments might be from the glassy rim of the same flow, incorporated during eruptive brecciation. The sample is strongly chlorite-altered, and contains disseminated pyrite.

SAMPLE: 701549 (BRD 5, 1118.4m)

SUMMARY:

This is a formerly glassy sparsely albite-phyric dacitic lava or lava breccia that has suffered patchy alteration with domains of strong silica-calcite overprinting, and less voluminous areas in which chloritization is more important.

HAND SPECIMEN

This is a dark green mottled felsic lava breccia with sparse albite phenocrysts and common quite large pale pink-cream patches of silicification and calcite alteration.

THIN SECTION DESCRIPTION:

The unusual texture of the groundmass of this strongly altered formerly glassy dacite lava breccia immediately recalls sample 501542 (from 1069.8m). The sample is texturally highly variable, making it very difficult to determine whether the rock was originally a glassy lava breccia, or whether the apparent 'brecciation' is alteration-produced, and the rock was originally a glassy massive lava. Certainly the boundary between pale-coloured silica-calcite altered areas of the sample, and the chlorite-altered areas is diffuse and gradual. Both domains are composed of sparsely albite-phyric formerly glassy dacitic lava. In the pale areas, both the albite phenocrysts and the mosaic quartz-albite groundmass is strongly overprinted by calcite alteration, and chlorite is quite rare. In contrast, the darker areas are characterized by unusual textures in which former perlitic cracks in devitrified glass are picked out and enhanced by green chlorite.

This sample was a glassy dacite lava or lava breccia that has suffered fairly strong carbonate alteration, and less intense chlorite alteration, the latter being restricted to small irregular domains.

SAMPLES: 701550 (BRD 5, 1164.9m), 701551 (BRD 5, 1166.2m) and 701552 (BRD 5, 1180.4m)

SUMMARY:

These are essentially identical well-preserved albite- and (sparse) augite- phyric dacitic or high-Si andesite lavas. Part of sample 701550 is strongly overprinted by a calcite-sericite alteration.

HAND SPECIMEN

These are grey-green very well-preserved dacitic lavas with relatively abundant albite phenocrysts; 701550 shows a distinct bleached area in which the greenish groundmass is altered to pink-cream over a distance of less than 2mm.

THIN SECTION DESCRIPTION:

The unbleached section of sample 501550, and all of the other two samples are beautifully preserved high-Si andesite or dacite lavas containing around 10-12 modal% of plagioclase and about 1-2 modal% of altered former mafic phenocrysts in a devitrified vitrophyric groundmass. The plagioclase phenocrysts are albitized and slightly rounded euhedra that show variable very fine- grained sericite speckling and rows of chloritized melt inclusions. These often occur in multi-crystal clots, intergrown with chlorite(±calcite)-altered augite microphenocrysts, leucoxenized small FeTi oxide microphenocrysts and occasional apatite microphenocrysts.

The groundmass of these lavas is a fine-grained mosaic intergrowth of quartz and albite, with common chlorite. Tiny albite microlites are growing in the quartz-albite mosaics after glass.

The passage from the 'fresh' to the bleached domain in 501550 is marked by a sudden strong decrease in the abundance of chlorite in the groundmass, and a concomitant increase in the abundance of sericite and calcite. Otherwise the rock is identical to the fresher part of the sample. These samples are amongst the best preserved felsic rocks from either drillhole (01 or 05), and one should be analyzed fully. Relative to the more typical dacites, the abundance of plagioclase phenocrysts and former augite phenocrysts, plus the common dispersed chlorite in the (unchloritized) groundmass of this rock all argue that it was a composition at the andesitic end of the dacite spectrum, and should have a Ti/Zr value greater than the preceding dacites (say 14-18, compared to 8-14 for the dacites).

Sample 701551 is petrographically very similar to the other two in this group sample in being an albite+sparsely augite-phyric andesite to dacite lava with a devitrified glassy groundmass. The main differences from 701550 and 701552, however, are:
1: in this rock, the chlorite in the groundmass is far more concentrated than the diffuse chlorite distribution in 701550. Chlorite occurs as green subparallel streaks through the groundmass.
2: some small augite microphenocrysts are commonly still fresh in this sample, which is most unusual for the MRV; although many are thoroughly chloritized.
3: this sample contains at least one 5mm wide vein of epidote-chlorite-calcite and a few small patches of intense epidote alteration.

Sample 701552 (1180.4m) is probably the best sample to analyze.

APPENDIX VII

DDH BRD 05 - DOWNHOLE EM 37 SURVEY

PLACER PACIFIC LIMITED

411375

DATE: 28 March 1990

TO: P. Ellis

cc P. Scott/C. Anderson/P. Kowalczyk/Sydney Office

FROM: Keiran Logan

SUBJECT: **Bulgobac River Prospect**
BRD5 EM37 Survey

Introduction

This report covers the results of a downhole EM37 survey conducted on DDH BRD5 from 23rd - 24th March 1990. The position of BRD5, ie 2400E, 7000N (Bulgobac River Grid), was 600m to the south of BRD1 which had been surveyed with EM37 in November 1989. The results of the previous survey did not show any indication of a Hellyer-type deposit. However, the range of the EM downhole technique is restricted to roughly 250m radius from the drill-hole. This meant that the possibility of a deposit located out of the 250m radius range of BRD1 could not be discounted. Drill-hole BRD5 was placed 600m to the South of BRD1 so that the downhold EM survey could cover the distance between the two drillholes and also the inferred synformal hinge axis of the basin sequence.

Results

Figure 1 shows the location of BRD5, the five EM37 transmitter loops and of the receiving stations down the drillhole. The results for each loop are shown in figures 2-6. Stations were spaced 10m apart from 680m to 1115m. **Note** there is some disagreement between the survey plotted locations and their true locations. The survey wireline went to 1115m (EOH) whereas accurate drilling survey equipment indicates that the true position should be 1181m (EOH).

Figure 2 shows the results for the entire drillhole length. The results gradually attennate towards the EOH and do not show any significant anomalies within the prospective Dacitic 'Mixed Sequence' (refer to appendix A for a simplified geological log of BRD5). The cross-over at 220m corresponds with the change from resistive Pyroclastics at 157.6m to conductive Que River Shale.

Figures 3-6 show the results for loops 2-5 respectively. These results also show no significant anomalies with the Dacitic 'Mixed Sequence'. Note that the noise in early channels 1-5 for Figures 3, 5 and 6 is due to the data being plotted at an exaggerated scale.

SYDNEY OFFICE
G.P.O. BOX 4315 N.S.W., 2001
TEL: (02) 241 1873

Conclusion

The EM37 results for BRD5 are consistent with previous results for BRD1. This indicates that an EM conductor the size of a Hellyer deposit and horizontal lying does not lie between the two drillholes. However, if a deposit was vertical at the target depth and some distance from each drillhole then it would not be picked up by the method used. A deposit could also be located outside of the survey range of BRD1 and BRD5.

KL209

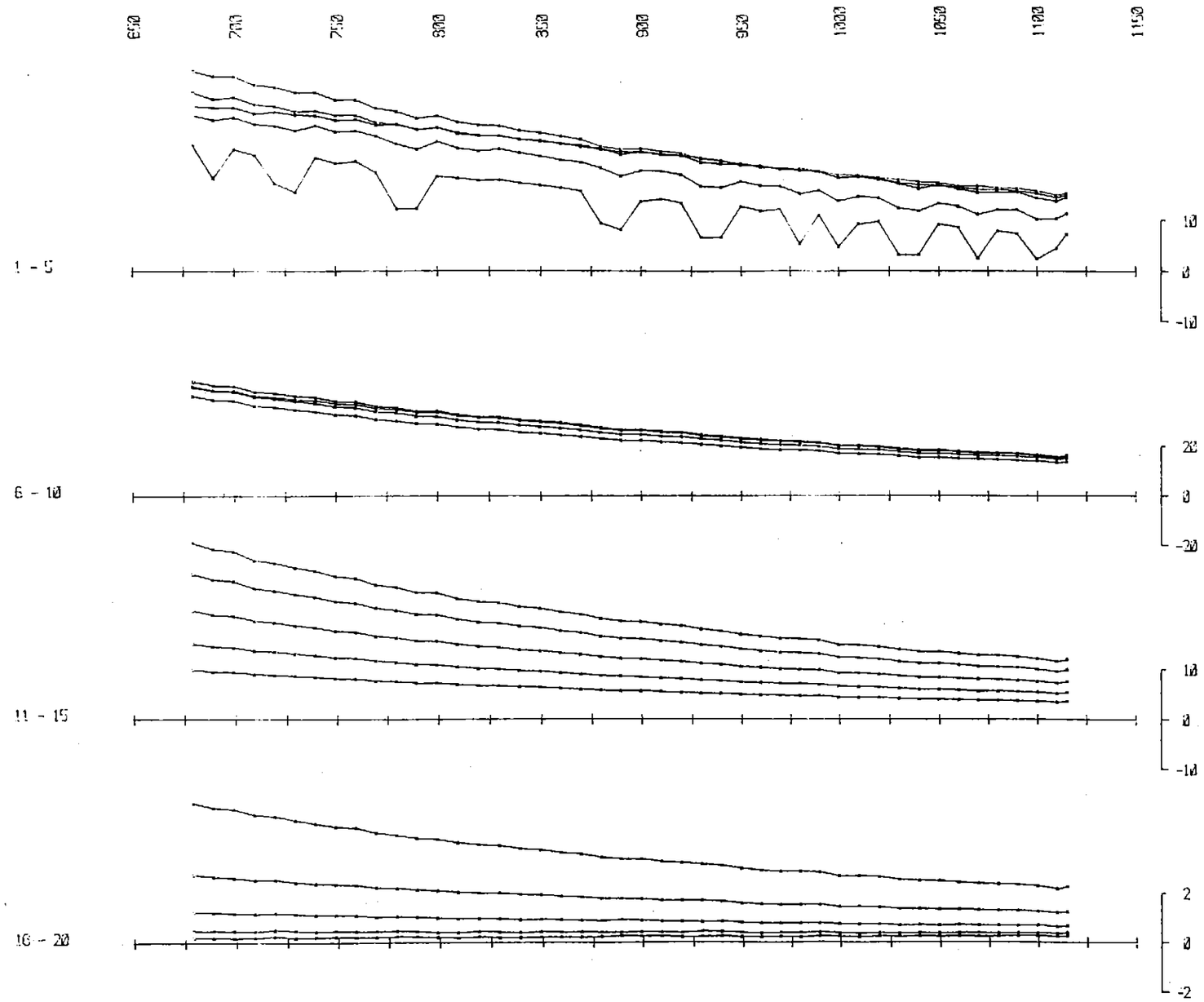
APPENDIX A

Below is a brief geological log of DDH BRD5:

FROM	TO	GEOLOGY
0	- 48.4 m	Quartz-feldspar rhyodacitic porphyry
48.4	- 92.3	Micaceous shale
92.5	- 157.6	Pyroclastics
157.6	- 192.2	Que River Shale
192.2	- 193.3	Volcanic conglomorate
193.3	- 530.6	Que River Shale
530.6	- 570.7	Primative basalt
570.7	- 570.9	Pyrite and quartz
570.9	- 684.0	Que River Shale
684.0	- 684.2	Volcanic conglomerate
684.2	- 687.8	Que River Shale
687.8	- 697.4	Pepperitic Basalt/Shale
697.4	- 1045.0	Hellyer Basalt
1045.0	- 1181.0	Dacitic "Mixed Sequence"

411378

AXIAL COMPONENT $\dot{B}$ (Z)



nanovolts per amp turn/m² squared

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY ($\dot{B}$)

5 cm

TX LOOP SIDES	:	7000N 1600E
	:	6400N 2400E
TX LOOP SIZE	:	600 m X 600 m
TX TURN OFF TIME	:	310 microsecs.
FIRST GATE TIME	:	88.5 microsecs.
CURRENT	:	14.0 amps
FREQUENCY	:	25 Hz.
INTEGRATION TIME	:	250 cycles
SYNC MODE	:	CRYSTAL
HORIZONTAL SCALE	:	1:2500
SURVEYED BY	:	BGSR
DATE	:	23/03/1990

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

PROJECT NO. 4-169

CLIENT . PLACER

PROJECT . DUE RIVER

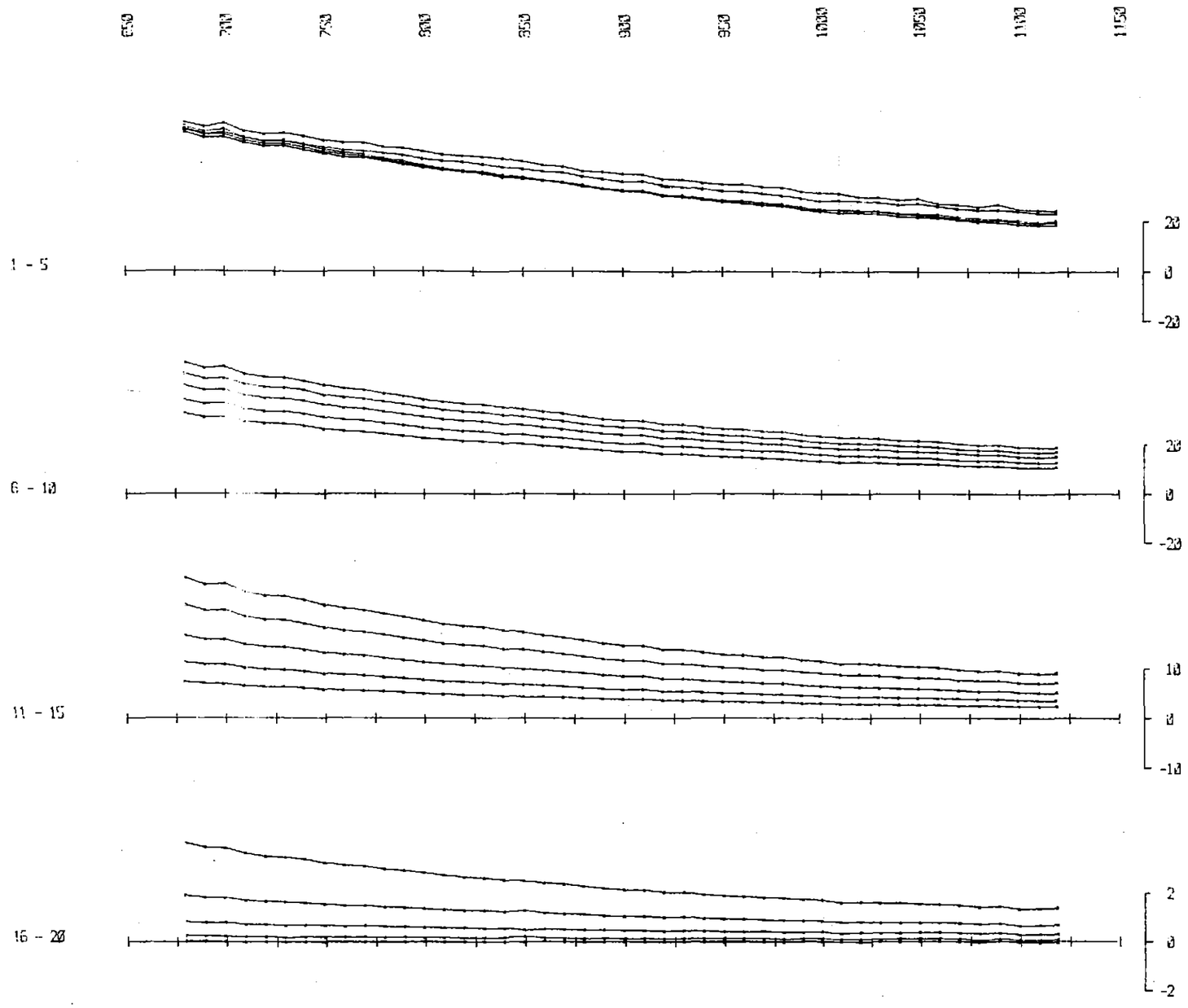
AREA . WARATAH TAS

BOREHOLE . BRD-5 A

TX LOOP . 2

FIGURE 3

AXIAL COMPONENT B (Z)



nanovolts per amp metre squared

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY (B)

5 cm

TX LOOP SIDES	: 6400N	2400E
	: 7000N	3400E
TX LOOP SIZE	: 600 m X 600 m	
TX TURN OFF TIME	: 290 microsecs.	
FIRST GATE TIME	: 66.6 microsecs.	
CURRENT	: 15.0 amps	
FREQUENCY	: 25 Hz.	
INTEGRATION TIME	: 256 cycles	
SYNC MODE	:	
HORIZONTAL SCALE	: 1:2500	
SURVEYED BY	: BGSR	
DATE	: 24/03/1990	

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.	PROJECT NO. 4-169

CLIENT . PLACER

PROJECT . QUE RIVER

AREA . WARATAH TAS

BOREHOLE . BRD-5 A

TX LOOP . 3

FIGURE 4

AXIAL COMPONENT $\dot{B}$ (Z)

650 700 750 800 850 900 950 1000 1050 1100 1150

1 - 5

10
0
-10

6 - 10

10
0
-10

11 - 15

10
0
-10

16 - 20

2
0
-2

nanovolts per amp metre squared

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY ($\dot{B}$)

5 cm

TX LOOP SIDES	:	7000N 2400E
	:	7600N 3000E
TX LOOP SIZE	:	600 m X 600 m
TX TURN OFF TIME	:	280 microsecs.
FIRST GATE TIME	:	99.5 microsecs.
CURRENT	:	14.0 amps
FREQUENCY	:	25 Hz.
INTEGRATION TIME	:	1024 cycles
SYNC MODE	:	
HORIZONTAL SCALE	:	1:2500
SURVEYED BY	:	BGSR
DATE	:	24/03/1990

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

PROJECT NO. 4-169

CLIENT . . PLACER

PROJECT . . QUE RIVER

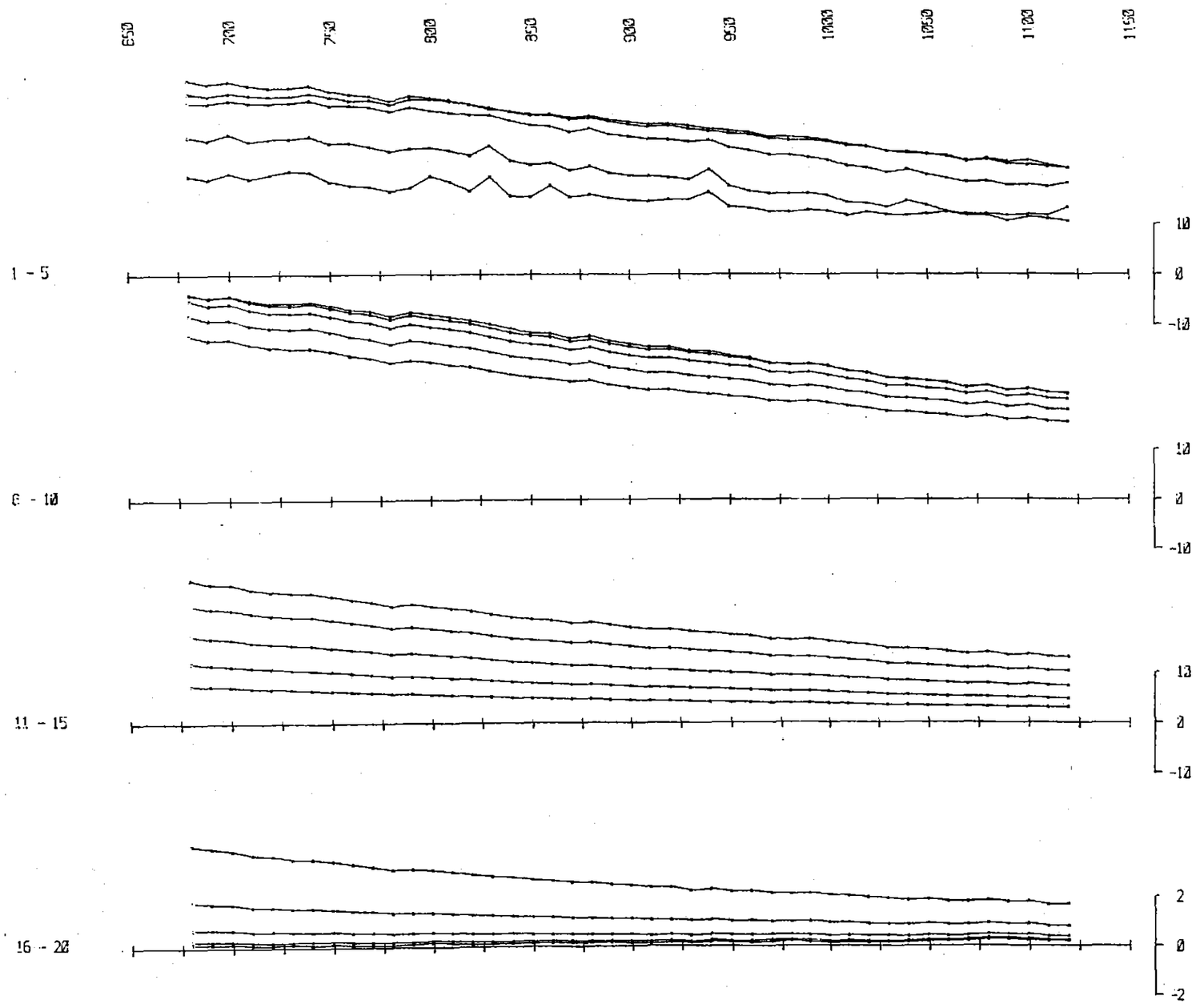
AREA . . WARATAH TAS

BOREHOLE . . BRD-5 A

TX LOOP . . 4

FIGURE 5

AXIAL COMPONENT $\dot{B}$ (Z)



nanovolts per metre squared.

EM-37

BOREHOLE SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD

TIME DERIVATIVE OF FLUX DENSITY ($\dot{B}$)

5 cm

TX LOOP SIDES	: 7900N	1500E
	: 7600N	2400E
TX LOOP SIZE	: 600 m X 600 m	
TX TURN OFF TIME	: 290 microsecs.	
FIRST GATE TIME	: 99.5 microsecs.	
CURRENT	: 14.0 amps	
FREQUENCY	: 25 Hz.	
INTEGRATION TIME	: 1024 cycles	
SYNC MODE	:	
HORIZONTAL SCALE	: 1:2500	
SURVEYED BY	: BGSR	
DATE	: 24/03/1990	

SURVEYED AND COMPILED BY GEOTERREX PTY. LTD.

PROJECT NO. 4-169

CLIENT . PLACER

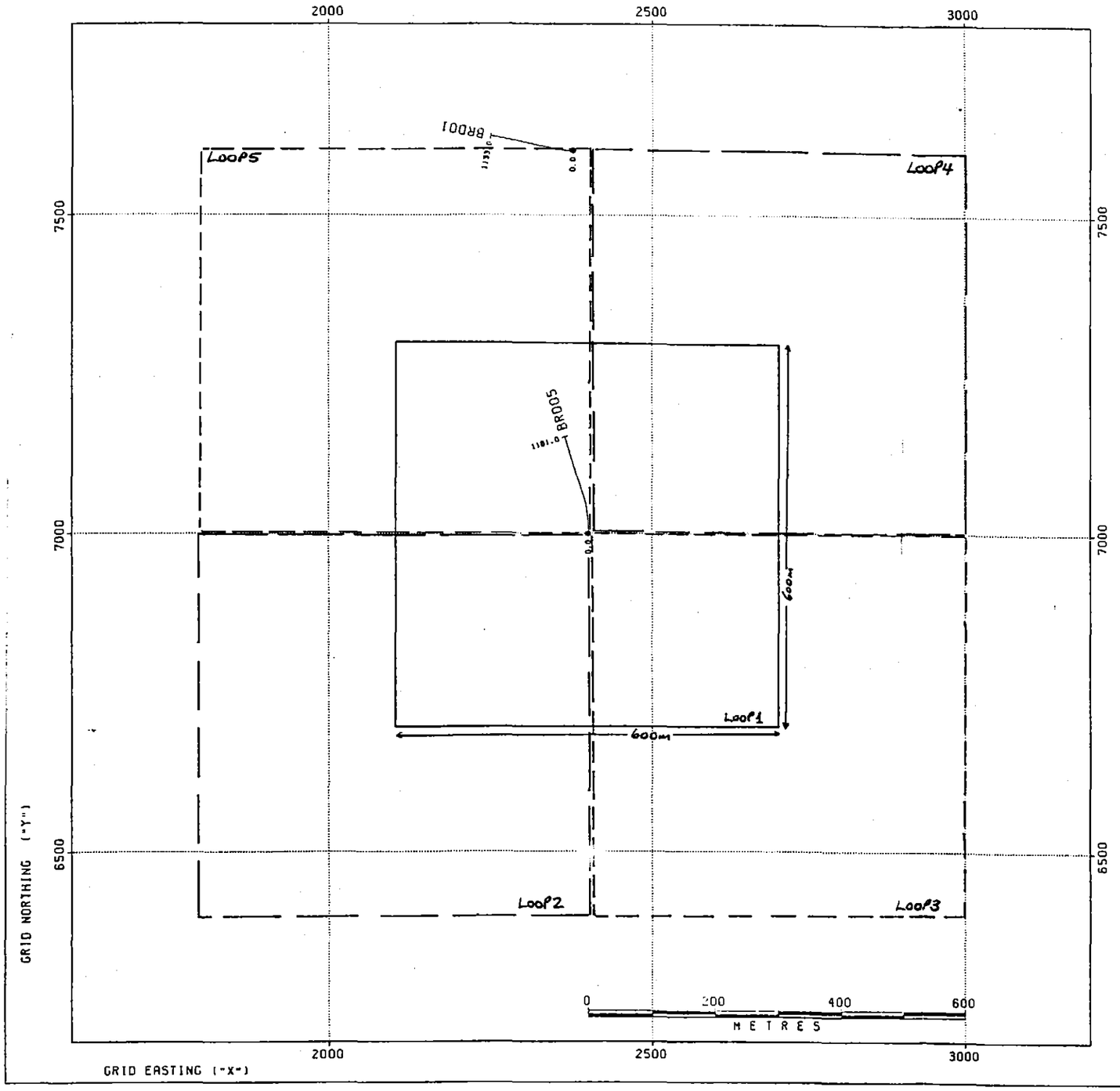
PROJECT . QUE RIVER

AREA . WARATAH TAS

BOREHOLE : BRD-5 A

TX LOOP . 5

FIGURE 6

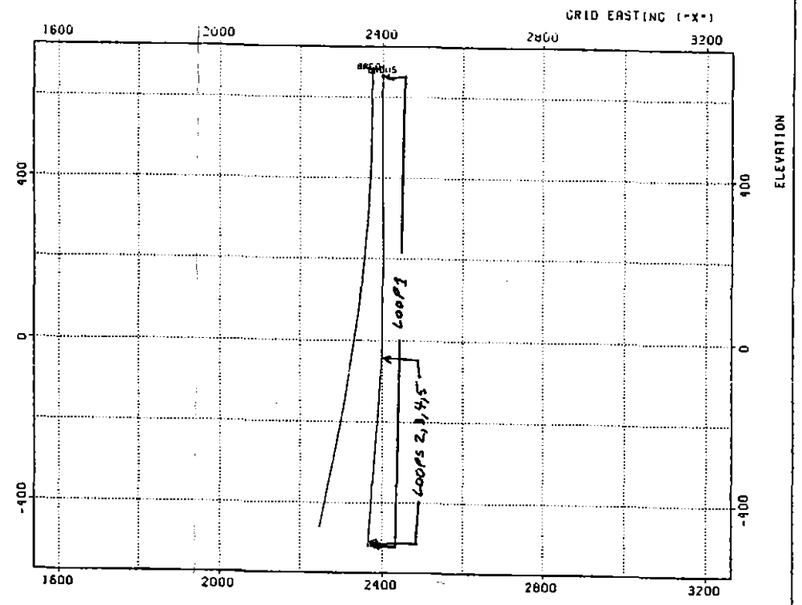


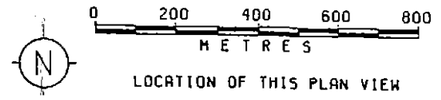
LEGEND

EM37 TRANSMITTER LOOP POSITIONS.

DOWNHOLE RECEIVING RANGE FOR PARTICULAR Tx. LOOPS.

Loop1





LOCATION OF THIS PLAN VIEW

THICK	TOP	BOTTOM
999.	661.	-510.

5 cm

DIRECTORY: &EXPL/BULGOBAC
DATA FILE: BRD.GLG

FIGURE 1

PLACER EXPLORATION LIMITED

DRAWN KJL	BULGOBAC RIVER PROSPECT, TAS
DATE 90:03:28	EM -37 DOWNHOLE SURVEY
SCALE 1:5000	
	NO. PLATE

APPENDIX VIII

BRD 1 and

DDH BRD 05 - GEOCHEMISTRY

Note BRD 1 has been duplicated in here (as well as reported in TCR 90-3090)

see yellow tags.

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411384

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Analytical Laboratories (INC IN WA)

Job: 9AD2870
O/N: 1465

ANALYTICAL REPORT

	Sample	As	Rb	Sr	Zr	Nb	Y	Cr
849.3	701201	<2	<2	135	105	8	16	910
851.3	701202	6	42	115	150	13	28	52
853.0	701203	25	195	115	290	22	38	<2
856.6	701204	2	35	190	210	16	25	18
862.8	701205	<2	130	90	210	16	30	<2
865.7	701206	<2	185	44	200	15	30	<2
867.8	701207	<2	40	180	220	15	32	19
871.0	701208	<2	76	130	195	15	28	12
877.9	701209	2	84	98	200	15	30	9
885.1	701210	<2	98	95	230	15	28	40
885.2	701211	<2	125	40	200	14	22	7
888.2	701212	<2	30	100	200	15	26	52
898.0	701213	<2	46	175	200	13	30	36
906.0	701214	2	72	200	220	15	30	40
908.5	701215	5	105	100	190	15	28	26
912.0	701216	<2	78	145	190	13	26	40
Pxl -	701217	4	17	1080	280	60	16	105 *
934.4	701218	4	10	330	145	12	22	360
964.0	701219	3	36	85	200	14	20	58
971.3	701220	3	96	115	185	15	24	42
992.0	701221	<2	64	105	180	14	28	58
	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	Detn Limit	2	2	2	4	2	4	2
	Scheme	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	XRF3

Thin Sections Done:

377

411385

CLASSIC COMLABS LTD

Analytical Laboratories (INC. IN WA)

Job: 9AD2870
O/N: 1465

ANALYTICAL REPORT

Sample	Cu	Pb	Zn	Ag
701201	56	26.	80	<1
701202	15	20	44	<1
701203	17	24	50	<1
701204	10	12	48	<1
701205	9	14	17	<1
701206	7	10	7	<1
701207	12	15	35	<1
701208	13	12	38	<1
701209	12	12	35	<1
701210	11	8	24	<1
701211	11	8	10	<1
701212	11	8	20	<1
701213	18	16	72	<1
701214	14	20	120	<1
701215	42	38	11	<1
701216	10	26	105	<1
701217	64	26	115	1
701218	105	48	170	<1
701219	11	16	66	<1
701220	44	12	19	<1
701221	18	26	65	<1
Units	ppm	ppm	ppm	ppm
Detn Limit	2	4	2	1
Scheme	AAS1	AAS1	AAS1	AAS2

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN WA)

Job: 9AD2870
O/N: 1465

ANALYTICAL REPORT

Sample	Au Avg	Au Dp1	Au Dp2	Au Dp3
701201	0.02	0.02	<0.01	--
701202	<0.01	<0.01	--	--
701203	0.01	0.01	--	--
701204	<0.01	<0.01	--	--
701205	<0.01	<0.01	--	--
701206	<0.01	<0.01	--	--
701207	<0.01	<0.01	--	--
701208	<0.01	<0.01	--	--
701209	<0.01	<0.01	--	--
701210	<0.01	<0.01	--	--
701211	<0.01	<0.01	--	--
701212	<0.01	<0.01	--	--
701213	<0.01	<0.01	--	--
701214	0.01	0.01	--	--
701215	0.07	0.02	--	--
701216	<0.01	<0.01	--	--
701217	<0.01	<0.01	--	--
701218	<0.01	<0.01	--	--
701219	<0.01	<0.01	--	--
701220	<0.01	<0.01	--	--
701221	<0.01	<0.01	--	--
Units	ppm	ppm	ppm	ppm
Detn Limit	0.01	0.01	0.01	0.01
Scheme	FA1	FA1	FA1	FA1

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CLASSIC COMLABS LTD
Analytical Laboratories (INC IN WA)

411387

Analysis code ICP 5 Report AC 9AD2870 Page I1

NATA Certificate Results in percentages

	701201	701202	701203	701204	701205
SiO2	42.1	66.1	61.7	68.9	66.9
TiO2	0.58	0.37	0.49	0.48	0.42
Al2O3	9.25	12.7	17.7	15.1	14.7
Fe2O3	9.75	4.32	6.10	4.84	2.36
MnO	0.18	0.08	0.06	0.06	0.08
MgO	12.8	1.81	2.56	1.71	1.25
CaO	11.0	3.04	0.96	1.00	3.78
Na2O	0.42	4.70	2.22	5.45	2.40
K2O	0.29	1.33	4.26	1.12	3.40
P2O5	0.39	0.09	0.14	0.15	0.13
LOI	12.3	3.70	3.80	2.08	5.00
Totals	99.1	98.2	100.0	100.9	100.4

Total FE as Fe2O3

CLASSIC COMLABS LTD
Analytical Laboratories (INC IN WA)

411388

Analysis code ICP 5 Report AC 9AD2870 Page 12

NATA Certificate Results in percentages

	701206	701207	701208	701209	701210
SiO2	69.5	69.2	67.7	65.5	70.7
TiO2	0.45	0.39	0.48	0.40	0.31
Al2O3	14.5	14.4	13.9	13.7	14.7
Fe2O3	1.67	3.68	5.85	5.40	3.42
MnO	0.05	0.06	0.09	0.10	0.04
MgO	0.75	1.09	1.22	1.25	0.99
CaO	3.14	1.90	2.72	3.70	1.06
Na2O	0.16	5.15	3.16	3.14	3.50
K2O	4.72	1.32	1.99	2.24	2.38
P2O5	0.16	0.12	0.19	0.12	0.10
LOI	4.66	2.60	3.64	4.82	2.46
Totals	99.8	99.9	100.9	100.4	99.7

Total FE as Fe2O3

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CLASSIC COMLABS LTD
Analytical Laboratories (INC IN WA)

411389

Analysis code ICP 5 Report AC 9AD2870 Page I3

NATA Certificate Results in percentages

	701211	701212	701213	701214	701215
SiO2	76.5	71.5	67.2	66.4	69.3
TiO2	0.19	0.31	0.36	0.40	0.34
Al2O3	11.7	13.1	12.9	14.4	12.2
Fe2O3	2.06	2.70	4.20	5.25	1.32
MnO	0.04	0.06	0.10	0.11	0.12
MgO	0.62	0.84	1.48	1.81	0.52
CaO	1.78	2.52	3.66	2.70	5.75
Na2O	0.86	5.45	4.20	3.86	2.16
K2O	3.26	0.93	1.35	1.96	2.80
P2O5	0.04	0.08	0.14	0.16	0.11
LOI	3.22	2.68	4.34	3.90	6.00
Totals	100.3	100.2	99.9	100.9	100.6

Total FE as Fe2O3

382

CLASSIC COMLABS LTD

Analytical Laboratories (INC. IN WA.)

411390

Analysis code ICP 5 Report AC 9AD2870 Page I4

NATA Certificate Results in percentages

	701216	701217	701218	701219	701220
SiO2	69.1	45.1	54.5	65.9	74.9
TiO2	0.34	2.34	0.45	0.37	0.35
Al2O3	12.2	14.3	12.2	14.2	11.9
Fe2O3	4.62	12.8	7.05	6.25	2.14
MnO	0.12	0.17	0.39	0.12	0.04
MgO	1.69	8.35	7.15	2.26	0.40
CaO	3.48	7.80	8.05	1.97	1.22
Na2O	2.62	5.50	3.70	4.88	2.74
K2O	2.02	2.02	0.81	0.98	4.64
P2O5	0.12	0.97	0.25	0.07	0.09
LOI	4.46	1.61	6.00	3.30	1.75
Totals	100.8	101.0	100.5	100.3	100.2

Total FE as Fe2O3

385

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN WA)

411391

Analysis code ICP 5 Report AC 9AD2870 Page I5

NATA Certificate .. Results in percentages

	701221
SiO2	67.8
TiO2	0.33
Al2O3	13.4
Fe2O3	4.26
MnO	0.11
MgO	1.42
CaO	3.34
Na2O	3.92
K2O	1.61
P2O5	0.07
LOI	4.00
Totals	100.3

Total FE as Fe2O3

384

411392

CLASSIC LABORATORIES LTD

Job: 9AD3379
O/N: 1471

ANALYTICAL REPORT

BKP1

Sample	As	Rb	Sr	Zr	Nb	Y	Cr	Depths
701286	<2	135	160	220	17	35	38	996.9
701287	2	64	165	180	14	24	68	999.6
701288	2	64	230	190	15	26	95	1009.6
701289	<2	120	220	195	17	28	5	1017.8
701290	3	28	155	160	12	44	98	1025.1
701291	2	62	145	200	15	28	30	1027.2
701292	14	72	170	130	11	20	64	1040.9
701293	3	50	210	155	12	25	34	1052.1
701294	5	105	230	140	13	24	4	1053.6
701295	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701296	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701297	3	48	380	130	10	25	25	1060.3
701298	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701299	2	94	120	140	13	20	34	1066.6
701402	7	76	330	130	11	22	22	1070.8
701403	3	72	280	140	11	25	50	1074.8
701404	3	82	290	140	12	26	22	1090.0
701405	2	74	230	135	12	24	35	1095.1
701406	16	82	200	120	9	20	85	1096.6
701407	20	10	185	88	8	16	105	1107.0
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
Detn Limit	2	2	2	4	2	4	2	
Scheme	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	XRF3	

CLASSIC LABORATORIES LTD

Job: 9AD3379
O/N: 1471

ANALYTICAL REPORT

Sample	Cu	Pb	Zn	Ag	Au
701286	66	20	58	<1	<0.01
701287	68	14	32	<1	0.01
701288	11	24	48	1	<0.01
701289	17	12	25	1	<0.01
701290	5	20	20	<1	<0.01
701291	10	15	22	1	<0.01
701292	56	42	280	1	0.01
701293	8	24	98	1	<0.01
701294	18	20	42	1	<0.01
701295	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
701296	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
701297	54	32	86	1	<0.01
701298	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
701299	6	18	96	1	<0.01
701402	34	34	52	1	0.02
701403	8	26	36	1	<0.01
701404	5	20	50	1	<0.01
701405	17	20	44	<1	<0.01
701406	38	68	330	2	<0.01
701407	66	50	52	1	0.01
Units	ppm	ppm	ppm	ppm	ppm
Detn Limit	2	4	2	1	0.01
Scheme	AAS1	AAS1	AAS1	AAS2	FA1

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411394

CLASSIC LABORATORIES LTD

Analysis code ICP5 Report AC 9AD3379

NATA Certificate

Results in percentages

	701286	701287	701288	701289	701290
SiO2	63.2	72.0	66.9	64.3	65.0
TiO2	0.40	0.32	0.35	0.37	0.29
Al2O3	16.5	13.3	14.0	14.4	12.6
Fe2O3	5.35	1.92	5.25	4.88	2.98
MnO	0.09	0.04	0.09	0.07	0.10
MgO	1.93	0.37	1.19	0.80	0.48
CaO	1.55	1.24	2.02	2.96	6.00
Na2O	3.52	4.68	4.26	3.16	5.45
K2O	2.96	3.06	2.64	3.94	1.02
P2O5	0.09	0.08	0.08	0.07	0.05
LOI	3.00	1.14	2.26	3.42	5.30
Totals	98.6	98.1	99.0	98.4	99.3

Total FE as Fe2O3

411395

CLASSIC LABORATORIES LTD

Analysis code ICP5 Report AC 9AD3379 Page I2

NATA Certificate Results in percentages

	701291	701292	701293	701294	701297
SiO2	69.4	64.4	53.0	60.6	59.3
TiO2	0.34	0.51	0.61	0.55	0.53
Al2O3	14.2	12.8	16.7	14.6	14.2
Fe2O3	4.08	7.85	11.4	6.70	7.05
MnO	0.05	0.14	0.19	0.11	0.14
MgO	0.70	2.70	3.82	1.89	2.30
CaO	0.76	1.50	2.52	4.04	5.10
Na2O	4.92	2.74	4.10	3.00	3.36
K2O	1.97	3.04	1.99	3.16	2.12
P2O5	0.07	0.16	0.19	0.17	0.17
LOI	1.59	3.08	4.10	4.08	3.94
Totals	98.1	98.9	98.6	98.9	98.2

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411596

Analysis code ICP5 Report AC 9AD3379 Page I3

NATA Certificate Results in percentages

	701299	701402	701403	701404	701405
SiO2	60.3	60.5	61.2	57.1	59.8
TiO2	0.54	0.50	0.54	0.58	0.55
Al2O3	14.8	13.4	14.8	15.5	13.8
Fe2O3	9.30	5.35	5.70	7.80	7.05
MnO	0.15	0.12	0.11	0.14	0.15
MgO	3.60	1.67	1.52	2.56	2.58
CaO	1.61	6.30	4.22	4.74	4.62
Na2O	1.84	2.82	3.92	3.08	2.84
K2O	2.72	2.84	2.30	2.46	2.32
P2O5	0.16	0.16	0.15	0.17	0.15
LOI	3.88	5.25	3.96	4.86	4.92
Totals	98.9	98.9	98.4	99.0	98.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411397

Analysis code ICP5 Report AC 9AD3379 Page I4

NATA Certificate Results in percentages

	701406	701407
SiO2	49.4	64.0
TiO2	0.68	0.56
Al2O3	16.0	11.7
Fe2O3	9.55	7.80
MnO	0.21	0.10
MgO	5.20	2.90
CaO	5.55	3.04
Na2O	2.52	4.36
K2O	2.56	0.57
P2O5	0.14	0.13
LOI	6.70	3.96
Totals	98.5	99.1

Total FE as Fe2O3

330

ANALABS

411398 601

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

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.32.08.06637	17/11/89	1466	1 OF 3

ROBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	As	As	
1	701217	350	175	4550	7.0	0.467	-	600	>100	Px 1
2	701222	15	15	80	<0.5	0.018	0.003	-	11	851.5-854.0
3	701223	5	15	85	<0.5	<0.008	-	-	2	854.0-856.2
4	701224	<5	20	10	<0.5	<0.008	-	-	1	856.2-858.4
5	701225	<5	10	90	<0.5	<0.008	-	-	<1	858.4-860.0
6	701226	<5	10	55	<0.5	0.007	-	-	<1	860.0-862.0
7	701227	5	20	45	<0.5	0.039	0.038	-	<1	862.0-864.0
8	701228	<5	5	60	<0.5	<0.008	-	-	<1	864.0-865.5
9	701229	<5	10	30	<0.5	<0.008	0.029	-	1	865.5-867.3
10	701230	<5	10	40	<0.5	<0.008	-	-	<1	867.3-870.0
11	701231	<5	10	55	<0.5	0.009	-	-	3	870.0-872.0
12	701232	<5	10	50	<0.5	0.014	-	-	1	872.0-874.0
13	701233	<5	10	45	<0.5	<0.008	-	-	<1	874.0-875.6
14	701234	<5	10	65	<0.5	<0.008	-	-	2	875.6-878.0
15	701235	<5	15	60	<0.5	<0.008	-	-	2	878.0-880.0
16	701236	<5	<5	60	<0.5	0.009	<0.008	-	<1	880.0-882.0
17	701237	<5	15	55	<0.5	0.010	-	-	<1	882.0-884.0
18	701238	<5	20	45	<0.5	0.008	-	-	<1	884.0-886.1
19	701239	<5	15	40	<0.5	0.020	-	-	1	886.1-887.9
20	701240	<5	10	45	<0.5	<0.008	-	-	3	887.9-889.2
21	701241	<5	10	50	<0.5	<0.008	-	-	<1	889.2-890.1
22	701242	5	5	65	<0.5	<0.008	-	-	<1	890.1-890.2
23	701243	<5	5	70	<0.5	<0.008	-	-	<1	890.2-892.0
24	701244	<5	5	75	<0.5	<0.008	-	-	2	892.0-894.0
25	701245	5	<5	65	<0.5	<0.008	-	-	<1	894.0-896.0

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

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ANALABS

411399

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

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.52.08.06637	17/11/89	1466	2 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	As	As	
1	701246	20	20	115	<0.5	<0.008	-	-	<1	896.0-898.0
2	701247	10	10	120	<0.5	<0.008	-	-	<1	898.0-900.0
3	701248	8	25	160	<0.5	<0.008	-	-	<1	900.0-902.0
4	701249	5	35	175	<0.5	<0.008	-	-	1	902.0-904.0
5	701250	40	40	180	<0.5	<0.008	-	-	<1	904.0-906.0
6	701251	85	20	60	<0.5	0.455	-	-	9	
7	701252	10	30	140	<0.5	<0.008	-	-	<1	906.0-908.0
8	701253	5	40	80	<0.5	0.025	<0.008	-	<1	908.0-909.1
9	701254	5	15	140	<0.5	0.043	-	-	<1	909.1-911.0
10	701255	10	20	140	<0.5	0.020	-	-	<1	911.0-913.0
11	701256	<5	10	125	<0.5	0.014	0.015	-	<1	913.0-915.0
12	701257	5	15	110	<0.5	0.016	-	-	<1	915.0-917.9
13	701258	5	60	340	<0.5	0.011	-	-	1	917.9-919.8
14	701259	5	20	155	<0.5	0.025	-	-	<1	919.8-921.1
15	701260	5	25	150	<0.5	0.049	-	-	<1	921.1-922.0
16	701261	40	80	370	<0.5	0.016	-	-	1	922.0-932.0
17	701262	60	160	850	<0.5	0.014	-	-	1	932.0-941.0
18	701263	65	70	365	<0.5	0.011	-	-	2	941.0-950.5
19	701264	5	35	225	<0.5	0.015	-	-	<1	950.5-953.5
20	701265	10	25	135	<0.5	0.050	-	-	10	953.5-958.3
21	701266	5	10	125	<0.5	0.020	-	-	7	958.3-967.9
22	701267	5	20	105	0.5	0.019	<0.008	-	<1	967.9-971.4
23	701268	170	15	145	0.5	0.013	-	-	5	971.4-974.9
24	701269	30	20	75	0.5	0.016	-	-	<1	974.9-977.4
25	701270	20	15	140	<0.5	0.013	-	-	<1	977.4-979.1

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

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I11

NATA Certificate Results in percentages

701217

SiO2	68.7
TiO2	0.39
Al2O3	14.7
Fe2O3	4.46
MnO	0.29
MgO	1.09
CaO	1.99
Na2O	0.78
K2O	4.42
P2O5	0.22
LOI	3.64
Totals	100.7

Total FE as Fe2O3

393

CLASSIC LABORATORIES LTD

411401

Analysis code ICP 5 Report AC 9AD3259

NATA Certificate Results in percentages

	701222	701223	701224	701225	701226
SiO2	67.4	68.9	64.2	64.7	65.9
TiO2	0.38	0.39	0.43	0.39	0.40
Al2O3	14.6	13.9	15.3	14.9	14.7
Fe2O3	4.68	4.58	5.10	3.74	3.36
MnO	0.06	0.06	0.09	0.09	0.09
MgO	2.44	2.14	2.10	2.18	2.22
CaO	1.50	1.64	2.50	3.42	3.62
Na2O	2.60	4.52	4.64	2.40	2.32
K2O	2.82	1.37	1.70	3.06	3.16
P2O5	0.10	0.12	0.15	0.12	0.11
LOI	3.50	2.72	3.64	5.05	5.15
Totals	100.1	100.3	99.8	100.0	101.0

Total FE as Fe2O3

394

411402

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259

NATA Certificate Results in percentages

	701227	701228	701229	701230	701231
SiO2	66.1	66.1	66.0	67.8	65.3
TiO2	0.40	0.44	0.44	0.42	0.48
Al2O3	14.3	15.1	14.9	14.7	14.4
Fe2O3	2.60	4.14	1.95	3.48	5.40
MnO	0.09	0.09	0.08	0.08	0.11
MgO	1.41	1.49	0.92	0.93	1.16
CaO	3.98	3.00	4.72	3.08	3.38
Na2O	2.10	2.38	1.08	4.26	3.36
K2O	3.46	3.36	4.36	2.06	2.36
P2O5	0.13	0.16	0.16	0.17	0.20
LOI	5.30	4.52	6.00	3.72	4.40
Totals	99.9	100.8	100.6	100.7	100.5

Total FE as Fe2O3

395

CLASSIC LABORATORIES LTD

411403

Job: 9AD3259
O/N: 1468

ANALYTICAL REPORT

Sample	Zr	Ba	Y	Nb	Cr
701217	135	380	.12	9	98
701222	200	430	28	16	94
701223	190	200	28	14	130
701224	200	250	32	15	90
701225	210	420	38	15	115
701226	200	2050	35	16	88
701227	200	680	30	15	64
701228	210	360	28	15	75
701229	200	340	32	14	40
701230	200	190	32	15	115
701231	185	290	30	14	55
701232	185	260	30	14	80
701233	185	160	28	16	52
701234	190	260	30	15	72
701235	190	270	32	14	105
701236	195	170	30	14	125
701237	210	330	30	17	86
701238	220	250	28	15	84
701239	230	340	34	17	150
701240	210	160	30	17	78
701241	220	270	26	16	180
701242	12	10	16	5	470
701243	210	110	34	15	155
701244	210	195	34	15	145
701245	210	240	32	16	135
701246	210	240	30	15	175
701247	210	270	32	15	125
701248	210	220	30	16	170
701249	210	440	30	14	130
701250	200	460	28	15	105
701251	I.S.	I.S.	I.S.	I.S.	I.S.
701252	210	350	30	17	86
701253	200	400	30	14	140
701254	210	300	32	16	76
701255	210	390	32	16	96
701256	200	190	28	15	90
701257	210	350	28	16	86
701258	130	140	26	12	350
701259	190	280	30	14	160
701260	210	280	30	15	105
701261	155	490	22	12	470
701262	145	870	20	14	440
701263	145	410	20	13	440
701264	165	35	32	14	480
701265	230	90	32	16	52
701266	210	110	25	17	80
701267	200	230	22	17	64
701268	185	1200	26	15	185
701269	190	180	30	15	70
701270	195	200	30	16	86
Units	ppm	ppm	ppm	ppm	ppm
Detn Limit	4	10	4	2	2
Scheme	XRF1	XRF1	XRF1	XRF1	XRF3

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411404

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I3

NATA Certificate. Results in percentages

	701232	701233	701234	701235	701236
SiO2	66.3	64.4	60.5	63.5	65.2
TiO2	0.48	0.53	0.55	0.41	0.45
Al2O3	14.3	14.9	14.7	13.9	15.1
Fe2O3	5.20	3.68	5.80	5.65	5.30
MnO	0.09	0.09	0.13	0.11	0.09
MgO	1.23	1.06	1.92	1.09	0.97
CaO	2.98	3.80	4.32	3.28	2.44
Na2O	3.44	5.75	2.74	3.20	6.20
K2O	2.30	2.52	4.92	2.16	0.97
P2O5	0.20	0.39	0.58	0.04	0.03
LOI	3.84	3.82	4.80	4.80	3.34
Totals	100.4	100.9	101.0	98.1	100.1

Total FE as Fe2O3

411405

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I4

NATA Certificate Results in percentages

	701237	701238	701239	701240	701241
SiO2	64.8	70.3	68.4	69.5	66.9
TiO2	0.41	0.28	0.30	0.31	0.40
Al2O3	15.1	14.0	14.4	14.1	15.4
Fe2O3	4.94	3.28	3.02	3.26	4.54
MnO	0.09	0.08	0.08	0.07	0.08
MgO	1.11	0.69	0.88	0.82	1.48
CaO	2.80	2.72	3.38	2.58	2.24
Na2O	3.36	3.78	2.72	5.45	3.50
K2O	2.58	2.04	2.84	1.10	2.44
P2O5	0.02	<0.01	<0.01	<0.01	0.03
LOI	4.40	3.76	4.54	3.42	3.78
Totals	99.6	100.9	100.5	100.6	100.8

Total FE as Fe2O3

398

411406

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I5

NATA Certificate Results in percentages

	701242	701243	701244	701245	701246
SiO2	77.0	66.0	64.6	66.5	64.8
TiO2	0.04	0.43	0.42	0.40	0.41
Al2O3	3.24	14.2	14.0	13.7	13.8
Fe2O3	5.05	4.62	4.56	5.10	5.10
MnO	0.16	0.10	0.11	0.10	0.11
MgO	1.78	1.97	2.02	1.88	1.77
CaO	6.50	3.26	4.06	3.22	3.54
Na2O	0.08	5.20	3.56	3.18	3.80
K2O	0.08	0.82	1.76	1.89	1.61
P2O5	0.05	0.14	0.13	0.13	0.16
LOI	6.30	4.08	5.30	4.56	4.68
Totals	100.3	100.8	100.5	100.7	99.8

Total FE as Fe2O3 4 2

100.26

399

411407

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I6

NATA Certificate Results in percentages

	701247	701248	701249	701250	701251
SiO2	65.8	65.3	64.0	65.5	73.9
TiO2	0.40	0.43	0.41	0.43	0.50
Al2O3	13.6	14.4	14.5	13.4	12.2
Fe2O3	5.15	5.25	5.25	5.05	4.20
MnO	0.11	0.11	0.12	0.12	0.02
MgO	1.97	1.92	1.93	1.95	0.69
CaO	3.56	3.00	3.16	3.14	0.39
Na2O	3.64	5.05	4.00	3.38	0.94
K2O	1.74	1.16	1.99	2.08	4.98
P2O5	0.19	0.21	0.20	0.23	0.21
LOI	4.68	3.86	4.38	4.22	2.82
Totals	100.8	100.7	99.9	99.5	100.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411408

Analysis code ICP 5 Report AC 9AD3259 Page I7

NATA Certificate Results in percentages

	701252	701253	701254	701255	701256
SiO2	64.9	63.5	65.0	63.5	66.6
TiO2	0.41	0.42	0.41	0.42	0.39
Al2O3	14.3	13.4	14.0	14.9	13.8
Fe2O3	4.18	1.92	4.48	5.15	4.72
MnO	0.12	0.16	0.13	0.13	0.10
MgO	1.70	1.01	1.86	2.08	1.89
CaO	3.74	6.55	3.54	3.28	2.64
Na2O	3.60	2.32	3.44	3.26	3.84
K2O	2.36	3.28	2.22	2.56	1.82
P2O5	0.23	0.27	0.22	0.25	0.23
LOI	4.86	7.10	4.84	4.70	3.86
Totals	100.4	99.9	100.1	100.2	99.9

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411409

Analysis code ICP 5 Report AC 9AD3259 Page I8

NATA Certificate Results in percentages

	701257	701258	701259	701260	701261
SiO2	66.2	47.4	58.9	63.4	48.5
TiO2	0.39	0.38	0.47	0.42	0.52
Al2O3	13.8	11.6	13.4	14.4	12.7
Fe2O3	4.74	8.05	5.70	5.16	9.55
MnO	0.10	0.11	0.15	0.10	0.34
MgO	1.91	5.35	3.24	2.78	8.60
CaO	2.64	10.8	5.50	3.04	7.00
Na2O	3.80	1.68	1.76	2.64	2.46
K2O	1.82	0.78	2.70	2.72	0.84
P2O5	0.22	0.24	0.31	0.26	0.37
LOI	4.58	11.6	7.20	4.90	9.05
Totals	100.2	98.0	99.3	99.8	99.9

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411410

Analysis code ICP 5 Report AC 9AD3259 Page I9

NATA Certificate Results in percentages

	701262	701263	701264	701265	701266
SiO2	53.9	49.0	28.4	48.4	59.3
TiO2	0.47	0.48	0.56	0.48	0.44
Al2O3	12.6	12.4	14.6	18.2	16.4
Fe2O3	8.25	9.80	14.6	9.05	8.20
MnO	0.36	0.32	0.43	0.22	0.16
MgO	8.35	8.90	10.1	4.24	3.16
CaO	6.30	7.40	13.4	5.90	2.42
Na2O	2.96	2.20	1.74	6.30	5.75
K2O	1.43	0.85	0.48	0.86	0.93
P2O5	0.33	0.32	0.40	0.19	0.18
LOI	6.00	9.25	16.0	7.15	3.84
Totals	100.9	100.9	100.7	101.0	100.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411411

Analysis code ICP 5 Report AC 9AD3259 Page I10

NATA Certificate Results in percentages

	701267	701268	701269	701270	701271
SiO2	64.5	68.3	62.7	64.8	68.4
TiO2	0.41	0.38	0.38	0.41	0.40
Al2O3	15.2	14.4	14.0	15.1	14.6
Fe2O3	7.75	4.54	5.60	5.45	4.42
MnO	0.13	0.08	0.13	0.12	0.29
MgO	2.78	1.38	1.65	1.99	1.15
CaO	0.90	1.26	3.20	2.70	2.02
Na2O	4.60	3.50	4.40	3.46	0.74
K2O	1.39	3.94	1.78	2.58	4.52
P2O5	0.17	0.18	0.08	0.22	0.27
LOI	2.78	2.22	4.28	4.04	4.08
Totals	100.6	100.2	98.2	100.9	100.9

Total FE as Fe2O3

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CLASSIC LABORATORIES LTD

411412

Job: 9AD3395
O/N: 1472

ANALYTICAL REPORT

Sample	Zr	Ba	Y	Nb	Cr	
701272	200	360	30	16	58	988.8 - 994.9
701273	220	500	32	15	34	994.8 - 999.2
701274	195	640	30	15	40	998.2 - 1001.2
701275	210	490	35	16	35	1001.2 - 1004.0
701276	195	640	32	14	38	1004.0 - 1006.6
701277	190	990	30	15	35	1006.6 - 1009.2
701278	190	440	30	15	48	1026.4 - 1029.8
701279	185	290	26	13	68	1029.6 - 1035.0
701280	150	270	16	12	30	1041.9 - 1046.0
701281	140	900	28	10	38	1060.0 - 1067.9
701282	135	530	28	11	30	1091.0 - 1095.1
701283	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701284	145	450	24	13	32	1085.1 - 1086.0
701285	150	780	25	13	42	1096.8 - 1098.0
Units	ppm	ppm	ppm	ppm	ppm	
Detn Limit	4	10	4	2	2	
Scheme	XRF1	XRF1	XRF1	XRF1	XRF3	

CLASSIC LABORATORIES LTD

411413

Analysis code ICP 5 Report AC 9AD3395

NATA Certificate Results in percentages

	701272	701273	701274	701275	701276
SiO2	63.8	62.1	67.0	62.4	64.1
TiO2	0.36	0.41	0.35	0.39	0.37
Al2O3	14.6	16.3	14.6	15.8	14.6
Fe2O3	5.60	7.10	4.16	6.30	4.70
MnO	0.12	0.12	0.08	0.12	0.11
MgO	1.82	2.02	1.21	2.18	1.18
CaO	2.72	2.34	2.46	2.36	3.70
Na2O	4.12	3.76	3.86	3.12	4.22
K2O	1.66	2.44	2.52	2.62	2.30
P2O5	0.11	0.11	0.09	0.10	0.09
LOI	3.96	4.10	3.60	4.46	4.40
Totals	98.9	100.8	99.9	99.8	99.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411414

Analysis code ICP 5 Report AC 9AD3395 Page I2

NATA Certificate Results in percentages

	701277	701278	701279	701280	701281
SiO2	64.1	64.4	65.0	60.4	59.3
TiO2	0.35	0.34	0.37	0.59	0.58
Al2O3	14.2	14.7	13.8	15.9	14.8
Fe2O3	5.25	4.74	5.45	9.70	7.30
MnO	0.12	0.09	0.11	0.18	0.14
MgO	1.06	1.03	2.12	4.36	2.54
CaO	3.64	3.36	3.42	0.79	5.05
Na2O	3.98	4.14	2.54	3.66	2.90
K2O	3.14	2.28	2.38	1.40	2.52
P2O5	0.09	0.10	0.14	0.21	0.20
LOI	3.94	4.50	5.00	3.64	4.80
Totals	99.8	99.7	100.3	100.8	100.1

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411415

Analysis code ICP 5 Report AC 9AD3395 Page I3

NATA Certificate Results in percentages

	701282	701284	701285
SiO2	58.8	57.1	62.8
TiO2	0.54	0.60	0.47
Al2O3	14.5	16.0	13.7
Fe2O3	6.70	8.25	6.35
MnO	0.14	0.16	0.15
MgO	2.12	3.46	2.54
CaO	5.65	3.58	3.94
Na2O	3.04	4.16	4.48
K2O	2.46	1.69	1.75
P2O5	0.18	0.18	0.13
LOI	6.35	4.96	4.64
Totals	100.5	100.1	100.9

Total FE as Fe2O3

408

411416

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN WA)

305 South Road, Mile End South, South Australia, 5031
Telephone: (08) 43 5722 Fax: (08) 234 0321 Telex: LABCOM AA89323

Mr Peter Ellis
Placer Exploration Limited
P.O. BOX 384
ROSNY PARK
TAS 7018

Job Number: 9AD2870

Your Reference: 1465
Number of Samples: 21
Extra Samples : 0

Date Received: 02-NOV-1989
Date Reported: 10-NOV-1989

This report comprises a cover sheet and pages 1 to 3, I1 to I5

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source. Please address any enquiries to Mr. Trevor Francis.

Approved Signature:

for

Dr. John Kikkert
General Manager - Adelaide.

CC Placer Exploration NSW

Report Analyte Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample for Analysis.

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

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CLASSIC COMLABS LTD

411417

Analytical Laboratories (INC. IN W.A.)

Job: 9AD2870
O/N: 1465

ANALYTICAL REPORT

	Sample	As	Rb	Sr	Zr	Nb	Y	Cr
849.3	701201	<2	<2	135	105	8	16	910
851.3	701202	6	42	115	150	13	28	52
853.0	701203	25	195	115	290	22	38	<2
856.6	701204	2	35	190	210	16	25	18
862.8	701205	<2	130	90	210	16	30	<2
865.7	701206	<2	185	44	200	15	30	<2
867.8	701207	<2	40	180	220	15	32	19
871.0	701208	<2	76	130	195	15	28	12
877.9	701209	2	84	98	200	15	30	9
885.1	701210	<2	98	95	230	15	28	40
885.2	701211	<2	125	40	200	14	22	7
888.2	701212	<2	30	100	200	15	26	52
898.0	701213	<2	46	175	200	13	30	36
906.0	701214	2	72	200	220	15	30	40
908.5	701215	5	105	100	190	15	28	26
912.0	701216	<2	78	145	190	13	26	40
PX1 -	701217	4	17	1080	280	60	16	105 *
934.4	701218	4	10	330	145	12	22	360
964.0	701219	3	36	85	200	14	20	58
971.3	701220	3	96	115	185	15	24	42
992.0	701221	<2	64	105	180	14	28	58
	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	Detn Limit	2	2	2	4	2	4	2
	Scheme	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	XRF3

Thin Sections Done:

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CLASSIC COMLABS LTD

Analytical Laboratories (INC. IN W.A.)

411418

Job: 9AD2870
O/N: 1465

ANALYTICAL REPORT

Sample	Cu	Pb	Zn	Ag
701201	56	26	80	<1
701202	15	20	44	<1
701203	17	24	50	<1
701204	10	12	48	<1
701205	9	14	17	<1
701206	7	10	7	<1
701207	12	15	35	<1
701208	13	12	38	<1
701209	12	12	35	<1
701210	11	8	24	<1
701211	11	8	10	<1
701212	11	8	20	<1
701213	18	16	72	<1
701214	14	20	120	<1
701215	42	38	11	<1
701216	10	26	105	<1
701217	64	26	115	1
701218	105	48	170	<1
701219	11	16	66	<1
701220	44	12	19	<1
701221	18	26	65	<1
Units	ppm	ppm	ppm	ppm
Detn Limit	2	4	2	1
Scheme	AAS1	AAS1	AAS1	AAS2

411

411419

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN W.A.)

Job: 9AD2870
O/N: 1465

ANALYTICAL REPORT

Sample	Au Avg	Au Dp1	Au Dp2	Au Dp3
701201	0.02	0.02	<0.01	--
701202	<0.01	<0.01	--	--
701203	0.01	0.01	--	--
701204	<0.01	<0.01	--	--
701205	<0.01	<0.01	--	--
701206	<0.01	<0.01	--	--
701207	<0.01	<0.01	--	--
701208	<0.01	<0.01	--	--
701209	<0.01	<0.01	--	--
701210	<0.01	<0.01	--	--
701211	<0.01	<0.01	--	--
701212	<0.01	<0.01	--	--
701213	<0.01	<0.01	--	--
701214	0.01	0.01	--	--
701215	0.07	0.02	--	--
701216	<0.01	<0.01	--	--
701217	<0.01	<0.01	--	--
701218	<0.01	<0.01	--	--
701219	<0.01	<0.01	--	--
701220	<0.01	<0.01	--	--
701221	<0.01	<0.01	--	--
Units	ppm	ppm	ppm	ppm
Detn Limit	0.01	0.01	0.01	0.01
Scheme	FA1	FA1	FA1	FA1

CLASSIC COMLABS LTD
Analytical Laboratories (INC IN WA)

Analysis code ICP 5 Report AC 9AD2870 Page 11

NATA Certificate Results in percentages

	701201	701202	701203	701204	701205
SiO2	42.1	66.1	61.7	68.9	66.9
TiO2	0.58	0.37	0.49	0.48	0.42
Al2O3	9.25	12.7	17.7	15.1	14.7
Fe2O3	9.75	4.32	6.10	4.84	2.36
MnO	0.18	0.08	0.06	0.06	0.08
MgO	12.8	1.81	2.56	1.71	1.25
CaO	11.0	3.04	0.96	1.00	3.78
Na2O	0.42	4.70	2.22	5.45	2.40
K2O	0.29	1.33	4.26	1.12	3.40
P2O5	0.39	0.09	0.14	0.15	0.13
LOI	12.3	3.70	3.80	2.08	5.00
Totals	99.1	98.2	100.0	100.9	100.4

Total FE as Fe2O3

Somewhat altered - LOI variable

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN WA.)

Analysis code ICP 5 Report AC 9AD2870 Page 12

NATA Certificate Results in percentages

	701206	701207	701208	701209	701210
SiO2	69.5	69.2	67.7	65.5	70.7
TiO2	0.45	0.39	0.48	0.40	0.31
Al2O3	14.5	14.4	13.9	13.7	14.7
Fe2O3	1.67	3.68	5.85	5.40	3.42
MnO	0.05	0.06	0.09	0.10	0.04
MgO	0.75	1.09	1.22	1.25	0.99
CaO	3.14	1.90	2.72	3.70	1.06
Na2O	0.16	5.15	3.16	3.14	3.50
K2O	4.72	1.32	1.99	2.24	2.38
P2O5	0.16	0.12	0.19	0.12	0.10
LOI	4.66	2.60	3.64	4.82	2.46
Totals	99.8	99.9	100.9	100.4	99.7

Total FE as Fe2O3

414

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN WA)

411422

Analysis code ICP 5 Report AC 9AD2870 Page I3

NATA Certificate Results in percentages

	701211	701212	701213	701214	701215
SiO2	76.5	71.5	67.2	66.4	69.3
TiO2	0.19	0.31	0.36	0.40	0.34
Al2O3	11.7	13.1	12.9	14.4	12.2
Fe2O3	2.06	2.70	4.20	5.25	1.32
MnO	0.04	0.06	0.10	0.11	0.12
MgO	0.62	0.84	1.48	1.81	0.52
CaO	1.78	2.52	3.66	2.70	5.75
Na2O	0.86	5.45	4.20	3.86	2.16
K2O	3.26	0.93	1.35	1.96	2.80
P2O5	0.04	0.08	0.14	0.16	0.11
LOI	3.22	2.68	4.34	3.90	6.00
Totals	100.3	100.2	99.9	100.9	100.6

Total FE as Fe2O3

CLASSIC COMLABS LTD
Analytical Laboratories (INC. IN W.A.)

411423

Analysis code ICP 5 Report AC 9AD2870 Page 14

NATA Certificate Results in percentages

	701216	701217	701218	701219	701220
SiO2	69.1	45.1	54.5	65.9	74.9
TiO2	0.34	2.34	0.45	0.37	0.35
Al2O3	12.2	14.3	12.2	14.2	11.9
Fe2O3	4.62	12.8	7.05	6.25	2.14
MnO	0.12	0.17	0.39	0.12	0.04
MgO	1.69	8.35	7.15	2.26	0.40
CaO	3.48	7.80	8.05	1.97	1.22
Na2O	2.62	5.50	3.70	4.88	2.74
K2O	2.02	2.02	0.81	0.98	4.64
P2O5	0.12	0.97	0.25	0.07	0.09
LOI	4.46	1.61	6.00	3.30	1.75
Totals	100.8	101.0	100.5	100.3	100.2

Total FE as Fe2O3

CLASSIC COMLABS LTD
Analytical Laboratories (INC IN WA)

Analysis code ICP 5 Report AC 9AD2870 Page I5

NATA Certificate Results in percentages

	701221
SiO2	67.8
TiO2	0.33
Al2O3	13.4
Fe2O3	4.26
MnO	0.11
MgO	1.42
CaO	3.34
Na2O	3.92
K2O	1.61
P2O5	0.07
LOI	4.00
Totals	100.3

Total FE as Fe2O3

CLASSIC LABORATORIES LTD
Osman Place, Thebarton, South Australia 5031
Telephone: (08) 43 5722 Facsimile: (08) 234 03251

411425

Mr Peter Ellis
Placer Exploration Limited
P.O. BOX 384
ROSNY PARK
TAS 7018

Job Number: 9AD3379

Your Reference: 1471
Number of Samples: 20
Extra Samples : 0

Date Received: 27-NOV-1989
Date Reported: 08-JAN-1990

This report comprises a cover sheet and pages 1 to 2, I1 to I4

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source. Please address any enquiries to Mr. Trevor Francis.

Approved Signature:

for .

Dr. John Kikkert
General Manager - Adelaide.

Report Analyte Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample for Analysis.

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

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411426

CLASSIC LABORATORIES LTD

Job: 9AD3379
O/N: 1471

ANALYTICAL REPORT

Sample	As	Rb	Sr	Zr	Nb	Y	Cr	Depths
701286	<2	135	160	220	17	35	38	996·8
701287	2	64	165	180	14	24	68	999·6
701288	2	64	230	190	15	26	95	1009·6
701289	<2	120	220	195	17	28	5	1017·8
701290	3	28	155	160	12	44	98	1025·1
701291	2	62	145	200	15	28	30	1027·2
701292	14	72	170	130	11	20	64	1040·9
701293	3	50	210	155	12	25	34	1052·1
701294	5	105	230	140	13	24	4	1053·6
701295	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701296	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701297	3	48	380	130	10	25	25	1060·3
701298	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701299	2	94	120	140	13	20	34	1066·6
701402	7	76	330	130	11	22	22	1070·8
701403	3	72	280	140	11	25	50	1074·8
701404	3	82	290	140	12	26	22	1080·0
701405	2	74	230	135	12	24	35	1085·1
701406	16	82	200	120	9	20	85	1096·6
701407	20	10	185	88	8	16	105	1107·0
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
Detn Limit	2	2	2	4	2	4	2	
Scheme	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	XRF3	

CLASSIC LABORATORIES LTD

411427

Job: 9AD3379
O/N: 1471

ANALYTICAL REPORT

Sample	Cu	Pb	Zn	Ag	Au
701286	66	20	58	<1	<0.01
701287	68	14	32	<1	0.01
701288	11	24	48	1	<0.01
701289	17	12	25	1	<0.01
701290	5	20	20	<1	<0.01
701291	10	15	22	1	<0.01
701292	56	42	280	1	0.01
701293	8	24	98	1	<0.01
701294	18	20	42	1	<0.01
701295	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
701296	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
701297	54	32	86	1	<0.01
701298	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
701299	6	18	96	1	<0.01
701402	34	34	52	1	0.02
701403	8	26	36	1	<0.01
701404	5	20	50	1	<0.01
701405	17	20	44	<1	<0.01
701406	38	68	330	2	<0.01
701407	66	50	52	1	0.01
Units	ppm	ppm	ppm	ppm	ppm
Detn Limit	2	4	2	1	0.01
Scheme	AAS1	AAS1	AAS1	AAS2	FA1

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411428

Analysis code ICP5 Report AC 9AD3379

NATA Certificate Results in percentages

	701286	701287	701288	701289	701290
SiO2	63.2	72.0	66.9	64.3	65.0
TiO2	0.40	0.32	0.35	0.37	0.29
Al2O3	16.5	13.3	14.0	14.4	12.6
Fe2O3	5.35	1.92	5.25	4.88	2.98
MnO	0.09	0.04	0.09	0.07	0.10
MgO	1.93	0.37	1.19	0.80	0.48
CaO	1.55	1.24	2.02	2.96	6.00
Na2O	3.52	4.68	4.26	3.16	5.45
K2O	2.96	3.06	2.64	3.94	1.02
P2O5	0.09	0.08	0.08	0.07	0.05
LOI	3.00	1.14	2.26	3.42	5.30
Totals	98.6	98.1	99.0	98.4	99.3

Total FE as Fe2O3

Analysis code ICP5 Report AC 9AD3379 Page I2

NATA Certificate Results in percentages

	701291	701292	701293	701294	701297
SiO2	69.4	64.4	53.0	60.6	59.3
TiO2	0.34	0.51	0.61	0.55	0.53
Al2O3	14.2	12.8	16.7	14.6	14.2
Fe2O3	4.08	7.85	11.4	6.70	7.05
MnO	0.05	0.14	0.19	0.11	0.14
MgO	0.70	2.70	3.82	1.89	2.30
CaO	0.76	1.50	2.52	4.04	5.10
Na2O	4.92	2.74	4.10	3.00	3.36
K2O	1.97	3.04	1.99	3.16	2.12
P2O5	0.07	0.16	0.19	0.17	0.17
LOI	1.59	3.08	4.10	4.08	3.94
Totals	98.1	98.9	98.6	98.9	98.2

Total FE as Fe2O3

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411430

CLASSIC LABORATORIES LTD

Analysis code ICP5 Report AC 9AD3379 Page I3

NATA Certificate Results in percentages

	701299	701402	701403	701404	701405
SiO2	60.3	60.5	61.2	57.1	59.8
TiO2	0.54	0.50	0.54	0.58	0.55
Al2O3	14.8	13.4	14.8	15.5	13.8
Fe2O3	9.30	5.35	5.70	7.80	7.05
MnO	0.15	0.12	0.11	0.14	0.15
MgO	3.60	1.67	1.52	2.56	2.58
CaO	1.61	6.30	4.22	4.74	4.62
Na2O	1.84	2.82	3.92	3.08	2.84
K2O	2.72	2.84	2.30	2.46	2.32
P2O5	0.16	0.16	0.15	0.17	0.15
LOI	3.88	5.25	3.96	4.86	4.92
Totals	98.9	98.9	98.4	99.0	98.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD 411431

Analysis code ICP5 Report AC 9AD3379 Page I4

NATA Certificate Results in percentages

	701406	701407
SiO2	49.4	64.0
TiO2	0.68	0.56
Al2O3	16.0	11.7
Fe2O3	9.55	7.80
MnO	0.21	0.10
MgO	5.20	2.90
CaO	5.55	3.04
Na2O	2.52	4.36
K2O	2.56	0.57
P2O5	0.14	0.13
LOI	6.70	3.96
Totals	98.5	99.1

Total FE as Fe2O3

424

ANALABS

411432

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. 799.52.08.06637

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

P.D. Ellis
Placer Exploration Ltd.
479 Oceana Drive
Howrah
Tasmania 7018

ORDER No.	PROJECT
1466	Bulgobac

DATE RECEIVED	RESULTS REQUIRED
03/11/89	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
3	17/11/89	1	51

STATE OF SAMPLES REFER BELOW	SAMPLE NUMBERS	PRE-TREATMENT: DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	ANALYSIS: REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	7012,17,22/71	DC	Prep: 006,010,01[illegible],012,[illegible]3,016						Cu,Pb,Zn,Ag/101		
	7012,17,22/71	DC	Prep: 006,010,01[illegible],012,[illegible]3,016						As/114		
	7012,17,22/71	DC	Prep: 006,010,01[illegible],012,[illegible]3,016						Au,AuChk/309		
	7012,17,22/71	DC	Prep: 006,010,01[illegible],012,[illegible]3,016						As/101		

RESULTS TO

P.D. Ellis
Placer Exploration Ltd.
479 Oceana Drive
Howrah
Tasmania 7018

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 Inchcape Inspection and Testing Services Australia Pty. Ltd.

411433

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.52.89.06637	17/11/89	1466	1 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	As	As	
1	701217	350	175	4550	7.0	0.467	–	600	>100	Px 1
2	701222	15	15	80	<0.5	0.018	0.002	–	11	851.5-854.0
3	701223	5	15	85	<0.5	<0.008	–	–	2	854.0-856.2
4	701224	<5	20	90	<0.5	<0.008	–	–	1	856.2-858.4
5	701225	<5	10	90	<0.5	<0.008	–	–	<1	858.4-860.0
6	701226	<5	10	55	<0.5	0.007	–	–	<1	860.0-862.0
7	701227	5	20	45	<0.5	0.039	0.038	–	<1	862.0-864.0
8	701228	<5	5	60	<0.5	<0.008	–	–	<1	864.0-865.5
9	701229	<5	10	30	<0.5	<0.008	0.027	–	1	865.5-867.3
10	701230	<5	10	40	<0.5	<0.008	–	–	<1	867.3-870.0
11	701231	<5	10	55	<0.5	0.009	–	–	3	870.0-872.0
12	701232	<5	10	60	<0.5	0.014	–	–	1	872.0-874.0
13	701233	<5	10	45	<0.5	<0.008	–	–	<1	874.0-875.6
14	701234	<5	10	65	<0.5	<0.008	–	–	2	875.6-878.0
15	701235	<5	15	60	<0.5	<0.008	–	–	2	878.0-880.0
16	701236	<5	<5	50	<0.5	0.007	<0.008	–	<1	880.0-882.0
17	701237	<5	15	55	<0.5	0.010	–	–	<1	882.0-884.0
18	701238	<5	20	45	<0.5	0.008	–	–	<1	884.0-886.1
19	701239	<5	15	40	<0.5	0.020	–	–	1	886.1-887.9
20	701240	<5	10	45	<0.5	<0.008	–	–	3	887.9-889.2
21	701241	<5	10	60	<0.5	<0.008	–	–	<1	889.2-890.1
22	701242	5	5	65	<0.5	<0.008	–	–	<1	890.1-890.2
23	701243	<5	5	70	<0.5	<0.008	–	–	<1	890.2-892.0
24	701244	<5	5	75	<0.5	<0.008	–	–	2	892.0-894.0
25	701245	5	<5	85	<0.5	<0.008	–	–	<1	894.0-896.0

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

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

411434

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	999.52.08.06637	17/11/89	1466	2 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	As	As	
1	701246	20	20	115	<0.5	<0.008	–	–	<1	896.0-898.0
2	701247	10	10	120	<0.5	<0.008	–	–	<1	898.0-900.0
3	701248	8	25	160	<0.5	<0.008	–	–	<1	900.0-902.0
4	701249	5	35	175	<0.5	<0.008	–	–	1	902.0-904.0
5	701250	40	40	180	<0.5	<0.008	–	–	<1	904.0-906.0
6	701251	85	20	60	<0.5	0.455	–	–	9	
7	701252	10	30	140	<0.5	<0.008	–	–	<1	906.0-908.0
8	701253	5	40	80	<0.5	0.025	<0.008	–	<1	908.0-909.1
9	701254	5	15	140	<0.5	0.043	–	–	<1	909.1-911.0
10	701255	10	20	140	<0.5	0.020	–	–	<1	911.0-913.0
11	701256	<5	10	125	<0.5	0.014	0.015	–	<1	913.0-915.0
12	701257	5	15	110	<0.5	0.016	–	–	<1	915.0-917.9
13	701258	5	60	340	<0.5	0.011	–	–	1	917.9-919.8
14	701259	5	20	155	<0.5	0.025	–	–	<1	919.9-921.1
15	701260	5	25	150	<0.5	0.049	–	–	<1	921.1-922.0
16	701261	40	80	370	<0.5	0.016	–	–	1	922.0-932.0
17	701262	60	160	850	<0.5	0.014	–	–	1	932.0-941.0
18	701263	65	70	360	<0.5	0.011	–	–	2	941.0-950.5
19	701264	5	35	225	<0.5	0.015	–	–	<1	950.5-953.5
20	701265	10	25	135	<0.5	0.050	–	–	10	953.5-958.3
21	701266	5	10	125	<0.5	0.020	–	–	7	958.3-967.5
22	701267	5	20	105	0.5	0.019	<0.008	–	<1	967.5-971.4
23	701268	170	15	145	0.5	0.013	–	–	5	971.4-974.9
24	701269	30	20	75	0.5	0.016	–	–	<1	974.9-974.9
25	701270	20	15	140	<0.5	0.013	–	–	<1	974.9-988.9

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

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ANALABS

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

411435

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	959.52.08.06637	17/11/89	1466	3 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	As	As	
1	701271	340	210	4350	5.0	0.829	0.508	600	>100	
2										
3										
4										
5										
6										
7										
8										
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

428

411436

ANALABS
A division of Inchcape Inspection and Testing Services, Australia, Pty. Ltd.
Perth Head Office:
52 Murray Road, Welshpool, Western Australia 6106.
Tel: (09) 458 7999. Telex: AA92560. Fax: (09) 458 2922.
P.O. Box 210 Bentley, W.A. 6102.

P O Box 929
Burnie Tas 7320

P D Ellis
Placer Exploration Ltd
479 Oceana Drive
Howrah
Tasmania 7018

Results for Ti,Y,Nb,Ba on your order No 1466 are as follows:-

Sample	Ti	Y	Nb	Ba
701222	1650	32	14	470
701223	1850	33	11	230
701224	2150	36	10	290
701225	1850	43	12	500
701226	1800	38	12	2200
701227	1950	35	12	820
701228	2050	33	13	380
701229	2000	35	10	390
701230	2000	35	17	210
701231	2300	33	12	330
701232	2300	36	13	280
701233	2500	36	11	160
701234	2150	36	12	290
701235	2100	35	10	300
701236	2250	36	12	180
701237	2050	37	14	370
701238	1350	35	13	300
701239	1400	36	11	380
701240	1550	33	13	170
701241	1900	32	13	300
701242	210	21	<3	<10
701243	2150	41	11	110
701244	2050	43	13	210
701245	2100	36	11	280
701246	2050	34	10	250
701247	2000	37	11	320
701248	2000	37	13	250

411437

Sample	Ti	Y	Nb	Ba
701249	2000	34	14	510
701250	1950	35	10	530
701252	1950	37	9	420
701253	1900	30	12	450
701254	1950	37	12	340
701255	2050	34	9	440
701256	1850	31	13	230
701257	1700	34	14	390
701258	3200	33	10	120
701259	2250	32	11	290
701260	1950	32	12	290
701261	2600	26	8	430
701262	2200	27	10	830
701263	2450	26	12	360
701264	2800	40	10	<10
701265	2100	40	12	65
701266	1950	29	15	95
701267	1900	31	14	230
701268	1750	31	15	1250
701269	1800	34	13	210
701270	1800	34	13	230
Detection	50	5	3	10
Units	ppm	ppm	ppm	ppm
Method	401	401	401	401

Yours faithfully

Peter Dzwonczyk
Manager - ANALABS TASMANIA

CLASSIC LABORATORIES LTD
Osman Place, Thebarton, South Australia 5031
Telephone: (08) 43 5722 Facsimile: (08) 234 03251

Mr Peter Ellis
Placer Exploration Limited
P.O. BOX 384
ROSNY PARK
TAS 7018

Job Number: 9AD3259

Your Reference: 1468
Number of Samples: 51
Extra Samples : 0

Date Received: 23-NOV-1989
Date Reported: 15-DEC-1989

This report comprises a cover sheet and pages I1 to I11, 1 to 2

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source. Please address any enquiries to Mr. Trevor Francis.

Approved Signature:

for

Dr. John Kikkert
General Manager - Adelaide.

Report Analyte Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample for Analysis.

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

411439

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259

NATA Certificate Results in percentages

	701222	701223	701224	701225	701226
SiO2	67.4	68.9	64.2	64.7	65.9
TiO2	0.38	0.39	0.43	0.39	0.40
Al2O3	14.6	13.9	15.3	14.9	14.7
Fe2O3	4.68	4.58	5.10	3.74	3.36
MnO	0.06	0.06	0.09	0.09	0.09
MgO	2.44	2.14	2.10	2.18	2.22
CaO	1.50	1.64	2.50	3.42	3.62
Na2O	2.60	4.52	4.64	2.40	2.32
K2O	2.82	1.37	1.70	3.06	3.16
P2O5	0.10	0.12	0.15	0.12	0.11
LOI	3.50	2.72	3.64	5.05	5.15
Totals	100.1	100.3	99.8	100.0	101.0

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I2

NATA Certificate Results in percentages

	701227	701228	701229	701230	701231
SiO2	66.1	66.1	66.0	67.8	65.3
TiO2	0.40	0.44	0.44	0.42	0.48
Al2O3	14.3	15.1	14.9	14.7	14.4
Fe2O3	2.60	4.14	1.95	3.48	5.40
MnO	0.09	0.09	0.08	0.08	0.11
MgO	1.41	1.49	0.92	0.93	1.16
CaO	3.98	3.00	4.72	3.08	3.38
Na2O	2.10	2.38	1.08	4.26	3.36
K2O	3.46	3.36	4.36	2.06	2.36
P2O5	0.13	0.16	0.16	0.17	0.20
LOI	5.30	4.52	6.00	3.72	4.40
Totals	99.9	100.8	100.6	100.7	100.5

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411441

Analysis code ICP 5 Report AC 9AD3259 Page I3

NATA Certificate. Results in percentages

	701232	701233	701234	701235	701236
SiO2	66.3	64.4	60.5	63.5	65.2
TiO2	0.48	0.53	0.55	0.41	0.45
Al2O3	14.3	14.9	14.7	13.9	15.1
Fe2O3	5.20	3.68	5.80	5.65	5.30
MnO	0.09	0.09	0.13	0.11	0.09
MgO	1.23	1.06	1.92	1.09	0.97
CaO	2.98	3.80	4.32	3.28	2.44
Na2O	3.44	5.75	2.74	3.20	6.20
K2O	2.30	2.52	4.92	2.16	0.97
P2O5	0.20	0.39	0.58	0.04	0.03
LOI	3.84	3.82	4.80	4.80	3.34
Totals	100.4	100.9	101.0	98.1	100.1

Total FE as Fe2O3

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CLASSIC LABORATORIES LTD

411442

Analysis code ICP 5 Report AC 9AD3259 Page I4

NATA Certificate Results in percentages

	701237	701238	701239	701240	701241
SiO2	64.8	70.3	68.4	69.5	66.9
TiO2	0.41	0.28	0.30	0.31	0.40
Al2O3	15.1	14.0	14.4	14.1	15.4
Fe2O3	4.94	3.28	3.02	3.26	4.54
MnO	0.09	0.08	0.08	0.07	0.08
MgO	1.11	0.69	0.88	0.82	1.48
CaO	2.80	2.72	3.38	2.58	2.24
Na2O	3.36	3.78	2.72	5.45	3.50
K2O	2.58	2.04	2.84	1.10	2.44
P2O5	0.02	<0.01	<0.01	<0.01	0.03
LOI	4.40	3.76	4.54	3.42	3.78
Totals	99.6	100.9	100.5	100.6	100.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I5

NATA Certificate Results in percentages

	701242	701243	701244	701245	701246
SiO2	77.0	66.0	64.6	66.5	64.8
TiO2	0.04	0.43	0.42	0.40	0.41
Al2O3	3.24	14.2	14.0	13.7	13.8
Fe2O3	5.05	4.62	4.56	5.10	5.10
MnO	0.16	0.10	0.11	0.10	0.11
MgO	1.78	1.97	2.02	1.88	1.77
CaO	6.50	3.26	4.06	3.22	3.54
Na2O	0.08	5.20	3.56	3.18	3.80
K2O	0.08	0.82	1.76	1.89	1.61
P2O5	0.05	0.14	0.13	0.13	0.16
LOI	6.30	4.08	5.30	4.56	4.68
Totals	100.3	100.8	100.5	100.7	99.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411444

Analysis code ICP 5 Report AC 9AD3259 Page I6

NATA Certificate Results in percentages

	701247	701248	701249	701250	701251
SiO2	65.8	65.3	64.0	65.5	73.9
TiO2	0.40	0.43	0.41	0.43	0.50
Al2O3	13.6	14.4	14.5	13.4	12.2
Fe2O3	5.15	5.25	5.25	5.05	4.20
MnO	0.11	0.11	0.12	0.12	0.02
MgO	1.97	1.92	1.93	1.95	0.69
CaO	3.56	3.00	3.16	3.14	0.39
Na2O	3.64	5.05	4.00	3.38	0.94
K2O	1.74	1.16	1.99	2.08	4.98
P2O5	0.19	0.21	0.20	0.23	0.21
LOI	4.68	3.86	4.38	4.22	2.82
Totals	100.8	100.7	99.9	99.5	100.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411445

Analysis code ICP 5 Report AC 9AD3259 Page I7

NATA Certificate Results in percentages

	701252	701253	701254	701255	701256
SiO2	64.9	63.5	65.0	63.5	66.6
TiO2	0.41	0.42	0.41	0.42	0.39
Al2O3	14.3	13.4	14.0	14.9	13.8
Fe2O3	4.18	1.92	4.48	5.15	4.72
MnO	0.12	0.16	0.13	0.13	0.10
MgO	1.70	1.01	1.86	2.08	1.89
CaO	3.74	6.55	3.54	3.28	2.64
Na2O	3.60	2.32	3.44	3.26	3.84
K2O	2.36	3.28	2.22	2.56	1.82
P2O5	0.23	0.27	0.22	0.25	0.23
LOI	4.86	7.10	4.84	4.70	3.86
Totals	100.4	99.9	100.1	100.2	99.9

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I6

NATA Certificate Results in percentages

	701247	701248	701249	701250	701251
SiO2	65.8	65.3	64.0	65.5	73.9
TiO2	0.40	0.43	0.41	0.43	0.50
Al2O3	13.6	14.4	14.5	13.4	12.2
Fe2O3	5.15	5.25	5.25	5.05	4.20
MnO	0.11	0.11	0.12	0.12	0.02
MgO	1.97	1.92	1.93	1.95	0.69
CaO	3.56	3.00	3.16	3.14	0.39
Na2O	3.64	5.05	4.00	3.38	0.94
K2O	1.74	1.16	1.99	2.08	4.98
P2O5	0.19	0.21	0.20	0.23	0.21
LOI	4.68	3.86	4.38	4.22	2.82
Totals	100.8	100.7	99.9	99.5	100.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I8

NATA Certificate Results in percentages

	701257	701258	701259	701260	701261
SiO2	66.2	47.4	58.9	63.4	48.5
TiO2	0.39	0.38	0.47	0.42	0.52
Al2O3	13.8	11.6	13.4	14.4	12.7
Fe2O3	4.74	8.05	5.70	5.15	9.55
MnO	0.10	0.11	0.15	0.10	0.34
MgO	1.91	5.35	3.24	2.78	8.60
CaO	2.64	10.8	5.50	3.04	7.00
Na2O	3.80	1.68	1.76	2.64	2.46
K2O	1.82	0.78	2.70	2.72	0.84
P2O5	0.22	0.24	0.31	0.26	0.37
LOI	4.58	11.6	7.20	4.90	9.05
Totals	100.2	98.0	99.3	99.8	99.9

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411448

Analysis code ICP 5 Report AC 9AD3259 Page I9

NATA Certificate Results in percentages

	701262	701263	701264	701265	701266
SiO2	53.9	49.0	28.4	48.4	59.3
TiO2	0.47	0.48	0.56	0.48	0.44
Al2O3	12.6	12.4	14.6	18.2	16.4
Fe2O3	8.25	9.80	14.6	9.05	8.20
MnO	0.36	0.32	0.43	0.22	0.16
MgO	8.35	8.90	10.1	4.24	3.16
CaO	6.30	7.40	13.4	5.90	2.42
Na2O	2.96	2.20	1.74	6.30	5.75
K2O	1.43	0.85	0.48	0.86	0.93
P2O5	0.33	0.32	0.40	0.19	0.18
LOI	6.00	9.25	16.0	7.15	3.84
Totals	100.9	100.9	100.7	101.0	100.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3259 Page I10

NATA Certificate Results in percentages

	701267	701268	701269	701270	701271
SiO2	64.5	68.3	62.7	64.8	68.4
TiO2	0.41	0.38	0.38	0.41	0.40
Al2O3	15.2	14.4	14.0	15.1	14.6
Fe2O3	7.75	4.54	5.60	5.45	4.42
MnO	0.13	0.08	0.13	0.12	0.29
MgO	2.78	1.38	1.65	1.99	1.15
CaO	0.90	1.26	3.20	2.70	2.02
Na2O	4.60	3.50	4.40	3.46	0.74
K2O	1.39	3.94	1.78	2.58	4.52
P2O5	0.17	0.18	0.08	0.22	0.27
LOI	2.78	2.22	4.28	4.04	4.08
Totals	100.6	100.2	98.2	100.9	100.9

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

411450

Analysis code ICP 5 Report AC 9AD3259 Page I11

NATA Certificate Results in percentages

701217

SiO2	68.7
TiO2	0.39
Al2O3	14.7
Fe2O3	4.46
MnO	0.29
MgO	1.09
CaO	1.99
Na2O	0.78
K2O	4.42
P2O5	0.22
LOI	3.64
Totals	100.7

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

ANALYTICAL REPORT

Job: 9AD3259
O/N: 1468

Sample	Zr	Ba	Y	Nb	Cr
701217	135	380	12	9	98
701222	200	430	28	16	94
701223	190	200	28	14	130
701224	200	250	32	15	90
701225	210	420	38	15	115
701226	200	2050	35	16	88
701227	200	680	30	15	64
701228	210	360	28	15	75
701229	200	340	32	14	40
701230	200	190	32	15	115
701231	185	290	30	14	55
701232	185	260	30	14	80
701233	185	160	28	16	52
701234	190	260	30	15	72
701235	190	270	32	14	105
701236	195	170	30	14	125
701237	210	330	30	17	86
701238	220	250	28	15	84
701239	230	340	34	17	150
701240	210	160	30	17	78
701241	220	270	26	16	180
701242	12	10	16	5	470
701243	210	110	34	15	155
701244	210	195	34	15	145
701245	210	240	32	16	135
701246	210	240	30	15	175
701247	210	270	32	15	125
701248	210	220	30	16	170
701249	210	440	30	14	130
701250	200	460	28	15	105
701251	I.S.	I.S.	I.S.	I.S.	I.S.
701252	210	350	30	17	86
701253	200	400	30	14	140
701254	210	300	32	16	76
701255	210	390	32	16	96
701256	200	190	28	15	90
701257	210	350	28	16	86
701258	130	140	26	12	350
701259	190	280	30	14	160
701260	210	280	30	15	105
701261	155	490	22	12	470
701262	145	870	20	14	440
701263	145	410	20	13	440
701264	165	35	32	14	480
701265	230	90	32	16	52
701266	210	110	25	17	80
701267	200	230	22	17	64
701268	185	1200	26	15	185
701269	190	180	30	15	70
701270	195	200	30	16	86
Units	ppm	ppm	ppm	ppm	ppm
Detn Limit	4	10	4	2	2
Scheme	XRF1	XRF1	XRF1	XRF1	XRF3

CLASSIC LABORATORIES LTD

Job: 9AD3259
O/N: 1468

ANALYTICAL REPORT

Sample	Zr	Ba	Y	Nb	Cr
701271	I.S.	I.S.	I.S.	I.S.	I.S.
Units	ppm	ppm	ppm	ppm	ppm
Detn Limit	4	10	4	2	2
Scheme	XRF1	XRF1	XRF1	XRF1	XRF3

CLASSIC LABORATORIES LTD
Osman Place, Thebarton, South Australia 5031
Telephone: (08) 43 5722 Facsimile: (08) 234 03251

411453

Mr Peter Ellis
Placer Exploration Limited
P.O. BOX 384
ROSNY PARK
TAS 7018

Job Number: 9AD3395

Your Reference: 1472
Number of Samples: 14
Extra Samples : 0

Date Received: 24-NOV-1989
Date Reported: 14-DEC-1989

This report comprises a cover sheet and pages 1 to 1, I1 to I3

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source. Please address any enquiries to Mr. Trevor Francis.

Approved Signature:

for

Dr. John Kikkert
General Manager - Adelaide.

Report Analyte Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample for Analysis.

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

411454

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3395 Page I1

NATA Certificate Results in percentages

	701272	701273	701274	701275	701276
SiO2	63.8	62.1	67.0	62.4	64.1
TiO2	0.36	0.41	0.35	0.39	0.37
Al2O3	14.6	16.3	14.6	15.8	14.6
Fe2O3	5.60	7.10	4.16	6.30	4.70
MnO	0.12	0.12	0.08	0.12	0.11
MgO	1.82	2.02	1.21	2.18	1.18
CaO	2.72	2.34	2.46	2.36	3.70
Na2O	4.12	3.76	3.86	3.12	4.22
K2O	1.66	2.44	2.52	2.62	2.30
P2O5	0.11	0.11	0.09	0.10	0.09
LOI	3.96	4.10	3.60	4.46	4.40
Totals	98.9	100.8	99.9	99.8	99.8

Total FE as Fe2O3

447

CLASSIC LABORATORIES LTD

411455

Analysis code ICP 5 Report AC 9AD3395 Page I2

NATA Certificate Results in percentages

	701277	701278	701279	701280	701281
SiO2	64.1	64.4	65.0	60.4	59.3
TiO2	0.35	0.34	0.37	0.59	0.58
Al2O3	14.2	14.7	13.8	15.9	14.8
Fe2O3	5.25	4.74	5.45	9.70	7.30
MnO	0.12	0.09	0.11	0.18	0.14
MgO	1.06	1.03	2.12	4.36	2.54
CaO	3.54	3.36	3.42	0.79	5.05
Na2O	3.98	4.14	2.54	3.66	2.90
K2O	3.14	2.28	2.38	1.40	2.52
P2O5	0.09	0.10	0.14	0.21	0.20
LOI	3.94	4.50	5.00	3.64	4.80
Totals	99.8	99.7	100.3	100.8	100.1

Total FE as Fe2O3

448

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 9AD3395 Page I3

NATA Certificate Results in percentages

	701282	701284	701285
SiO2	58.8	57.1	62.8
TiO2	0.54	0.60	0.47
Al2O3	14.5	16.0	13.7
Fe2O3	6.70	8.25	6.35
MnO	0.14	0.16	0.15
MgO	2.12	3.46	2.54
CaO	5.65	3.58	3.94
Na2O	3.04	4.16	4.48
K2O	2.46	1.69	1.75
P2O5	0.18	0.18	0.13
LOI	6.35	4.96	4.64
Totals	100.5	100.1	100.9

Total FE as Fe2O3

449

411457

CLASSIC LABORATORIES LTD

Job: 9AD3395
O/N: 1472

ANALYTICAL REPORT

Sample	Zr	Ba	Y	Nb	Cr	
701272	200	360	30	16	58	988·8 - 994·9
701273	220	500	32	15	34	994·8 - 999·2
701274	195	640	30	15	40	998·2 - 1001·2
701275	210	490	35	16	35	1001·2 - 1004·0
701276	195	640	32	14	38	1004·0 - 1006.6
701277	190	990	30	15	35	1006·6 - 1009·2
701278	190	440	30	15	48	1026·4 - 1029·8
701279	185	290	26	13	68	1029·6 - 1035·0
701280	150	270	16	12	30	1041·9 - 1046·0
701281	140	900	28	10	38	1060.0 -1067·9
701282	135	530	28	11	30	1091·0 -1095·1
701283	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701284	145	450	24	13	32	1085·1 - 1086.0
701285	150	780	25	13	42	1096·8 - 1098.0
Units	ppm	ppm	ppm	ppm	ppm	
Detn Limit	4	10	4	2	2	
Scheme	XRF1	XRF1	XRF1	XRF1	XRF3	

459

411458

CLASSIC LABORATORIES LTD

Job: 9AD3395
O/N: 1472

ANALYTICAL REPORT

Sample	Zr	Ba	Y	Nb	Cr	
701272	200	360	30	16	58	988.8 - 994.8
701273	220	500	32	15	34	994.8 - 998.2
701274	195	640	30	15	40	998.2 - 1001.2
701275	210	490	35	16	35	1001.2 - 1004.0
701276	195	640	32	14	38	1004.0 - 1006.6
701277	190	990	30	15	35	1006.6 - 1009.2
701278	190	440	30	15	48	1026.4 - 1028.8
701279	185	290	26	13	68	1029.6 - 1035.0
701280	150	270	16	12	30	1041.9 - 1046.0
701281	140	900	28	10	38	1060.0 - 1067.9
701282	135	530	28	11	30	1091.0 - 1095.1
701283	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701284	145	450	24	13	32	1085.1 - 1086.0
701285	150	780	25	13	42	1096.8 - 1098.0
Units	ppm	ppm	ppm	ppm	ppm	
Detn Limit	4	10	4	2	2	
Scheme	XRF1	XRF1	XRF1	XRF1	XRF3	

451

411459

New Data
BRD1 & 5

CLASSIC LABORATORIES LTD

Job: OAD1077
O/N: 1481

ANALYTICAL REPORT

Sample	As	Nb	Zr	Sr	Rb	Y	Ag	
701409	20	8	135	270	52	16	1	527.5 - 547.7
701410	11	10	115	300	14	22	2	547.7 - 571.7
701411	11	11	110	360	28	24	1	571.7 - 577.7
701412	12	11	98	300	9	18	1	577.7 - 586.7
701413	7	11	105	310	22	18	1	586.7 - 592.7
701414	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
701415	<2	11	110	330	48	22	1	592.7 - 610.8
701416	13	12	125	270	16	22	1	610.8 - 634.3
701417	3	10	125	280	6	22	1	634.3 - 652.8
701418	6	10	105	400	40	18	<1	652.8 - 688.3
701419	6	9	105	420	30	20	1	688.8 - 694.2
701420	3	9	105	470	34	22	1	694.8 - 700.8
701421	<2	10	105	230	<2	18	1	700.8 - 718.3
701422	<2	10	115	540	32	20	1	718.3 - 742.8
701423	<2	11	145	510	5	24	1	742.8 - 754.8
701424	2	12	130	290	2	20	1	754.8 - 760.8
701425	<2	6	76	210	10	12	2	760.8 - 784.8
701426	<2	7	60	190	15	8	2	784.8 - 796.8
701427	24	10	115	200	3	20	2	798.8 - 814.8
701428	<2	10	110	220	7	20	2	814.8 - 838.8
701429	8	9	95	250	28	18	2	838.8 - 851.2
701430	11	14	180	100	96	28	1	851.2 - 851.5
701431	<2	15	190	210	78	30	<1	1008.2 - 1013.0
701432	3	15	185	230	82	32	<1	1013.0 - 1014.6
701433	4	14	185	185	105	32	1	1014.6 - 1024.1
701434	2	15	175	135	64	30	<1	1024.1 - 1026.4
701435	<2	15	210	105	50	34	1	1028.8 - 1029.6
701436	9	12	160	150	54	24	1	1035.0 - 1041.9
701437	4	12	140	210	66	26	1	1046.0 - 1052.2
701438	5	10	135	280	76	28	1	1052.2 - 1060.0
701439	<2	11	125	310	80	28	1	1067.9 - 1072.8
701440	3	11	115	270	76	25	1	1072.0 - 1074.3
701441	<2	10	130	230	95	28	1	1074.3 - 1077.8
701442	<2	12	130	230	94	28	<1	1077.8 - 1081.0
701443	15	9	110	210	42	22	1	1086.0 - 1092.2
701444	6	14	145	210	58	28	1	1092.2 - 1096.5
701445	10	12	130	120	115	28	1	1098.6 - 1107.0
701446	28	8	98	240	8	20	1	1107.0 - 1109.8
701447	17	8	115	100	94	20	1	1109.8 - 1118.5
701448	13	13	160	66	110	22	1	1118.5 - 1131.0
701449	5	11	145	125	52	24	<1	1131.0 - 1133.0
704302	<2	11	170	34	64	25	1	3.0 - 11.4
704303	3	11	140	98	94	26	<1	26.6 - 36.7
704304	<2	11	165	120	88	24	<1	45.7 - 48.5
704305	4	16	115	135	125	26	<1	92.9 - 95.0
704306	4	16	115	75	105	28	<1	95.6 - 119.0
704307	7	15	125	68	74	26	<1	119.0 - 131.0
704308	5	15	125	82	85	24	<1	131.0 - 144.5
704309	11	13	140	115	90	26	<1	144.5 - 157.7
704310	19	7	110	540	38	14	2	531.8 - 533.0
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
Detn Limit	2	2	4	2	2	4	1	
Scheme	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	AAS2	

BRD1

Sample between Previous Sample

BRD5

452

411460

CLASSIC LABORATORIES LTD

Job: 0AD1077
O/N: 1481

ANALYTICAL REPORT

Sample	As	Nb	Zr	Sr	Rb	Y	Ag	
704311	14	11	130	410	13	20	1	533.0 - 545.0
704312	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
704313	15	10	145	420	16	22	1	545.0 - 569.0
704314	13	9	115	320	44	16	1	569.0 - 570.8
704315	15	13	115	60	115	18	1	688.5 - 692.0
704316	16	14	130	48	125	22	1	692.0 - 698.0
704317	10	10	110	230	<2	24	1	698.0 - 710.0
704318	5	8	82	200	<2	12	1	710 - 713.0
704319	16	9	105	350	11	18	1	713.0 - 724.5
704320	4	7	75	270	14	14	1	724.5 - 751.7
704321	22	10	130	220	30	22	1	751.7 - 761.0
704322	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	
704323	10	10	135	360	66	22	1	761.0 - 772.7
704324	5	11	145	440	11	26	1	772.7 - 797.0
704325	<2	12	130	340	12	26	1	797.0 - 823.9
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
Detn Limit	2	2	4	2	2	4	1	
Scheme	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	AAS2	

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CLASSIC LABORATORIES LTD

Job: 0AD1077
O/N: 1481

ANALYTICAL REPORT

Sample	Cu	Pb	Zn	Au Dp1	Au Dp2	Au Dp3
701409	92	75	800	<0.01	0.01	--
701410	38	76	86	<0.01	--	--
701411	40	64	100	<0.01	--	--
701412	35	72	115	<0.01	--	--
701413	48	155	330	<0.01	--	--
701414	L.N.R.	L.N.R.	L.N.R.	L.N.R.	--	--
701415	38	40	78	0.01	--	--
701416	48	120	400	<0.01	--	--
701417	25	40	98	<0.01	--	--
701418	40	58	115	0.01	--	--
701419	44	38	58	<0.01	--	--
701420	66	36	52	<0.01	--	--
701421	28	32	105	<0.01	--	--
701422	25	185	1140	0.01	--	--
701423	38	240	450	<0.01	--	--
701424	20	45	250	0.02	--	--
701425	66	530	1320	0.02	--	--
701426	56	700	1900	<0.01	--	--
701427	50	90	490	<0.01	--	--
701428	26	165	320	<0.01	--	--
701429	38	145	190	<0.01	0.01	--
701430	6	24	48	<0.01	--	--
701431	12	22	50	<0.01	--	--
701432	28	20	42	<0.01	--	--
701433	7	15	22	<0.01	--	--
701434	16	18	22	<0.01	--	--
701435	2	20	52	0.01	--	--
701436	18	26	88	<0.01	--	--
701437	18	28	160	<0.01	--	--
701438	11	25	74	<0.01	--	--
701439	34	30	68	<0.01	--	--
701440	52	24	55	0.01	--	--
701441	10	10	40	<0.01	--	--
701442	2	18	40	<0.01	--	--
701443	24	20	120	<0.01	--	--
701444	14	15	50	<0.01	--	--
701445	74	22	74	<0.01	--	--
701446	100	30	94	<0.01	--	--
701447	58	30	46	<0.01	--	--
701448	22	28	44	<0.01	--	--
701449	30	22	52	<0.01	0.01	--
704302	8	44	62	<0.01	--	--
704303	10	80	200	0.01	--	--
704304	15	490	1120	<0.01	--	--
704305	8	26	40	0.01	--	--
704306	3	16	15	0.01	--	--
704307	3	12	13	0.01	--	--
704308	3	12	26	0.03	--	--
704309	13	22	32	0.05	--	--
704310	76	34	58	0.05	--	--
Units	ppm	ppm	ppm	ppm	ppm	ppm
Detn Limit	2	4	2	0.01	0.01	0.01
Scheme	AAS1	AAS1	AAS1	FA1	FA1	FA1

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CLASSIC LABORATORIES LTD

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Job: 0AD1077
O/N: 1481

ANALYTICAL REPORT

Sample	Cu	Pb	Zn	Au Dp1	Au Dp2	Au Dp3
704311	70	28	46	0.04	--	--
704312	L.N.R.	L.N.R.	L.N.R.	L.N.R.	--	--
704313	64	25	48	0.05	--	--
704314	120	38	155	0.04	--	--
704315	58	38	135	<0.01	--	--
704316	52	40	95	<0.01	--	--
704317	92	36	70	0.02	--	--
704318	42	18	68	0.02	--	--
704319	48	70	95	0.02	--	--
704320	92	30	96	0.02	--	--
704321	165	28	92	0.01	0.02	--
704322	L.N.R.	L.N.R.	L.N.R.	L.N.R.	--	--
704323	90	35	78	0.01	--	--
704324	95	32	62	0.02	--	--
704325	120	30	72	0.01	--	--
Units	ppm	ppm	ppm	ppm	ppm	ppm
Detn Limit	2	4	2	0.01	0.01	0.01
Scheme	AAS1	AAS1	AAS1	FA1	FA1	FA1

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CLASSIC LABORATORIES LTD

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Analysis code ICP 5 Report AC 0AD1077 Page 11

NATA Certificate Results in percentages

	701409	701410	701411	701412	701413
SiO2	45.0	50.8	49.6	49.6	50.4
TiO2	0.55	0.65	0.69	0.57	0.65
Al2O3	9.85	10.9	11.9	11.5	11.7
Fe2O3	6.95	8.10	9.15	8.00	8.80
MnO	0.15	0.16	0.15	0.16	0.17
MgO	6.35	7.10	7.65	6.40	6.75
CaO	15.5	12.1	11.0	14.2	11.6
Na2O	0.90	2.10	2.26	2.86	2.72
K2O	1.65	0.47	1.07	0.14	1.13
P2O5	0.30	0.22	0.25	0.20	0.31
LOI	11.0	6.05	6.40	5.45	4.24
Totals	98.2	98.6	100.1	99.1	98.5

Total FE as Fe2O3

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Analysis code ICP 5 Report AC 0AD1077 Page I2

NATA Certificate Results in percentages

	701415	701416	701417	701418	701419
SiO2	51.6	53.0	48.7	49.7	49.2
TiO2	0.69	0.68	0.67	0.58	0.56
Al2O3	12.3	12.3	11.9	11.3	11.0
Fe2O3	8.85	8.75	8.70	8.25	8.00
MnO	0.21	0.20	0.18	0.16	0.15
MgO	7.55	7.15	7.55	6.75	6.45
CaO	10.6	10.5	12.4	13.9	15.3
Na2O	1.72	3.12	2.68	1.79	1.64
K2O	1.90	0.07	<0.01	1.14	0.85
P2O5	0.26	0.19	0.20	0.17	0.14
LOI	4.56	4.92	7.70	6.95	7.60
Totals	100.2	100.9	100.7	100.7	100.9

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

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Analysis code ICP 5 Report AC 0AD1077 Page I3

NATA Certificate Results in percentages

	701420	701421	701422	701423	701424
SiO2	49.5	45.9	52.6	50.0	50.0
TiO2	0.58	0.56	0.64	0.74	0.61
Al2O3	11.4	10.6	12.0	12.9	12.6
Fe2O3	8.25	8.90	8.65	9.35	8.00
MnO	0.15	0.18	0.26	0.32	0.18
MgO	7.15	8.80	7.20	7.15	5.80
CaO	14.2	13.2	12.0	10.2	10.1
Na2O	2.02	1.40	1.71	2.86	3.30
K2O	0.91	<0.01	0.91	<0.01	<0.01
P2O5	0.16	0.16	0.21	0.31	0.26
LOI	6.25	11.1	4.42	6.75	10.1
Totals	100.6	100.8	100.6	100.6	100.9

Total FE as Fe2O3

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CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1077 Page I4

NATA Certificate Results in percentages

	701425	701426	701427	701428	701429
SiO2	52.8	52.9	45.1	40.3	43.2
TiO2	0.33	0.25	0.58	0.59	0.53
Al2O3	11.7	12.1	11.3	10.0	9.90
Fe2O3	8.95	9.25	9.15	8.80	7.20
MnO	0.37	0.45	0.22	0.28	0.22
MgO	8.40	9.30	8.35	8.45	7.95
CaO	8.50	6.15	11.4	16.3	16.3
Na2O	2.14	1.70	1.69	1.29	1.70
K2O	<0.01	0.20	<0.01	0.06	1.25
P2O5	<0.01	<0.01	0.25	0.26	0.31
LOI	7.70	7.75	11.1	13.7	11.7
Totals	100.9	100.0	99.1	100.0	100.3

Total FE as Fe2O3

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Analysis code ICP 5 Report AC 0AD1077 Page I5

NATA Certificate Results in percentages

	701430	701431	701432	701433	701434
SiO2	67.0	67.3	67.4	66.4	66.3
TiO2	0.38	0.36	0.35	0.34	0.32
Al2O3	14.2	14.4	14.2	14.0	12.8
Fe2O3	4.52	4.92	4.52	3.76	3.56
MnO	0.07	0.09	0.08	0.08	0.10
MgO	2.32	1.12	0.78	0.65	0.61
CaO	2.66	2.38	2.64	3.98	5.20
Na2O	3.16	4.54	4.42	3.76	4.26
K2O	2.38	2.92	3.24	3.72	1.99
P2O5	0.07	0.08	0.06	0.09	0.07
LOI	3.94	2.78	2.86	4.04	5.30
Totals	100.7	100.9	100.5	100.8	100.5

Total FE as Fe2O3

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CLASSIC LABORATORIES LTD

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Analysis code ICP 5 Report AC 0AD1077 Page I6

NATA Certificate Results in percentages

	701435	701436	701437	701438	701439
SiO2	63.8	65.5	61.1	62.3	63.0
TiO2	0.39	0.47	0.56	0.55	0.54
Al2O3	15.5	14.0	15.2	14.6	14.7
Fe2O3	6.60	6.75	7.80	6.85	6.60
MnO	0.09	0.13	0.18	0.13	0.13
MgO	2.16	2.54	2.78	2.10	1.94
CaO	1.99	1.92	3.24	4.42	4.14
Na2O	4.90	4.00	3.68	3.12	2.86
K2O	1.42	1.86	1.73	2.28	2.74
P2O5	0.09	0.12	0.13	0.12	0.11
LOI	3.48	3.28	4.44	4.36	4.12
Totals	100.4	100.6	100.8	100.8	100.9

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

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Analysis code ICP 5 Report AC 0AD1077 Page I7

NATA Certificate Results in percentages

	701440	701441	701442	701443	701444
SiO2	59.7	61.0	59.7	56.7	58.2
TiO2	0.49	0.54	0.53	0.56	0.86
Al2O3	13.2	14.6	14.7	14.2	15.8
Fe2O3	5.25	6.40	6.50	6.90	8.00
MnO	0.18	0.12	0.13	0.18	0.15
MgO	1.22	1.76	1.86	3.18	2.90
CaO	8.00	5.35	5.70	6.80	3.96
Na2O	3.20	2.90	3.08	4.02	4.12
K2O	2.66	2.68	2.60	1.62	1.65
P2O5	0.11	0.13	0.12	0.08	0.15
LOI	6.90	5.50	6.00	6.80	5.10
Totals	100.9	101.0	100.9	101.0	100.9

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1077 Page I8

NATA Certificate Results in percentages

	701445	701446	701447	701448	701449
SiO2	56.4	54.0	59.7	66.8	60.0
TiO2	0.80	0.69	0.48	0.48	0.48
Al2O3	14.3	15.9	13.0	11.6	14.7
Fe2O3	7.60	10.5	6.90	5.20	6.20
MnO	0.18	0.14	0.12	0.08	0.11
MgO	3.48	4.84	5.05	4.32	5.00
CaO	6.25	3.22	4.74	3.70	2.96
Na2O	1.54	5.15	1.02	0.02	3.66
K2O	2.60	0.37	2.24	2.76	1.84
P2O5	0.15	0.14	0.13	0.07	0.14
LOI	7.40	5.90	6.95	6.00	5.65
Totals	100.7	100.8	100.3	101.0	100.7

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

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Analysis code ICP 5 Report AC 0AD1077 Page 19

NATA Certificate Results in percentages

	704302	704303	704304	704305	704306
SiO2	69.9	73.2	68.2	75.5	75.1
TiO2	0.31	0.32	0.31	0.18	0.19
Al2O3	15.4	13.6	14.4	12.8	13.1
Fe2O3	4.34	3.08	4.92	1.95	2.16
MnO	0.05	0.08	0.12	0.04	0.03
MgO	1.15	1.49	3.36	0.93	1.07
CaO	0.09	0.17	0.18	0.82	0.21
Na2O	0.55	1.78	2.42	2.88	4.04
K2O	2.48	4.06	2.88	3.02	3.06
P2O5	0.05	0.05	0.05	0.04	0.05
LOI	6.45	3.08	3.74	2.40	1.53
Totals	100.8	100.9	100.6	100.6	100.5

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1077 Page I10

NATA Certificate Results in percentages

	704307	704308	704309	704310	704311
SiO2	75.8	73.6	74.0	36.4	55.5
TiO2	0.16	0.18	0.24	0.41	0.48
Al2O3	12.9	13.4	12.9	9.50	11.7
Fe2O3	2.24	3.08	3.12	11.5	8.70
MnO	0.02	0.02	0.03	0.14	0.13
MgO	1.35	2.22	1.62	3.76	5.65
CaO	<0.01	<0.01	0.58	16.1	6.30
Na2O	4.58	4.06	3.50	2.08	2.92
K2O	2.08	2.22	2.42	0.93	0.71
P2O5	<0.01	<0.01	0.05	0.27	0.33
LOI	1.54	2.12	2.40	8.20	6.05
Totals	100.6	100.9	100.9	89.3 ****	98.5

**** Checked

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

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Analysis code ICP 5 Report AC 0AD1077 Page I11

NATA Certificate Results in percentages

	704313	704314	704315	704316	704317
SiO2	53.3	47.7	67.5	68.4	43.4
TiO2	0.53	0.44	0.73	0.77	0.47
Al2O3	12.6	10.00	12.9	13.2	8.30
Fe2O3	7.30	8.60	6.05	6.15	7.45
MnO	0.14	0.12	0.04	0.03	0.20
MgO	6.90	3.50	3.02	3.06	9.50
CaO	8.25	12.5	1.07	0.51	15.2
Na2O	3.18	1.92	0.64	0.64	0.73
K2O	1.01	1.21	2.94	3.00	<0.01
P2O5	0.36	0.30	0.11	0.11	0.26
LOI	6.85	7.45	5.50	5.05	14.0
Totals	100.4	93.7 ****	100.5	100.9	99.5

**** Checked

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1077 Page 112

NATA Certificate Results in percentages

	704318	704319	704320	704321	704323
SiO2	57.9	42.6	49.2	52.1	50.7
TiO2	0.37	0.49	0.41	0.57	0.55
Al2O3	6.80	8.25	11.0	14.8	13.0
Fe2O3	5.90	7.35	7.50	8.15	7.35
MnO	0.15	0.18	0.14	0.13	0.14
MgO	7.60	8.45	9.50	7.85	6.40
CaO	10.5	16.5	11.1	5.05	9.30
Na2O	0.59	0.89	2.04	3.40	2.26
K2O	<0.01	0.61	0.45	0.82	1.84
P2O5	0.19	0.29	0.19	0.36	0.44
LOI	10.7	14.4	9.15	6.50	8.35
Totals	100.7	100.0	100.7	99.7	100.3

Total FE as Fe2O3

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CLASSIC LABORATORIES LTD

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Analysis code ICP 5 Report AC 0AD1077 Page I13

NATA Certificate Results in percentages

	704324	704325
SiO2	47.3	42.9
TiO2	0.54	0.50
Al2O3	12.1	11.1
Fe2O3	8.05	8.40
MnO	0.17	0.18
MgO	6.90	7.75
CaO	13.4	14.2
Na2O	2.88	1.79
K2O	0.60	0.49
P2O5	0.53	0.52
LOI	7.90	12.0
Totals	100.4	99.8

Total FE as Fe2O3

CLASSIC LABORATORIES LTD

Analysis code ICP 5A | Report AC 0AD1077 | Page 114

NATA Certificate | Order No. 1481 | Results in ppm

Sample	Cr
710409	739
710410	623
710411	615
710412	491
710413	459
710415	551
710416	542
710417	624
710418	571
710419	573
710420	590
710421	519
710422	559
710423	537
710424	339
710425	965
710426	1095
710427	1332
710428	1295
710429	1235
Detn limit	(20)

CLASSIC LABORATORIES LTD

Analysis code ICP 5A | Report AC 0AD1077 | Page 115

NATA Certificate | Order No. 1481 | Results in ppm

Sample	Cr
710430	78
710431	86
710432	136
710433	73
710434	162
710435	66
710436	78
710437	94
710438	52
710439	97
710440	62
710441	80
710442	65
710443	99
710444	59
710445	108
710446	132
701447	234
701448	284
701449	105
Detn limit	(20)

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CLASSIC LABORATORIES LTD

Analysis code ICP 5A | Report AC 0AD1077 | Page 116

NATA Certificate | Order No. 1181 | Results in ppm

Sample	Cr
704302	77
704303	35
704304	139
704305	76
704306	124
704307	62
704308	101
704309	92
704310	211
704311	334
704313	214
704314	220
704315	158
704316	110
704317	987
704318	784
704319	1068
704320	735
704321	278
704323	164
704324	739
704325	609
Detn Limit	(20)

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CLASSIC LABORATORIES LTD

Partial Preliminary

ANALYTICAL REPORT

Job: OAD1134
O/N: 1482

Sample	Cu	Pb	Zn	
704326	130	30	98	823·9 - 883·0
704327	125	38	68	883·0 - 857·0
704328	80	34	58	857·0 - 875·0
704329	75	35	66	875·0 - 893·0
704330	52	30	60	893·0 - 905·0
704331	L.N.R.	L.N.R.	L.N.R.	
704332	82	26	68	905·0 - 911·0
704333	48	46	110	911·0 - 929·0
704334	58	34	68	929·0 - 953·0
704335	48	40	82	953·0 - 970·9
704336	58	38	130	970·9 - 977·0
704337	54	36	84	977·0 - 995·0
704338	56	34	70	995·0 - 1007·0
704339	56	40	68	1007·0 - 1031·0
704340	44	34	90	1031·0 - 1045·9
704341	L.N.R.	L.N.R.	L.N.R.	
704342	7	56	230	1045·9 - 1055·0
704343	8	28	320	1055·0 - 1061·0
704344	2	20	120	1061·0 - 1067·0
704345	6	16	105	1067·0 - 1079·0
704346	7	10	78	1079·0 - 1084·1
704347	8	14	92	1084·1 - 1094·0
704348	3	18	120	1094·0 - 1099·0
704349	24	38	540	1099·0 - 1112·0
704350	4	12	110	1112·0 - 1150·0
704351	3	20	160	1150·0 - 1156·0
704352	2	18	170	1156·0 - 1159·0
704353	7	20	130	1159·0 - 1160·0
704354	5	12	92	1160·0 - 1181·0
Units	ppm	ppm	ppm	
Detn L	2	4	2	
Scheme	AAS1	AAS1	AAS1	

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CLASSIC LABORATORIES LTD

Partial Preliminary

ANALYTICAL REPORT

Job: OAD1134
O/N: 1482

Sample	Ag
704326	1
704327	<1
704328	<1
704329	<1
704330	1
704331	[illegible]
704332	<1
704333	1
704334	1
704335	<1
704336	<1
704337	<1
704338	<1
704339	<1
704340	1
704341	[illegible]
704342	<1
704343	<1
704344	<1
704345	<1
704346	<1
704347	<1
704348	<1
704349	<1
704350	<1
704351	<1
704352	<1
704353	<1
704354	<1
Units	ppm
Detn L	1
Scheme	AAS2

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475

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1134 Page I1

NATA Certificate Results in percentages

	704326	704327	704328	704329	704330
SiO2	43.1	45.7	45.5	47.8	47.8
TiO2	0.46	0.47	0.47	0.51	0.49
Al2O3	11.1	11.7	11.5	11.1	10.7
Fe2O3	9.15	7.90	7.95	8.35	8.50
MnO	0.20	0.15	0.15	0.13	0.15
MgO	9.60	7.20	6.65	6.95	7.80
CaO	11.5	13.5	15.6	12.8	13.8
Na2O	1.61	1.98	1.82	2.28	2.12
K2O	<0.01	0.86	1.22	0.94	0.78
P2O5	0.53	0.56	0.57	0.32	0.32
LOI	12.8	9.00	7.85	6.90	7.65
Totals	100.0	99.0	99.3	98.1	100.1

Total FE as Fe2O3

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CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1134 Page I2

NATA Certificate Results in percentages

	704332	704333	704334	704335	704336
SiO2	47.8	47.6	46.1	43.4	45.1
TiO2	0.50	0.49	0.48	0.62	0.75
Al2O3	11.0	10.6	10.4	11.7	13.2
Fe2O3	8.45	8.20	7.45	8.20	7.55
MnO	0.15	0.20	0.16	0.12	0.12
MgO	8.80	7.60	7.45	7.80	7.90
CaO	12.1	12.3	15.7	14.5	12.9
Na2O	1.98	1.93	2.20	2.78	2.58
K2O	1.01	0.61	1.02	1.15	1.59
P2O5	0.33	0.29	0.35	0.42	0.49
LOI	7.60	8.60	8.50	7.55	6.25
Totals	99.7	98.3	99.8	98.2	98.4

Total FE as Fe2O3

475

411483

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1134 Page I3

NATA Certificate Results in percentages

	704337	704338	704339	704340	704342
SiO2	48.3	41.3	38.7	39.7	67.6
TiO2	0.65	0.61	0.53	0.51	0.33
Al2O3	12.4	10.7	9.85	9.65	14.0
Fe2O3	7.95	8.00	7.35	7.70	6.40
MnO	0.14	0.14	0.14	0.15	0.12
MgO	8.35	8.45	7.40	9.50	2.82
CaO	12.3	16.3	19.7	16.3	1.24
Na2O	1.95	1.71	2.08	1.43	5.05
K2O	2.32	1.71	1.02	0.84	1.28
P2O5	0.41	0.41	0.40	0.36	0.09
LOI	5.05	9.35	11.4	12.2	2.40
Totals	99.8	98.7	98.6	98.3	100.2

Total FE as Fe2O3

411484

470

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1134 Page I4

NATA Certificate Results in percentages

	704343	704344	704345	704346	704347
SiO2	67.3	67.8	67.6	68.5	67.5
TiO2	0.34	0.34	0.36	0.35	0.38
Al2O3	14.5	14.0	14.2	14.5	14.1
Fe2O3	4.98	5.75	5.05	4.60	5.50
MnO	0.15	0.16	0.14	0.08	0.09
MgO	1.35	1.16	1.07	1.77	2.72
CaO	1.36	1.89	1.63	0.81	0.94
Na2O	2.76	3.44	4.24	5.90	5.35
K2O	4.86	3.42	3.16	1.89	1.29
P2O5	0.09	0.10	0.11	0.12	0.14
LOI	1.83	1.85	1.69	2.20	2.10
Totals	99.5	99.9	99.2	100.7	100.1

Total FE as Fe2O3

411485

477

CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1134 Page I5

NATA Certificate Results in percentages

	704348	704349	704350	704351	704352
SiO2	63.8	65.0	66.6	62.4	67.1
TiO2	0.45	0.36	0.36	0.36	0.35
Al2O3	14.8	14.4	15.1	14.7	14.4
Fe2O3	7.30	6.70	5.35	8.45	5.50
MnO	0.11	0.14	0.13	0.18	0.16
MgO	4.28	3.18	2.52	5.60	2.38
CaO	0.71	1.48	1.38	0.70	1.85
Na2O	4.94	4.00	5.55	4.04	5.15
K2O	0.86	2.06	1.57	0.96	1.36
P2O5	0.19	0.14	0.15	0.15	0.12
LOI	2.96	2.74	2.32	3.38	2.30
Totals	100.4	100.2	101.0	100.9	100.7

Total FE as Fe2O3

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CLASSIC LABORATORIES LTD

Analysis code ICP 5 Report AC 0AD1134 Page I6

NATA Certificate Results in percentages

	704353	704354
SiO2	66.9	67.2
TiO2	0.35	0.33
Al2O3	14.4	14.6
Fe2O3	5.45	5.00
MnO	0.15	0.10
MgO	2.60	1.60
CaO	1.61	1.99
Na2O	5.65	4.90
K2O	1.21	2.28
P2O5	0.12	0.12
LOI	2.60	2.24
Totals	100.9	100.4

Total FE as Fe2O3

411487

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CLASSIC LABORATORIES LTD

Analysis code ICP 5A Report AC 0AD1134 Page I7

NATA Certificate Order No. 1482 Results in ppm

Sample	Cr
704326	611
704327	648
704328	613
704329	904
704330	865
704332	889
704333	871
704334	841
704335	1243
704336	1591
704337	1406
704338	1234
704339	1027
704340	941
704342	<50
704343	119
704344	<50
704345	107
704346	51
704347	125
Detn limit	(50)

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Analysis code ICP 5A Report AC 0AD1134 Page I8

NATA Certificate Order No. 1482 Results in ppm

Sample	Cr
704348	<50
704349	70
704350	85
704351	96
704352	86
704353	138
704354	<50
Detn limit	(50)

481

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CLASSIC LABORATORIES LTD

ANALYTICAL REPORT

Job: 0AD1134
O/N: 1482

Sample	As	Rb	Sr	Zr	Nb	Y	Ag
704326	2	<2	95	130	4	20	1
704327	5	20	480	135	5	20	<1
704328	3	32	720	125	5	18	<1
704329	12	22	350	110	4	18	<1
704330	5	17	360	105	2	18	1
704331	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
704332	5	22	390	105	<2	18	<1
704333	3	12	350	105	4	18	1
704334	8	20	530	98	4	18	1
704335	40	20	410	120	3	22	<1
704336	24	30	480	145	6	30	<1
704337	8	48	450	125	3	22	<1
704338	8	38	370	110	3	22	<1
704339	4	17	390	94	3	18	<1
704340	8	14	270	100	3	16	1
704341	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.
704342	3	38	350	200	8	32	<1
704343	<2	145	370	180	9	32	<1
704344	<2	100	410	185	9	32	<1
704345	3	86	350	190	9	32	<1
704346	3	34	135	200	10	32	<1
704347	<2	24	195	200	9	30	<1
704348	<2	22	180	200	8	30	<1
704349	<2	68	210	200	9	32	<1
704350	<2	48	180	210	9	32	<1
704351	<2	28	115	200	8	30	<1
704352	6	34	270	210	8	32	<1
704353	2	30	160	200	8	30	<1
704354	2	70	240	200	9	34	<1
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detn Limit	2	2	2	4	2	4	1
Scheme	XRF1	XRF1	XRF1	XRF1	XRF1	XRF1	AAS2

482

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CLASSIC LABORATORIES LTD

Job: OAD1134
O/N: 1482

ANALYTICAL REPORT

Sample	Au Avg	Au	Au Rpl	Au SS1	Cu	Pb	Zn
704326	0.02	0.03	<0.01	--	130	30	98
704327	0.02	0.02	--	--	125	38	88
704328	0.02	0.02	--	--	90	34	58
704329	<0.01	<0.01	--	--	75	35	68
704330	<0.01	<0.01	--	--	52	30	60
704331	L.N.R.	L.N.R.	--	--	L.N.R.	L.N.R.	L.N.R.
704332	0.01	0.01	--	--	82	28	68
704333	0.02	0.02	--	--	48	46	110
704334	0.02	0.02	--	--	58	34	68
704335	<0.01	<0.01	--	--	48	40	82
704336	0.01	0.01	--	--	58	38	130
704337	0.01	0.01	--	--	54	36	84
704338	0.01	0.01	--	--	58	34	70
704339	<0.01	<0.01	--	--	56	40	68
704340	0.01	0.01	--	--	44	34	90
704341	L.N.R.	L.N.R.	--	--	L.N.R.	L.N.R.	L.N.R.
704342	<0.01	<0.01	--	--	7	58	230
704343	0.01	0.01	--	--	8	28	320
704344	<0.01	<0.01	--	--	2	20	120
704345	<0.01	<0.01	--	--	6	16	105
704346	<0.01	<0.01	0.01	--	7	10	78
704347	0.01	0.01	--	--	8	14	92
704348	0.01	0.01	--	--	3	18	120
704349	0.01	0.01	--	--	24	38	540
704350	0.01	0.01	--	--	4	12	110
704351	<0.01	<0.01	--	--	3	20	160
704352	<0.01	<0.01	--	--	2	18	170
704353	<0.01	<0.01	--	--	7	20	130
704354	<0.01	<0.01	--	--	5	12	82
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detn Limit	0.01	0.01	0.01	0.01	2	4	2
Scheme	FA1	FA1	FA1	FA1	AAS1	AAS1	AAS1

PETROLOGY, GEOCHEMISTRY AND CORRELATION OF LAVAS IN BULGOBAC RIVER DRILLHOLES BRD-01, 02, 03 and 05, W. TASMANIA

A Report for Placer (Australia)
(attn. Peter Ellis)

Anthony J. Crawford
Geology Department
University of Tasmania

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CONTENTS (continued)

FIGURES:

TABLES:

SUMMARY and RECOMMENDATIONS

This report presents a review of the geology, geochemistry and tectonic implications of the economically-important Mount Read Volcanics, a Cambrian orogenic basalt-andesite-dacite-rhyolite suite in western Tasmania. A petrological and geochemical study of the thick lava sequences drilled by CSR/Placer in their Bulgobac EL39/85 is reported. These lavas are compared with the regional units recognized within the Mt Read Volcanics, and correlations are drawn. There is indisputable evidence that the thick basalt-andesite sequences drilled at Bulgobac are direct correlates of the Hellyer basalt, that hosts the Hellyer VMS deposit 5km further east. The Hellyer basalt and its correlates at Bulgobac are shown to be very unusual shoshonitic lavas (high-K, high-P2O5, but low TiO2 contents) and modern analogues are restricted to post-collisional settings, being erupted after arc-continent or arc-arc collisions. A tectonic model for the geological evolution of W Tasmania is summarized. In this model, the extensive mafic-ultramafic complexes of the region are interpreted as folded, formerly near-horizontal thrust sheets (allochthons) emplaced westward on to the Rocky Cape passive continental margin during arc-continent collision in the Middle or Late Cambrian. The Hellyer basalts were erupted after this event, as evidenced by the occurrence of abundant ophiolite-derived chromites in the Animal Ck Greywacke that underlies the Hellyer basalts and associated rocks.

Correlations of various lava units between the Bulgobac drillholes and the Mines Dept Mt Charter drillhole further south are attempted, based on diagnostic immobile element ratios. One key observation is that the basal (Unit 9) andesite recovered in BRD01/01A is likely to be a correlate of the Central Volcanic Complex Group 2 andesites, that intruded the Central Volcanic Complex Group 1 lavas along the length of the Mt Read Volcanics belt. This could imply that the Animal Ck Greywacke thins dramatically westward, as the overlying Hellyer basalts and Que Rv Shale thicken in the same direction. The simplest interpretation of this scenario is that the rift (?) basin in which these sediments and lavas were accumulating had its deepest area moving westward with time. This hypothesis may be useful in focussing exploration models on regions of greatest potential interest.

Within the EL, the rock sequence in the subsurface contains the mineralized horizon that hosts the Que and Hellyer VMS deposits, although alteration within the drillholes was not as expected in the vicinity of any significant VMS mineralization. In addition to providing a better understanding of the local geological setting of this key area for VMS exploration, this report suggests that the contact between the Que Rv Shale and the Hellyer basalts should not be disregarded during exploration, especially as there appears to be a shift with time in the locus of volcanism and sedimentation across this region.

SECTION 2: INTRODUCTION and AIMS OF THIS STUDY

EL 39/85, held by Placer Exploration Ltd and targeted at volcanogenic base and precious metal mineralization, is located immediately W of the Murchison Hwy only a few kilometers W of the Que Rv deposit and 5km W of the Hellyer massive sulphide deposit (Figure 1). There is little doubt from regional geological considerations and mapping around the EL that the geological sequence underlying the EL correlates directly with the sequences east of the Murchison Hwy at Que Rv and Hellyer.

Five diamond drillholes BRD 01 to 05, have been put down into Mount Read Volcanics correlates. Significant thicknesses of basic and intermediate lavas within the Mount Read Volcanics (herein MRV) correlates were encountered in four of these, including the two deep holes, BRD 01 (1133m), and in BRD 05 (1181m).

The main aims of the present study are:

1: to combine petrographic and geochemical data from each of the drillholes on EL39/85 to define and classify volcanic units in each drillhole

2: to search for possible interhole correlations between units drilled in the five holes on EL39/85,

3: to compare, petrologically and compositionally, the lava sequences drilled in EL39/85 with other lava sequences within the MRV, particularly those at the Mines Department Mt Charter stratigraphic hole MCH-1, and at the mines at Que Rv and Hellyer,

4; to examine the distribution, and petrographic and compositional effects of alteration in the drillholes, and

5: to make some regional synthesis of the significance of the petrological and geochemical data assessed in this study.

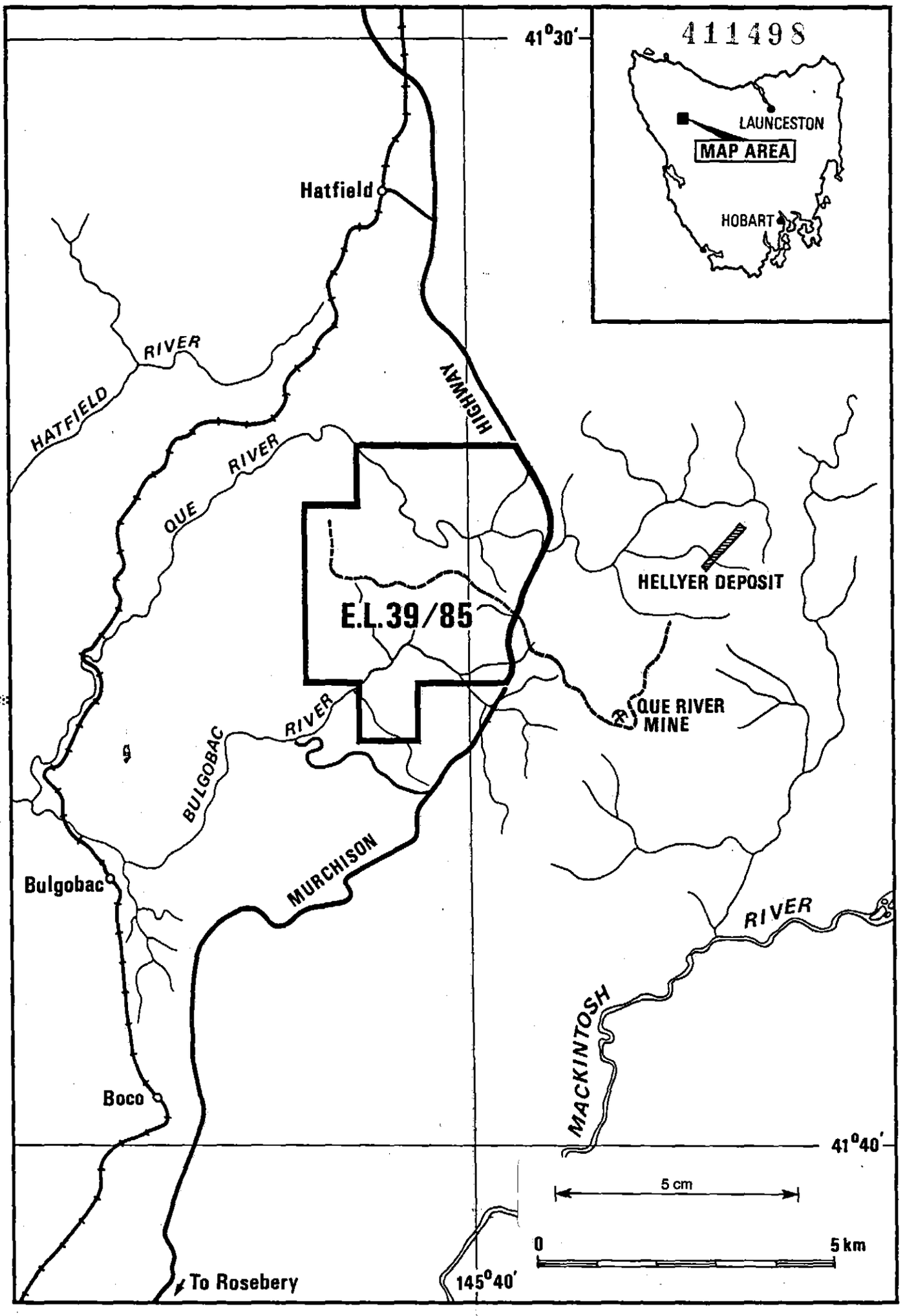


FIG. 1 LOCATION MAP E.L.39/85 BULGOBAC RIVER TAS.

SECTION 3: METHODS

Background information for this study was provided by Peter Ellis, and included Placer Exploration and earlier CSR Exploration Ltd. reports. A large number of thin sections from the five Bulgobac holes have been examined, the first batch (BRD01 top section, 02 and 03) by Dr Jane Barron , and the remainder by me. Around 170 wholerock major and trace element analyses of individual samples or core sections were done for CSR/Placer by Classic Comlabs (SA) and provided to me for this study. These were dominantly for samples from BRD01 and 05, and all have been arranged for convenience into Tables 1-3, according to depth in each hole. These Tables are saved, together with a copy of the text of this report, on a MACINTOSH microcomputer disc stored in the back cover of this report.

As the major element analyses provided by Classic Comlabs contain between 1 and 20 wt% loss on ignition (proportional broadly to the degree of alteration of the sample), all analyses have been recalculated volatile-free. This procedure facilitates data interpretation and makes direct comparison of variably altered samples more meaningful.

In sequences of altered lavas, it is obvious that different styles of alteration, and variable vein assemblages, produce differing extents and directions of modifications of the primary rock composition. The common vein and alteration minerals and assemblages in MRV lava sequences, such as calcite, quartz, sericite, chlorite and to a lesser extent pyrite and barite, indicate that SiO2, CaO and the alkalis (Na, K, Sr, Rb, Ba..) are all mobile to some extent during both regional burial metamorphism, and more localized hydrothermal alteration. Therefore, in assessing the geochemical data from such lava suites with regard to determining primary affinities or making regional or local correlations, due weight should be put on those elements and element ratios which are known to be essentially immobile during such post-eruptive alteration. These so-called immobile elements are those with a high charge to radius ratio, notably Ti, Nb, Zr, Y, the rare earth elements, and some other transition elements such as Sc, V, and normally Ni and Cr. For this study, REE data are not available, although REE data are available for basalts and andesites from the same general sequence from east of the Murchison Hwy (Whitford et al 1989 and author's own data). The REE data are used for this study in the section dealing with regional interpretation and tectonic scenario.

Before the data for the Bulgobac drillholes is presented and discussed, a review of the petrology and geochemistry of the MRV is warranted, since a

major aim of this study is to compare the Bulgobac samples with other MRV sequences. In the following pages, a review of the regional distribution, stratigraphic subdivision, geochemical characteristics, compositional range through time and tectonic significance of the MRV is given. This section draws heavily on a paper in preparation (Crawford , Corbett and others) that should be prepared for a Special Issue of Economic Geology (Ed. R.R. Large) due to be published in a year's time.

SECTION 4: THE MOUNT READ VOLCANICS: A REVIEW

Six years ago I initiated a study to determine the tectonic affinities of the MRV, using analyses of very carefully selected least-altered lavas taken from existing University, Mines Department and company collections (see AMIRA Report 84/P210 April 1986 for background). An initial batch of analyses of around 100 well-preserved lavas was presented, but the stratigraphic positions of these rocks was not discussed. Subsequent work, documented in the August 1987 AMIRA Report, increased the data base (mainly with samples collected either by myself, Dr. Keith Corbett (Dept. of Mines) or several company geologists), and attempted to assign compositional classification/characteristics to well-defined stratigraphic units such as the Hellyer basalts and the Central Volcanic Complex andesite-dacite-rhyolite sequence. Further additions to the data base have been made mainly from samples collected by Dr. Joe Stolz, as part of the Mount Read gold study reported in the August 1988 AMIRA Report, and samples from the E-W extension of the MRV from east of Hellyer to Beulah. The latter samples were mainly collected by Doug Jack (Aberfoyle Exploration Ltd.) or myself and analysed by me in the Geology Department, University of Tasmania. Analyses of the samples collected by Doug Jack are not proprietary information.

The following pages provide a detailed and necessary review of my current understanding of the compositional range, distribution and affinities of the various diverse rock suites that constitute the MRV. Although no detailed study of the petrology, geochemistry and tectonic significance of the MRV has been attempted prior to the present (ongoing) study, previous reconnaissance studies of the MRV have reached concensus that they are a typical calc-alkaline orogenic basalt-andesite-dacite-rhyolite suite, dominated by dacites and rhyolites.

The Noddy Creek Volcanics, a belt of Cambrian calc-alkaline andesites on the Sorell Peninsula south of Macquarie Harbour and east of the MRV proper, are considered by previous authors to be a separate entity to the MRV, and have not been effectively incorporated in any tectonic model for the development of western Tasmania.

SECTION 5: MOUNT READ VOLCANICS: GEOLOGICAL CONSIDERATIONS

5.1: Introduction

The MRV are a basalt-andesite-dacite-rhyolite suite with abundant interbedded pyroclastics, epiclastics and shale horizons. Rapid facies changes, complex internal stratigraphy and structure, paucity of fossils, variable alteration and poor exposure have frustrated a detailed understanding of their regional geological and tectonic significance. Major advances have been made in the last five years following a detailed mapping programme funded by the State Government's MRV Project. Radiometric dating has provided little clarification of age relationships within the MRV, due to pervasive alteration. Probably, the most reliable date is a zircon age of 511 m.y. for the Darwin Granite, which intrudes Tyndall Group, whereas K-Ar dates range from 407 to 528 m.y. Late Middle- and Upper Cambrian fossils are recorded from several localities within the MRV (Corbett and Lees 1987), and trilobites have recently been discovered by the author in rocks collected by Doug Jack for thin section description from just west of Paradise; these are being studied by Dr J. Jago (SAIT). A detailed review of the stratigraphy of the MRV is given in Corbett and Solomon (1989)

Recent systematic detailed mapping by the MRV Project geologists from the Tasmanian Department of Mines has clarified important geological relationships within the belt, although several major problems remain. Whereas the Tyndall and Dundas Groups both clearly overlie Central Belt Volcanics, some uncertainty remains regarding the stratigraphic relationships and geological significance of Corbett's (1979) Western Sequence. Corbett (1979) argued that, since the Western Sequence south of Queenstown apparently dips beneath the Central Volcanic Complex, it is likely to be older than the latter. Subsequently, he revised this interpretation to one in which the thick Western Sequence mafic-intermediate lava pile at Lynchford has punched up through an older sedimentary sequence. My detailed geochemical studies of these Western Sequence lavas indicate that they are almost certainly equivalent to the Hellyer basalts, time-correlated with the basal Dundas Group, which are agreed to be post-Central Volcanic Complex. This suggests that the Central Volcanic Complex in the area south of Queenstown may have been thrust westward over flanking younger Western Sequence rocks. This postulated fault would be a southern analogue of the east-dipping Rosebery Fault, which juxtaposes Dundas Group rocks with overthrust but older Central

Volcanic Complex in the Rosebery area; main movement on this fault was Tabberabberan (Corbett & Lees 1987). I prefer to incorporate all lava-dominated sequences along the western side of the MRV in the Western Volcanic Sequence; this includes Corbett's (1979) Western Sequence south of Queenstown, and basal Dundas Group lavas in the Que-Hellyer area further north.

Several significant findings of the geological mapping of the MRV by Corbett and others have been:

1. recognition of the Henty Fault System, which transects the MRV east of Rosebery, bifurcating south of Red Hills; it separates regions of the Central Volcanic Complex which have different dominant lithologies, structure and ore deposits: and,
2. the discovery of tholeiitic lavas and dykes outcropping in the core of an anticline within the Western Volcanic Sequence at Miners Ridge (SW of Queenstown; Corbett 1979), also in the western part of the block sandwiched between the north and south Henty Faults (known as the Henty Fault Wedge), and as a basaltic dyke swarm (the Henty Dyke Swarm) through the Central Volcanic Complex north of the Henty Fault, between Mount Dundas and the Pinnacles. These lavas and dykes are compositionally unlike the high-K calc-alkaline MRV, and their nature and existence must be taken into account in any comprehensive attempt to model the tectonic development of western Tasmania.

5.2: Central Volcanic Complex

The Central Volcanic Complex shows significant differences on either side of the Henty Fault System. Southeast of the fault, volumetrically dominant plagioclase-phyric dacitic and rhyolitic lavas are intruded by domes and plugs of hornblende+plagioclase-phyric andesites, well-exposed on Crown Hill and Leach Hill. Subvolcanic granitoids intrude the Central Volcanic Complex both north (Murchison Granite) and south (Darwin Granite) of Queenstown, and are thought to be responsible for the extensive, pink-weathering potassic alteration which affects felsic lavas throughout this area. Ignimbrite-like flows with flattened pumice shards are common, but shale interbeds are sparse. North and west of the Henty Fault the Central Volcanic Complex contains more andesites than further south, no granites are recorded, and pink, potassic alteration is rare. Andesites appear to be mainly extrusive, and as for further south, ignimbritic flows are abundant and shale intervals are rare. Basaltic dykes of the Henty Dyke Swarm, unrelated to MRV magmatism, intrude the Central Volcanic Complex north of

the Henty Fault. No basaltic lavas are known from either the northern or southern segments of the Central Volcanic Complex.

5.3: Western Volcanic Sequence

The Western Volcanic Sequence extends along the western side of the Central Volcanic Complex from Hellyer to south of Queenstown. Unlike the Central Volcanic Complex, it includes abundant basalts, and shows a compositional spectrum from basaltic through to rhyolitic lavas, although basalts are dominant. Extensive, sheet-like bodies of dacitic to rhyolitic porphyries may be of shallow, intrusive origin. Basalt- and andesite-dominated sequences occur in the Que-Hellyer and Lynch Creek areas, and may represent individual volcanic edifices.

5.4: Tyndall Group

The Tyndall Group is presently known only on the southeastern side of the Henty Fault System. In the Queenstown area, and further south, the Tyndall Group apparently overlies both the Western Volcanic Sequence and the Central Volcanic Complex. Correlates of the Tyndall Group occupy several near-meridional grabens extending north from Queenstown, one along the Tyndall Range to near Red Hills and the other along the eastern margin of the MRV in the Lake Dora - Lake Selina area. A significant difference between the rhyolitic lithologies of the Tyndall Group and those in the Central Volcanic Complex is believed to be the relative abundance of quartz phenocrysts in the Tyndall rocks, and their general paucity in the latter, although my own observations suggest that this diagnostic criteria may not have much value regionally. Late Middle Cambrian fossils are known from near the base of the Tyndall Group at several localities. Tuffs, laharic breccias and epiclastics dominate the Tyndall Group, although lavas are present in the belt along the eastern side of the MRV. The most distinctive unit within the Tyndall Group is the Comstock Tuff, a banded pink and grey tuff well exposed on the Anthony Road. Corbett (1979) recorded a strikingly similar unit, the Lynchford Tuff, overlying Western Volcanic Sequence rocks south of Queenstown. The dominant lithology in the Tyndall Group is quartz+ feldspar-phyric rhyolitic tuff and subordinate lavas, although dacites are present in the Lake Dora - Lake Selina area. In the area N of the Henty Fault system, the Southwell Subgroup is the lateral correlate of the Tyndall Group. Siliciclastic sediments of the Owen Conglomerate unconformably overlie the Tyndall Group.

5.5: The Noddy Creek Volcanics

The Queenstown 1: 250,000 sheet, and also a small less detailed map from the new Geology and Mineral Resources of Tasmania show a probably fault-bounded block of MRV-type volcanics, informally named the Noddy Creek Volcanics, extending from Asbestos Point on the southern shore of Macquarie Harbour southward past the Timbertops area to the headwaters of the Hibbs River and beyond. As this area is largely inaccessible, details of the stratigraphy and structure are presently unavailable. Most analyzed samples in my database were collected by AMOCO/Cyprus geologists during traverses across the area in summer 1985-86. The volcanic belt is overlain, probably unconformably, by correlatives of the Owen Conglomerate and Gordon Limestone; these form a syncline which trends northwest, at a high angle to the regional strike of the Cambrian lavas and associated rocks. A second, complex belt of mafic and ultramafic rocks, with slivers of Owen Conglomerate and fossiliferous Late Cambrian Dundas Group rocks, crops out sub-parallel to the Noddy Creek belt only a few kilometers further west. On the Queenstown sheet, this belt appears to be pinched out by faulting before it reaches the southern shore of Macquarie Harbour.

Mapping by myself and M. Sandiford along the southern shore of Macquarie Harbour around Asbestos Point, where the Noddy Creek belt is inferred to outcrop, has shown that lavas are absent from the highly-sheared sequence here. The sequences along this coast show extensive faulting (rotated thrusts?). Cataclasized, serpentinized formerly orthopyroxene-rich ultramafics contain low-Ti dolerite boudins and dolerite dykes up to 10m thick outcrop immediately east of Asbestos Point. No MRV lithologies have been found along this coast; I suggest that it is the western mafic-ultramafic belt which reaches Macquarie Harbour near Asbestos Point, not the Noddy Creek belt. Further inland the former belt contains orthopyroxene- rich ultramafic cumulates and gabbros, and also boninitic lavas. It is interpreted to be a considerably more tectonized equivalent of the mafic-ultramafic complexes exposed further north in the Dundas Trough at Heazlewood River, Serpentine Hill and McIvor Hill (Berry and Crawford 1988). The extent of the Noddy Creek belt north of Timbertops is unknown, but it does not intersect the Macquarie Harbour shoreline .

Mount Read Volcanics collected in the Noddy Creek belt include representatives of a basalt- andesite-dacite-rhyolite suite, and a range of hornblende- bearing dioritic to granodioritic shallow intrusives. A small hornblende- bearing granodiorite intrusion at Timbertops, and a newly-

discovered larger pluton of diorite-granodiorite in the headwaters of the Hibbs River further south (boundaries presently unknown) are undoubtedly part of the MRV (ie. Cambrian, and not related to the Upper Devonian granites elsewhere in W Tasmania) sequence in this area, and may be related to the Murchison and Darwin granitoids which intrude the MRV north of Macquarie Harbour.

5.6: Granitoid Intrusives

The sub-volcanic Murchison Granite intrudes Tyndall Group lavas and pyroclastics, and at least two plutons intrude Noddy Creek Volcanics on Sorell Peninsula. However relative age relationships of the Darwin Granite are less clear cut. The Darwin Granite intrudes Central Volcanic Complex lavas, but pebbles of Darwin Granite occur in sediments which unconformably overlie the granite, and were assigned to the Tyndall Group by Corbett (1979). On this basis, the Darwin Granite must be pre-Tyndall Group and cannot be related to the Murchison Granite intrusive event; implied are two discrete episodes of granitoid magmatism within the Cambrian in western Tasmania. This problem is simply resolved if the sediments containing the granite pebbles near Mount Darwin are not Tyndall Group, but Jukes Breccia (R. Large, pers. comm. 1987); pebbles of Murchison Granite occur in the Dora Conglomerate, a Jukes Breccia correlate, which disconformably overlies Tyndall Group lavas near Mount Murchison.

5.7: The Miners Ridge Sequence

Mapping by Corbett (1979) delineated an occurrence of *tholeiitic* basalts and dolerites in the core of an anticline within the Western Volcanic Sequence in the Miners Ridge area, southwest of Queenstown. They are separated from overlying Western Volcanic Sequence MRV lavas by a sequence of greywacke, shale and tuff, followed upward by a distinctive quartzwacke marker horizon, the Miners Ridge Sandstone, then an overlying sequence of tuff, shale and greywacke which becomes more greywacke-rich up-sequence. Several voluminous basalt-andesite units (Lynch Creek Basalts) within the greywacke sequence, which forms part of my Western Volcanic Sequence, are interpreted as a major volcanic edifice (Corbett 1979). A white quartz-rich tuff separates the greywacke sequence from the overlying Lynchford Tuff, which bears remarkable similarity in outcrop and thin section to the Comstock Tuff, the type formation of the Tyndall Group.

5.8: The Henty Fault Wedge and Henty Dyke Swarm

Between the northern and southern extensions of the Henty Fault System, Corbett & Lees (1987) recorded a complex sequence of lavas and

sediments. Near the junction of the two branches of the Henty Fault and in the central part of the wedge, the sequence is sediment- dominated, but some felsic tuffs and andesitic lavas are also present. However in the western part of the wedge, a belt of pillowed and massive tholeiitic basalts and intrusive gabbros occurs. The western boundary of this mafic sequence is a fault; relationships between the basalts, and sediments and andesites occurring a short distance further east, remain unknown.

Abundant dykes of basalt and dolerite of the Henty Dyke Swarm intrude the Central Volcanic Complex along, and northwest of the northern branch of the Henty Fault, at least as far north as Tullah. Preliminary geochemical studies (McClenaghan & Corbett 1985) showed these dykes to be tholeiitic, and Corbett & Lees (1987) suggested that they may be related to the basalt sequence within the Henty Fault Wedge.

SECTION 6: GEOCHEMISTRY OF THE MOUNT READ VOLCANICS

6.1: Introduction

For the purposes of this review, I have distinguished nine igneous suites within the MRV. These are:-

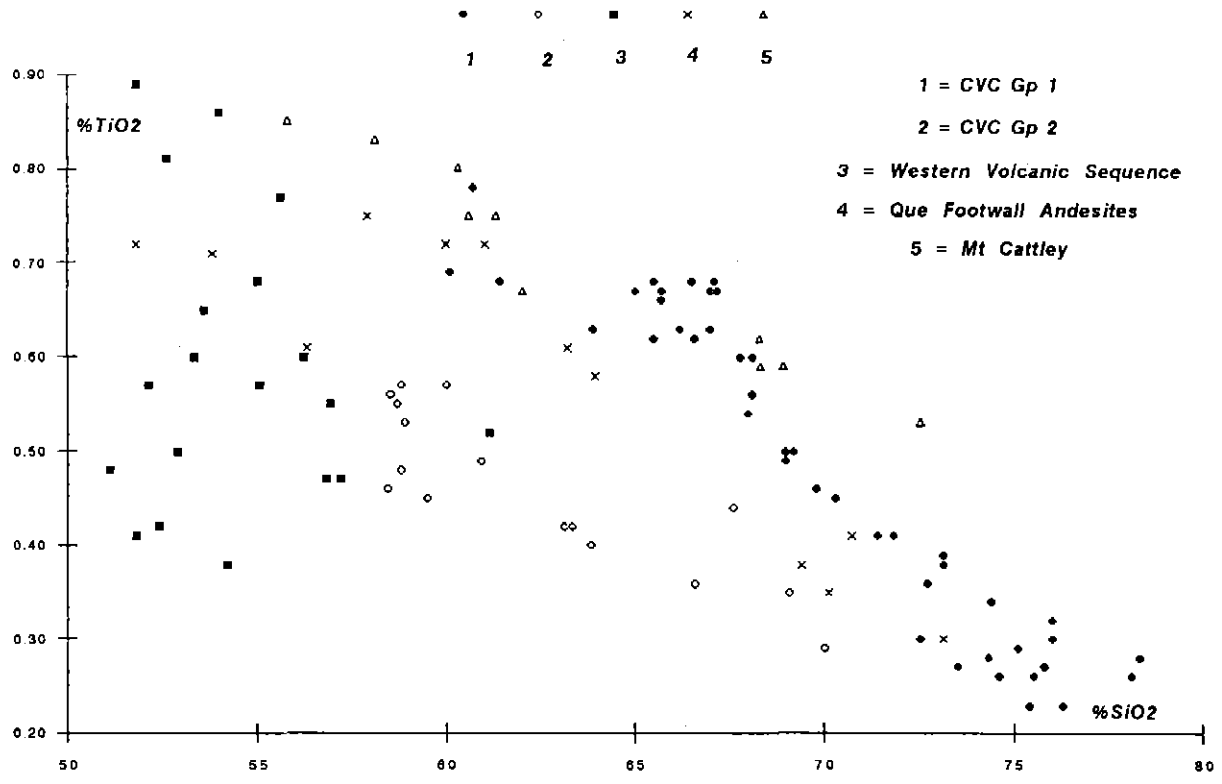
1-3. the Central Volcanic Complex
4. the Western Volcanic Sequence
5. the Tyndall Group
6. the Noddy Creek Volcanics
7. the Miners Ridge basalts,
8. Henty Fault Wedge basalts and Henty Dyke Swarm, all tholeiitic, and
9. the Darwin-Murchison and Timbertop-Hibbs Rv. sub-volcanic granitoids.

6.2: Wholerock Chemistry

Representative analyses of andesites, dacites and rhyolites from the Central Volcanic Complex are given in Appendix Tables A1 and A2; analyses of Western Volcanic Sequence lavas are given in Tables A3 and A4; analyses of the Que-Hellyer Footwall andesites are listed in Table A5; analyses of Tyndall Group lavas and intrusive granitoids are listed in Table A6;.analyses of lavas and granitoids from the Noddy Creek belt are given in Table A7, analyses of Miners Ridge and Henty Dyke Swarm mafic lavas are given in Table A8.

6.2.1: Central Volcanic Complex

Within the main body of the Central Volcanic Complex (herein CVC) from south of Queenstown to the Mount Charter Fault, the 61 analyzed least-altered lavas fall into two clearly defined compositional groups, clearly shown by the variation diagrams in Figure 2. Note that no lavas more mafic than 58% SiO_2 are known. Group 1 lavas are volumetrically dominant, and contain no amphibole in the andesite-dacite compositional range, whereas the Group 2 rocks almost always contain amphibole, and appear to be mainly intrusive into the Group 1 lavas. The best occurrences of these Group 2 amphibole-bearing shallow intrusive rocks is around Crown Hill, N of Queenstown. Both suites are high-K calc-alkaline andesites. The Group 2 rocks, however, are considerably more enriched in REE, and have more pronounced LREE-enrichment than any Group 1 lavas at similar MgO levels, and lack the pronounced Eu anomalies that typify the Group 1 andesites. As shown further on, these Group 2 andesites intrusive into the CVC bear strong compositional similarities to many basalt-andesite rocks in the Western Volcanic Sequence.



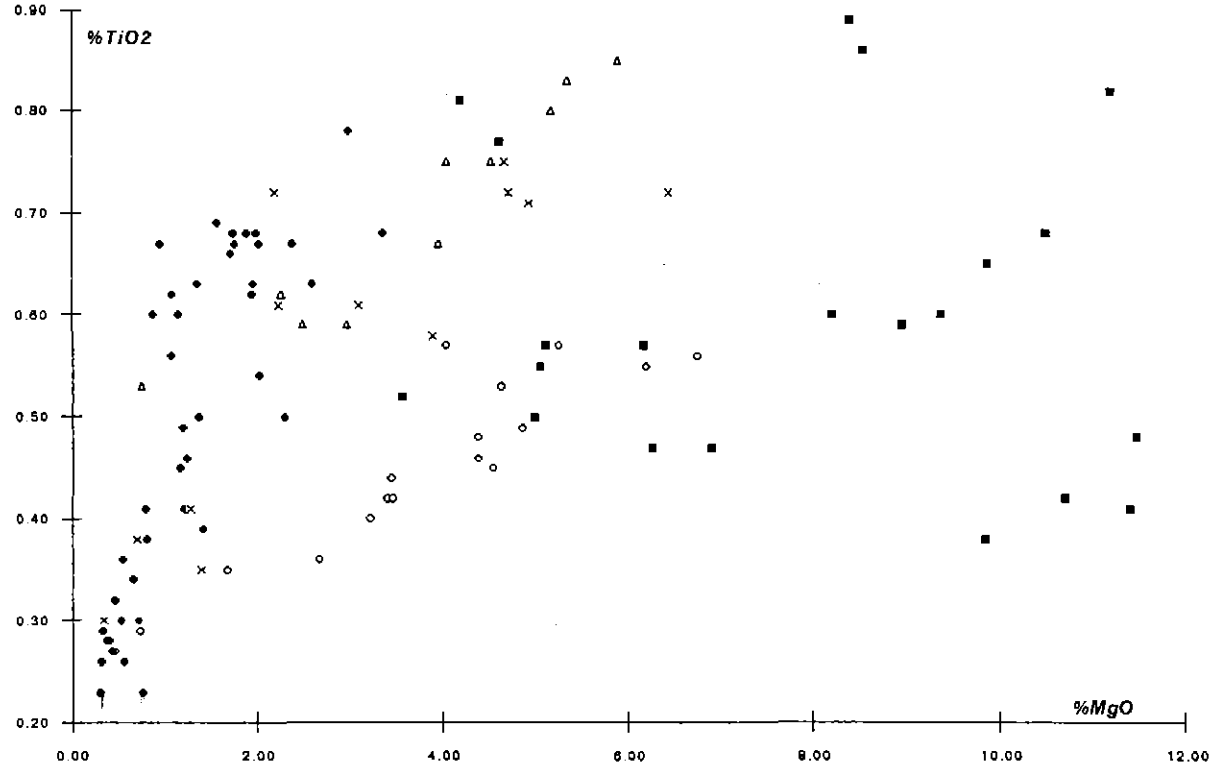
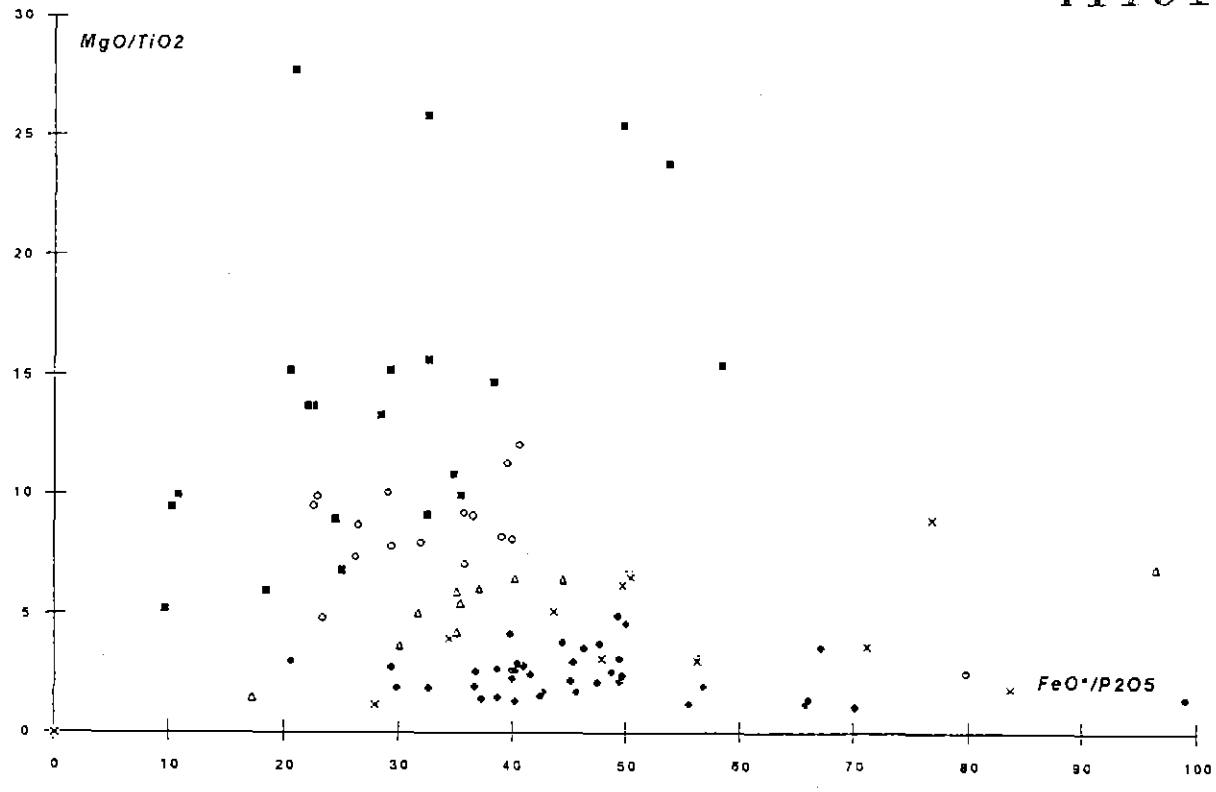


Figure 2: Immobile element variation diagrams showing compositional fields for the main stratigraphic volcanic units in the Mount Read Volcanics. Note the general separation of Central Volcanic Complex Group 1 lavas from those in Group 2.



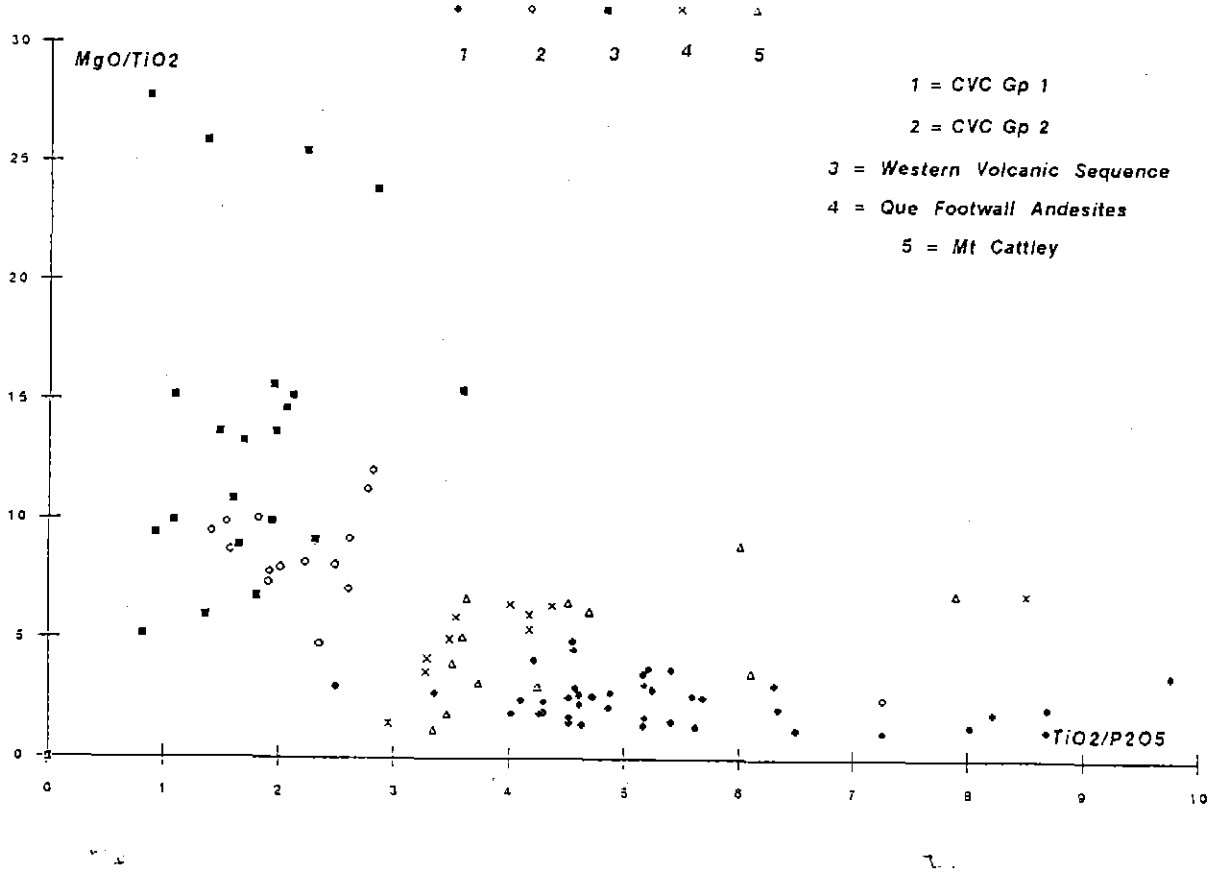
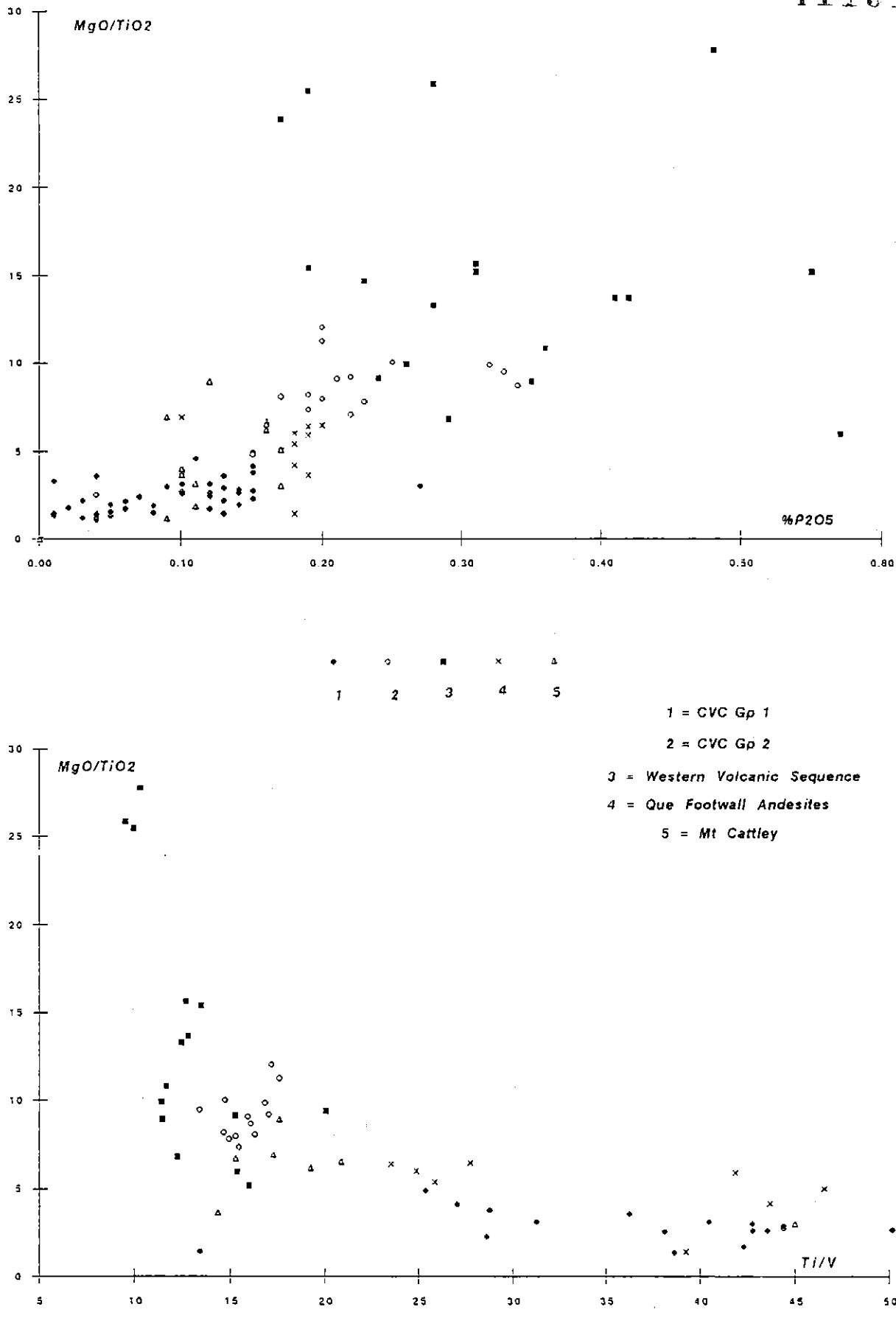


Figure 2 (continued):



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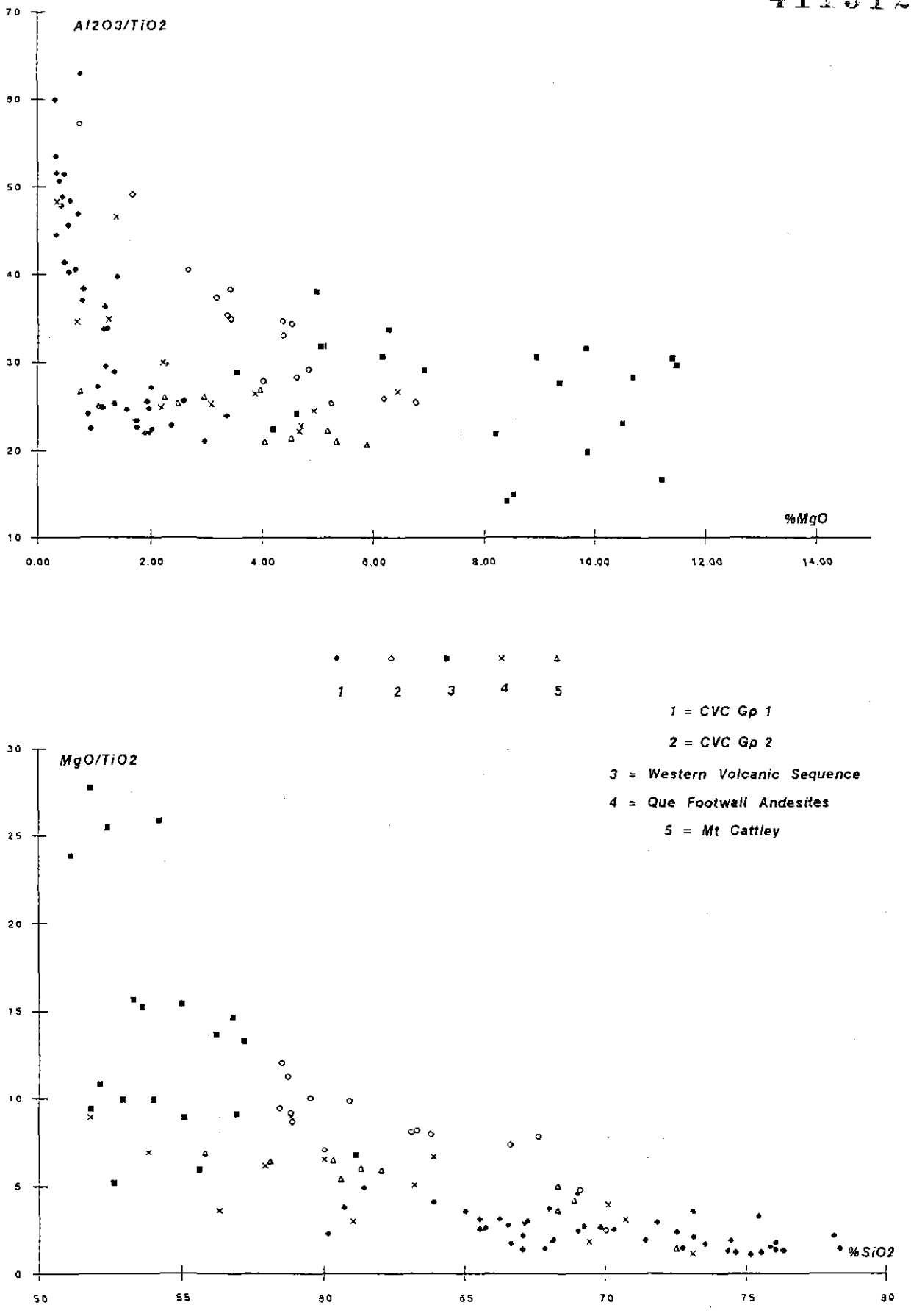


Figure 2 (continued):

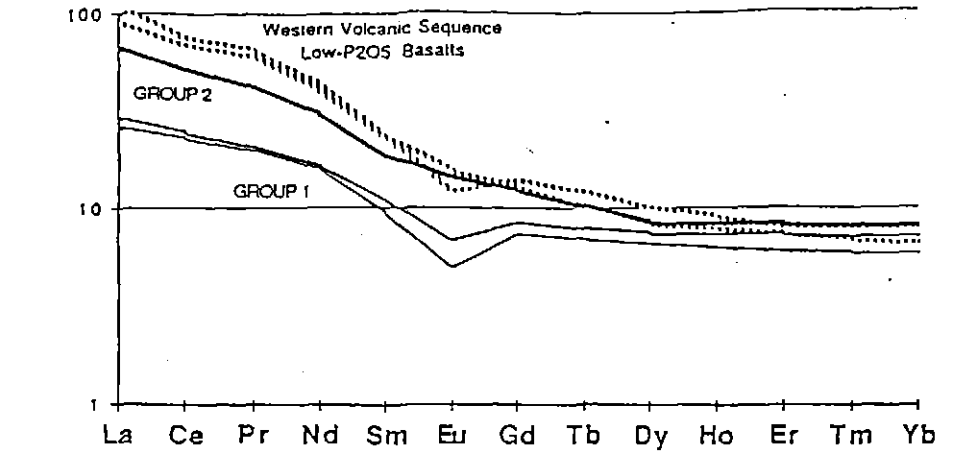
6.2.2: Que-Hellyer Footwall Andesites

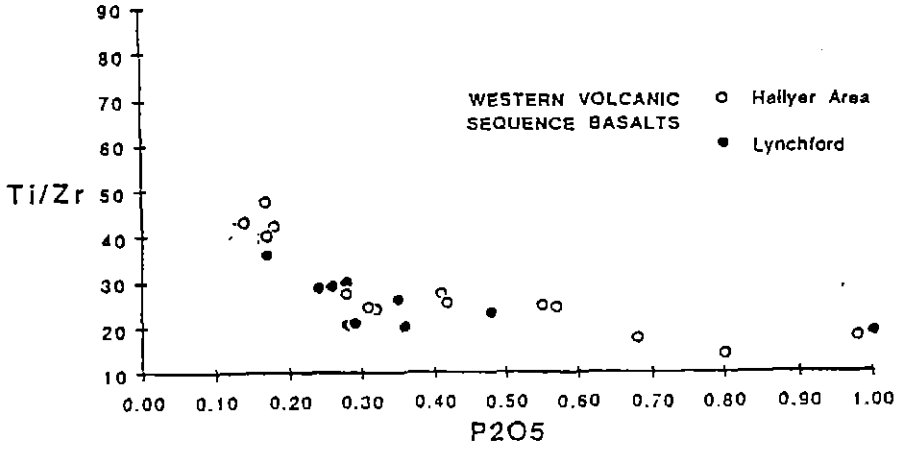
Abundant andesites and dacites in the area N of the Mt. Charter Fault, and occurring footwall to the Hellyer and Que Rv. massive sulphide deposits, are high-K calc-alkaline orogenic andesites (Table A5). These footwall andesites, however, bear many compositional similarities to the Central Volcanic Complex Group 1 andesite-dacite- rhyolite lavas, as shown by the element variation diagrams in Figure 2. On most of the major element variation diagrams, the Que-Hellyer Footwall andesites bridge the compositional gap between the Central Volcanic Complex Groups 1 and 2 lavas. Trace element ratios plotted against major element abundances or ratios (Figure 2 continued) show that the mafic Central Volcanic Complex Group 1 andesite with 61% SiO_2 tends to plot in the field of the Que-Hellyer Footwall andesites. Note that the great majority of analyzed Central Volcanic Complex Group 1 lavas have more than 65% SiO_2, whereas the Que-Hellyer Footwall lavas range down to 53% SiO_2 and have abundant lavas with less than 65% SiO_2.

It is generally accepted that the Que-Hellyer Footwall andesites are separated from the underlying Central Volcanic Complex lavas by the largely Precambrian-derived Animal Creek Greywacke. Also, as suggested above, the Central Volcanic Complex Group 2 andesites and related rocks are compositionally similar to the Western Volcanic Sequence andesites, and are mainly clearly intrusive into the Group 1 CVC lavas. This implies that there may be a gradual temporal compositional change in the Mt. Read Volcanics from Group 1 CVC lavas, through Que-Hellyer Footwall andesites to the most REE- and P2O5-enriched basaltic-andesitic lavas of the Western Volcanic Sequence (mainly within the Hellyer and Lynchford basalt sequences). The CVC Group 2 andesites intrusive into the CVC may be broadly time correlates of the Hellyer basalts, which crystallized abundant hornblende due to the slightly deeper crustal level at which these intrusives crystallized.

6.2.3: Western Volcanic Sequence Lavas

Abundant basalts in the Western Volcanic Sequence both N and S of the Henty Fault System range compositionally from high-K calc-alkaline basalt compositions to exceptionally P_2O_5- and LREE-enriched shoshonites (Tables A3 and A4). These occur in two main accumulations, at Hellyer, and another further south at Lynchford. Both probably represent volcanic edifices within fault-bounded troughs. No basaltic lavas are known from the Central





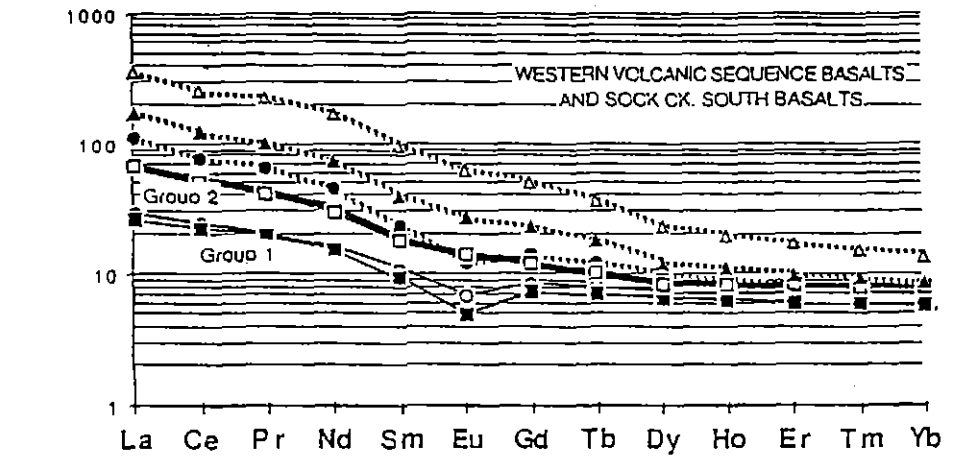


Figure 3. Compositional diagrams showing (a and c) the enrichment in REE of the Western Volcanic Sequence basalts relative to Groups 1 and 2 lavas from the Central Volcanic Complex. and (b) the decrease of Ti/Zr with increasing P2O5 of the shoshonitic basalts in the Western Volcanic Sequence

Volcanic Complex. The Western Volcanic Sequence andesitic lavas, although apparently subordinate volumetrically to basalts, are compositionally distinct from any possible parent magmas of the Central Volcanic Complex Group 1 andesites.

The less enriched end-members of the spectrum of (basalt and) andesite compositions in the Western Volcanic Sequence overlap compositionally with Central Volcanic Complex Group 2 andesites and extend to considerably higher LREE and P_2O_5 (and lower Ti/Zr) contents (Figure 3a and 3b and Tables A3 and A4).

The occurrence of strikingly unusual highly P_2O_5- and LREE-enriched (Figure 3b) magnesian basaltic lavas both in the northern part of the Western Volcanic Sequence (Hellyer area) and 50 km further south at Lynchford (west of Queenstown) forms the basis of my claim that Corbett's (1979) Western Sequence in the Queenstown area is likely to be younger than the Central Volcanic Sequence, and a correlate of the Hellyer basalt-andesite sequence. Similar lavas are recorded from the poorly-known Beulah section of the MRV, well to the east of Hellyer.

6.2.4: Noddy Creek Volcanics

Representative analyses of the Noddy Creek Volcanics are given in Table A7. These are a high-K calc-alkaline suite extending across the basalt to rhyolite compositional range. Compositional fields for the Noddy Creek rocks plus REE patterns (not shown) suggest that both the compositional groups recognized within the Central Volcanic Complex are also present in the Noddy Creek belt. This is further supported by the observation that the group of Noddy Creek rocks with the higher REE levels, close to those of the Central Volcanic Complex Group 2, are hornblende diorites and granodiorites compositionally and mineralogically very close to the CVC Group 2 hornblende-bearing lavas and shallow andesitic intrusives. One difference from the Central Volcanic Complex, however, is that the extrusive basalts within the Noddy Creek Volcanics have no known counterparts in the Central Volcanic Complex.

6.2.5: The Tyndall Group

Geochemical study of the Tyndall Group and the Cambrian granitoids in western Tasmania is only now commencing, so it is premature to draw any firm conclusions about the compositional affinities and correlations of these lavas, which for the available data, always have more than 66 SiO_2.

Preliminary isotopic data for Nd-Sr suggest that the Tyndall lavas have a stronger crustal signature than the CVC Group 1 rocks. However, it appears that in major element terms, the Tyndall Group lavas are similar to the Group 1 Central Volcanic Complex lavas with similar SiO_2 levels. Further detailed studies of the Tyndall Group and its correlates are required before any real idea of the significance and extent (in time and space) of this unit can be gained. It seems reasonable based on available data to argue that the Darwin and Murchison Granites are broadly comagmatic with the Tyndall Group.

6.2.6: The Miners Ridge Basalts

Basalts outcropping in the anticlinal core within the Western Volcanic Sequence at Miners Ridge are compositionally (Table A8) unlike the MRV, in that they are strongly tholeiitic, with Ti/Zr values from 90 to 160, very low P_2O_5 contents, and strongly depleted REE patterns. All these compositional features are characteristic of island arc tholeiites erupted in an intra-oceanic arc setting, such as those presently erupting in the Tongan and Vanuatu arcs. In this respect, they would seem to be unrelated to the MRV. They may, therefore, represent part of the basement onto which the MRV were erupted. In this scenario, they would be the uppermost part of the large ophiolites along the western margin of the Dundas Trough. These are interpreted as allochthonous slices of forearc crust that was emplaced on Rocky Cape passive margin crust during the Middle Cambrian arc-continent collision which constructed much of the crust of western Tasmania (see Berry and Crawford 1987 and later).

6.2.7: The Henty Dyke Swarm and Henty Fault Wedge Sequence.

As for the Tyndall Group, geochemical studies of these rocks have only recently commenced. However, on the basis of available data, it is clear that both the Henty Dyke Swarm and the Henty Fault Wedge are basalt-dominated sequences, and that the lavas are tholeiitic (Table A9), with relatively flat REE patterns and other immobile trace element ratios most similar to incipient backarc basin basalts. The dyke swarm, at least, attests to an episode of tension and rifting of the Central Volcanic Complex that has no known counterpart in the Western Volcanic Sequence. It will be critical to determine if Henty Dyke Swarm correlates are present in the Hellyer to Beulah area.

6.3: Summary of the Geochemical Correlations Within the Mount Read Volcanics

The element variations diagrams presented in all the foregoing discussion, suggest to me the following conclusions regarding correlations within the MRV.

1. The primitive, LREE-depleted tholeiites exposed at the base of the Western Volcanic Sequence at Miners Ridge are probably part of the ophiolitic allochthon extending along the western side of the Mt. Read Volcanics belt, and formed in an intra-oceanic island arc. The Western Volcanic Sequence lavas may have been erupted partly or entirely through and onto this ophiolitic sheet.
2. The Western Volcanic Sequence lavas are basalt- and andesite-dominated and occur in two major accumulations, in the Que-Hellyer region and at Lynchford. A third. poorly-known sequence of these lavas may be present at Beulah. These rocks range from high-K calc-alkaline basalts and andesites to exceptionally LREE-and P_2O_5-enriched shoshonitic compositions. The latter are characteristic of post-collisional magmatism, and their tectonic significance will be discussed further on.
3. Rocks classified as belonging to the Central Volcanic Complex of the MRV in the area from the Mount Charter Fault to south of Queenstown are high-K orogenic andesites and fall into two major compositional groups. The older Group 1 andesite-dacite-rhyolite sequence (minimum SiO_2 content 58%) is intruded by the often hornblende-bearing Group 2 andesitic to dacitic rocks, which are much more strongly REE-enriched, and have lower TiO_2 and higher P_2O_5 contents at any stage of fractionation. It should be examined in the future whether these Group 2 rocks are compositionally transitional into the Western Volcanic Sequence lava spectrum.
4. North of the Mount Charter Fault, the Que-Hellyer Footwall andesite-dacite sequence shows a strong compositional overlap with the Central Volcanic Complex Group 1 lavas, but nevertheless can be discriminated from the latter using appropriate variation diagrams. The Que-Hellyer Footwall andesites show a range of compositions, from relatively weak LREE-enrichment, to quite pronounced LREE-enrichment, approaching levels shown by the Central Volcanic Complex Group 2 lavas.
5. The sequence of lavas exposed on the Sorell Peninsula, known as the Noddy Creek Volcanics, shows an almost identical range of compositions to the Central Volcanic Complex, except that it contains basaltic flows which remain undiscovered if they exist within the Central Volcanic Complex.

Both the less LREE-enriched (Group 1) and more strongly LREE-enriched (Group 2) suites represented in the Central Volcanic Complex are also present in the Noddy Creek Volcanics, with the further similarity that the Group 2 correlates are hornblende-bearing intrusives similar to many of the Central Volcanic Complex Group 2 lavas around Crown and Leach Hills, N of Queenstown.

6. Preliminary geochemical studies of the Tyndall Group are only just commencing, but the small amount of available data suggest that the few Tyndall Group andesites/dacites known (from the Lake Selina area) are compositionally identical to the Group 1 Central Volcanic Complex lavas. As it is presently understood, I am not happy with the definition and interpretations of the distribution and significance of the Tyndall Group. It seems to me to be simply the top part of the Central Volcanic Complex, separated from the main underlying lava pile by a weak (or sometimes probably absent) dis- or unconformity.

7. Finally, the Central Volcanic Complex is intruded by abundant basaltic dykes of the Henty Dyke Swarm. These basalts are closest compositionally to young and incipient backarc basin basalts, and are unknown intruding the Western Volcanic Sequence or the belt of Mount Read Volcanics north of the Mount Charter Fault and also east of Hellyer.

SECTION 7: MODERN ANALOGUES OF THE MOUNT READ VOLCANICS

Most andesites and associated lavas recorded in this study (some Central Volcanic Complex lavas and their correlates east of Hellyer, in the Que-Hellyer Footwall and in the Noddy Creek belt, have REE patterns comparable to modern high-K calc-alkaline arc lavas. The closest chemically analogous modern arc suites to these MRV andesites are those high-K calc-alkaline suites erupted in mature island arcs (eg. Japan or Sumatra) or continental margin arcs such as the Aeolian and northwestern Hellenic arcs, the Andes, Mexico and Central America.

The closest modern analogues of the high-K to shoshonitic basaltic-andesitic suites in the Western Volcanic Sequence are the high-K mafic-intermediate lava series from eastern Papua and the Papua-Niugini highlands, the lower-K suites of the Roman Province, post-orogenic dykes in the European Alps in northern Italy and post-collisional lavas in eastern Turkey - northern Iran. In each of these areas magmatism is post-collisional, yet the lavas show evidence (eg. low Ti, Nb) of derivation from a subduction-modified upper mantle. Varne (1985) argued that K-rich lavas in the Indonesian and other island arcs may be derived from ancient, enriched subcontinental mantle dragged into the sub-arc subduction zone of magma generation during continent-arc collision.

I am impressed by the similarities in geological setting and composition of the MRV and those from eastern Papua. At the latter location, high-K and shoshonitic lavas overlie allochthonous, depleted 'ophiolitic' basement (that includes boninites) of the Papuan Ultramafic Belt, which had been emplaced during Mid-Tertiary arc-continent collision. As shown in the Miners Ridge area, similar LREE- and P_2O_5 -rich, high-K andesites and basalts (shoshonites) overlie LREE-depleted basalts very similar to those in the low-Ti lava carapace of the Serpentine Hill mafic - ultramafic complex thrust slice . This actualistic tectonic comparison offers further support for the hypothesis that the igneous rock associations in W Tasmania were assembled as a result of a middle Middle Cambrian arc-continent collision (Berry & Crawford 1987). This model is referred to again further on in this report.

SECTION 8: SUMMARY of GEOCHEMISTRY of Mt. READ VOLCANICS

The Mount Read Volcanics are a complex Middle and Upper Cambrian orogenic volcanic series in which the major magmatic suites represented are high-K calc-alkaline, differing mainly in the degree of enrichment of LREE (and probably originally, of K-group elements and P). The lavas range from high-K andesites with *relatively* weak LREE-enrichment (yet still significantly greater than for many normal, medium-K arc (orogenic) andesites, to shoshonitic basalts with extreme LREE- and P-enrichment.

The former extend along the length of the Mount Read Volcanic belt, and must include at least several discrete volcanic centres. Subtle but consistent compositional differences, for example between the Que-Hellyer Footwall andesites and the Central Volcanic Complex Group 1 andesites support this interpretation. Shoshonites are apparently restricted to several major eruptive centres (rifts?), and occur near the top of the Mount Read lava pile. There is strong evidence for a progressive enrichment in LREE and P_2O_5 in the Mount Read lavas with time, so that the uppermost lavas should be, and apparently are, the most enriched.

LREE-depleted, low-Ti tholeiites outcropping in the core of an anticline at Miners Ridge are tentatively correlated with the uppermost lavas in the allochthonous mafic-ultramafic complexes which extend down the western margin of the Dundas Trough. Since the Miners Ridge sequence forms basement to the Western Volcanic Sequence of the MRV, it is inferred that lavas of the latter sequence were erupted through and onto the recently-emplaced allochthon, and record the progressive change in mantle composition and structure as underthrust sub-continental mantle arrived under the former site of arc magmatism.

The range of magma suites represented in the MRV record continental arc magmatism during and after an arc-continent collision.

SECTION 9: DRILL LOGS and STRATIGRAPHIC SEQUENCE AROUND EL39/85

9.1: Introduction

Much of the NW part of the EL is a plateau covered by Tertiary basalt flows that support thick rainforest. The SE part of the EL is underlain by relatively flat-lying late Middle Cambrian volcaniclastic sediments and shale interpreted to overlie the main Que-Hellyer volcanics sequence. The regional stratigraphy determined from the Hellyer-Que-Mt Charter area is (Corbett and Komyshan, 1989) from base upwards (Figure 4):

1: Central Volcanic Complex (CVC) andesites, dacites and rhyolites of unknown thickness, presumed to conformably underlie

2: the Animal Creek Greywacke, a sequence of muscovite-bearing greywackes up to ~600m thick in the Murchison Hwy area, derived in large part from pelitic metamorphics of probable Precambrian age.

3: Overlying the Animal Creek Greywacke with conformity is a sequence of feldspar-phyric andesites and minor basalts, with dacitic flows and domes, termed the Que-Hellyer Footwall Andesites.(herein QHFA). These include the Lower Tuff and Lava sequence, and the Lower Andesites and Basalts of Corbett and Komyshan (1989), as shown on Figure 4. This sequence varies in thickness from an estimated maximum of around 1000m near the Que Rv mine, to ~480m in the Mt Charter drillhole MCH1. Corbett and Komyshan (1989) subdivided this sequence into

3a: a basal 'Lower Tuff and Lava ' unit, perhaps 200-300m thick SE of Mt Charter, but only 60m thick in MCH-1; this unit consists of felsic tuff and subordinate flow-banded dacitic lavas, and a unit of andesitic lava (62% SiO2, 2.3% MgO) referred to as 'basalt' in Corbett and Komyshan Overlying this unit is a sequence referred to by Corbett and Komyshan (1989) as

3b: the 'Lower Andesites and Basalts', which may be as thick as 400-500m E of the Que River Mine, but is only 260m thick in MCH-1. This unit is discussed in more detail further on; it consists of basaltic and andesitic lavas and breccias and a 5m-thick siltstone unit.

4: Conformably overlying the QHFA is a sequence of pyroclastics and epiclastics that is up to 300m thick, and is termed in the Que Rv mine stratigraphy the 'Mixed Sequence'. This 'Mixed Sequence' hosts both the Que River and Hellyer massive sulphide deposits, and is clearly the main exploration target in this EL. This unit is around 70m thick in MCH-1, and NE of Que Rv it contains up to five separate flows of andesitic-basaltic lavas. It is conformably overlain by

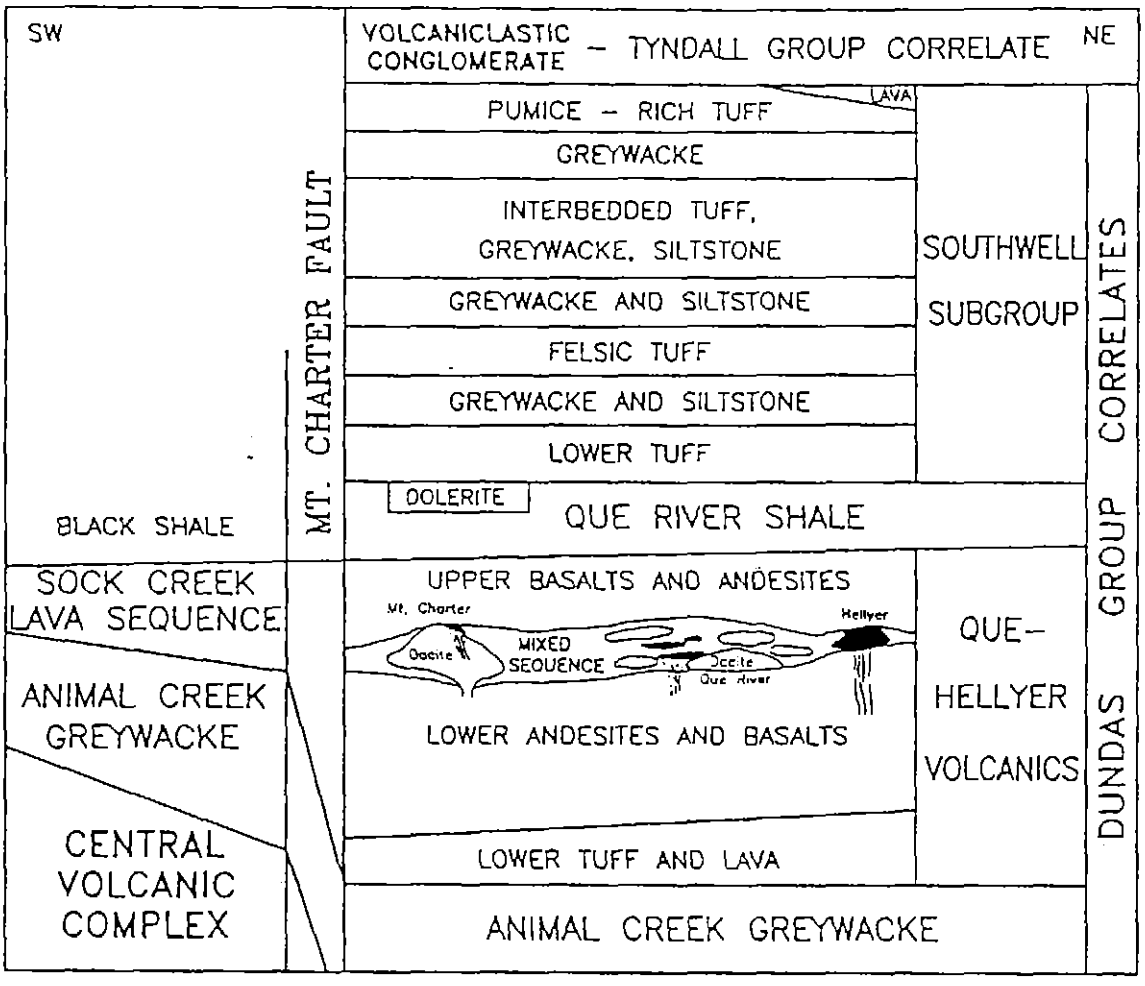


Figure 4: Stratigraphic diagram for the Que-Hellyer-Bulgobac region according to Corbett and Komyshan (1989).

5: the Hellyer Basalt (also termed the Upper Basalts and Andesites), an extensive often vesicular, pillowed and quite primitive basalt, reaching 220m thick above the Hellyer orebody. This basalt apparently thins to the S, where it is only around 60m thick in MCH-1, and overlain by about 30m of andesitic lava and breccia. This basaltic unit apparently thins to the N, where only a 10m thickness is present just SE of the Murchison Hwy - Cradle Mtn Link Rd junction.

6: Overlying the Hellyer Basalt conformably is a remarkable, thick black shale, the Que River Shale, that contains late Middle Cambrian fossils; it is around 150m thick on the Murchison Hwy, but probably thins out eastward.

7: The youngest Cambrian unit in the area is a sequence of epiclastic sediments and tuffs with occasional rhyolitic lavas, of the Southwell Subgroup. This apparently conformably overlies the Que River Shale. The basal unit is an ~300m thick pumiceous crystal-lithic-vitric tuff.

Five diamond drillholes have been put down within the EL since April 1987. The locations of these holes are shown on Figure 5.

9.2: BRD 01/01A

0 - 75m	Felsic Pyroclastics
75 - 531m	Que River Shale
531 - 850.5m	Hellyer Basalt
850 - 917m	Epiclastic "Mixed Sequence"
917 - 953m	Lower Basalts
953 - 1052m	Dacitic lavas and breccias
1052 - 1086m	Andesitic lavas
1086 - 1120m	Tuffs and sediments
1120 - 1131m	Animal Creek Greywacke correlates
1131 - 1133m(EOH)	Basaltic andesite lava

9.3: BRD 02

0 - 65.8m	Felsic Pyroclastics
65.8 - 373.0m	Que River Shale
373.0 - 676.6m (EOH)	Hellyer Basalt

9.4: BRD 03

0 - 301m	Que River Shale
301 - 426m	Hellyer Basalt
426 - 427	Mixed Sequence
427 - 458m	Que-Hellyer Footwall Andesite
458 - 541	Animal Creek Greywacke correlates

9.5: BRD 04

0 - 86m	Felsic Pyroclastics
86 - 205m	Que Rv Shale
205 - 209m	Fault Zone
209 - 301m	Animal Creek Greywacke correlates

9.6: BRD 05

0 - 11.5m	Quartz feldspar porphyry
11.5 - 48.4m	Interlayered shale and q-f porphyry
48.4 - 92.5m	Shale
92.5 - 157.6m	Mass flow epiclastic (conglom base)
157.6m - 530.6m	Que Rv Shale
530.6 - 530.7m	Basalt flow
530.7 - 531.8m	Que River Shale
531.8 - 570.7m	Hellyer(?) Basalt (with py and qtz veins)
570.7 - 570.9m	Pyrite and quartz veins
570.9 - 634.0m	Que Rv Shale
634.0 - 684.2m	Conglomerate
684.2 - 687.8m	Que Rv Shale
687.8 - 697.4m	Shale-basalt pepperite mixture
697.4 - 698.6	Quartz-carbonate vein
698.6 - 1045.9m	Hellyer Basalt
1045.9 - 1055.0m	Polymict felsic lava breccias
1055.0 - 1061.0m	Dacite lava-breccia
1061.0 - 1067.0m	Polymict felsic lava breccias
1067.0 - 1181.0m	Dacitic lavas and lava-breccia

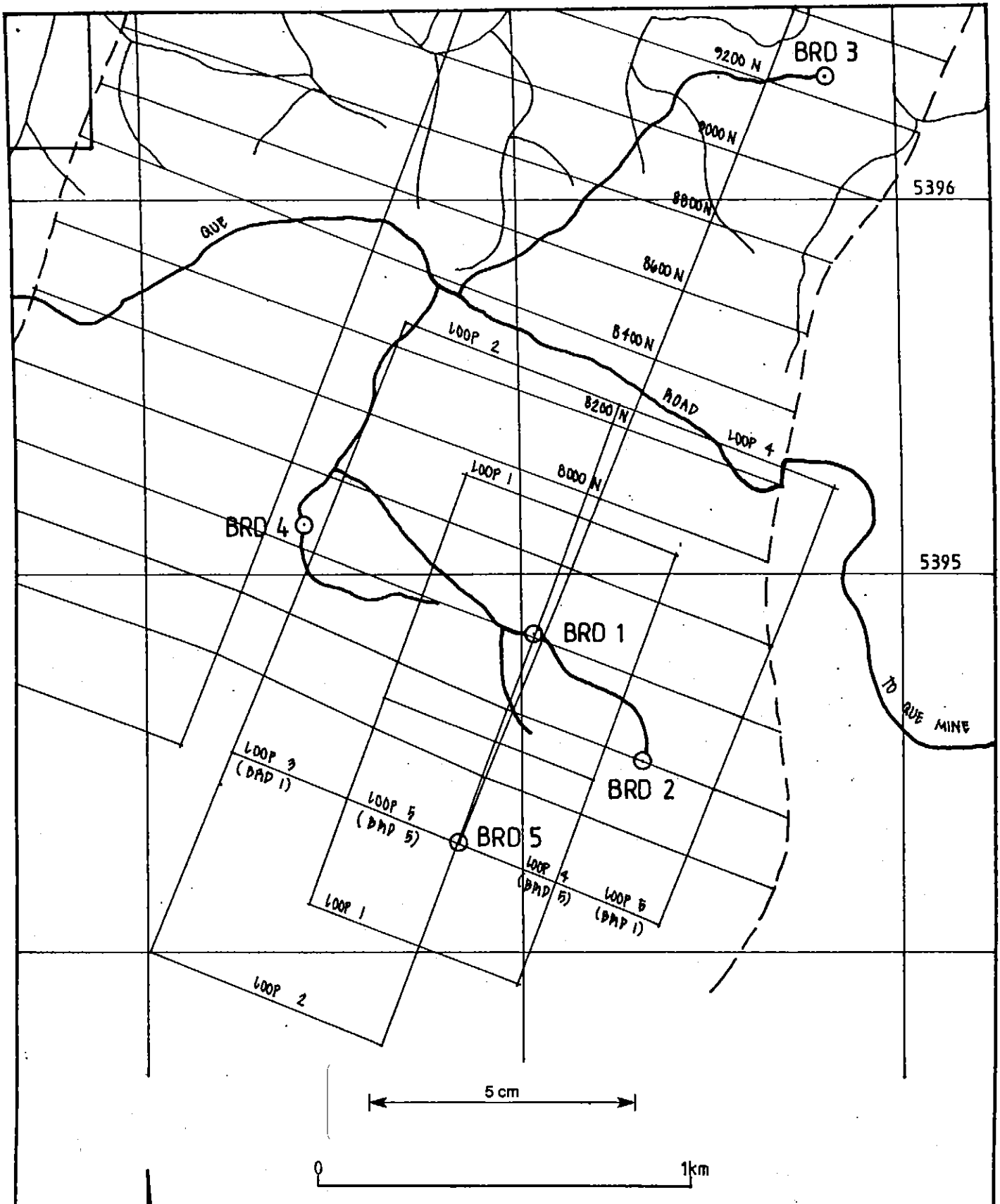


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FIG.5 , DRILL HOLE LOCATIONS AND E.M. 37 LOOPS, E.L.39/85, BULGOBAC RIVER.

Date:	Geologist: P.D.E
Checked:	Drawn: R.K
Revisions:	Plan No.: SE60-

9.7: Mines Dept Hole MCH-1

The Mines Department drilled a stratigraphic hole just W of Mt Charter, which was deepened 200m by Aberfoyle Resources Ltd., who had fillet grinds of the entire core section analyzed for Ti, Zr, Cr, Ba and base metals. This is almost 6km due S of the Bulgobac holes, and provides a useful published database for regional comparison of the Bulgobac sections. The generalized log follows. I have not examined thin sections from this hole:

0 - 10.3m	Que Rv Shale
10.3 - 57.7m	Dacitic lavas and lava breccias
57.7 - 115.1m	Basaltic lavas/breccias (Siltstone at 115.1 - 116m)
116.0 - 120.5m	Basaltic lava breccia
120.5 - 178.0m	Dacitic tuffs and lavas, flow banded
178.0 - 195.7m	"Epiclastic Breccia' - dacitic
195.7 - 354.3m	Basaltic lava and lava breccia
354.3 - 359.7m	Sandstone
359.7 - 378.9m	Dacitic lava breccias
378.9 - 399.8m	Andesitic lavas and breccias
399.8 - 459.7m	Dacitic lavas and lava breccias
459.7 - 491.5m	Andesitic lavas/breccias (Siltstone at 491.5 - 497.2m)
497.2 - 498.5m	Andesite lava
498.5 - 500.8m	Basaltic lava breccia
500.8 - 518.1m	Andesitic lava and lava breccia
518.1 - 561.7m	Tuffs, tuffaceous sandstones
561.7 - 606.3m	Animal Creek Greywacke

A necessary prerequisite to attempting correlation of units between the Bulgobac, and other available drillhole information (such as the Mt Charter hole MCH-1; Corbett and Komyshan 1989)) is to define petrographic-geochemical units from the data available for each hole. In the following section, petrographical - compositional logs of each of the above drillholes are made, with emphasis placed on four main geochemical parameters, Ti/Zr values, and TiO2, Cr and P2O5 abundances. These are considered to be essentially immobile during regional burial metamorphic alteration, and are used along with abundances of MgO and SiO2 (less immobile guides to basaltic versus andesitic versus dacitic nature of the primary lava) to define general petrological-geochemical units. A variety of chemical variation diagrams for lavas from BRD-01 and BRD-05, using these diagnostic immobile parameters, are shown in Figures 6a-f.

TABLE 1: Wholerock analyses of rocks from BRD-01													
HOLE	1	1	1	1	1	1	1	1	1	1	1	1	1
DEPTH	527.0-547.7	547.7-571.7	571.7-577.7	577.7-586.7	584.00	586.7-592.7	592.8-610.8	610.8-634.8	634.8-652.8	652.8-688.8	688.8-694.8	691.80
Litho Unit	1a	1b	1b	1b	1b	1b	1b	2	2	2	2	2
No	A701409	A701410	A701411	A701412	A295065	A701413	A701415	A701416	A701417	A701418	A701419	A295066
SiO2	51.60	54.90	52.90	53.00	50.40	55.00	54.00	55.20	52.40	53.00	52.70	55.70
TiO2	0.63	0.70	0.74	0.61	0.70	0.65	0.72	0.71	0.72	0.62	0.60	0.65
Al2O3	11.30	11.80	12.70	12.30	11.91	12.50	12.90	12.80	12.80	12.10	11.80	11.78
Fe2O3	7.97	8.75	9.77	8.54	10.10	9.35	9.25	9.11	9.35	8.80	8.57	10.30
MnO	0.16	0.17	0.16	0.17	0.21	0.18	0.22	0.21	0.19	0.17	0.16	0.17
MgO	7.28	7.67	8.16	6.83	8.90	7.09	7.89	7.45	8.12	7.20	6.91	7.66
CaO	17.80	13.10	11.74	15.20	10.20	11.90	11.10	10.90	13.30	14.81	16.40	7.51
Na2O	1.03	2.27	2.41	3.05	2.91	2.46	1.80	3.25	2.88	1.91	1.76	2.31
K2O	1.89	0.51	1.14	0.15	1.78	0.62	1.99	0.07	0.00	1.22	0.91	1.47
P2O5	0.34	0.24	0.27	0.21	0.30	0.21	0.27	0.20	0.22	0.18	0.15	0.31
LOI	11.00	6.05	6.40	5.45	2.30	4.24	4.56	4.92	7.70	6.95	7.60	2.59
Zr	152	122	118	104	136	110	115	131	135	113	114	126
Nb	9	11	12	12	8	11	12	13	11	11	10	9
Y	18	23	26	19	20	19	23	23	24	19	22	21
Cr	830	863	657	519	419	479	577	570	676	617	620	421
Sr	303	319	385	317	522	324	346	284	303	430	455	575
Rb	58	15	30	10	46	23	50	17	7	43	32	41
Cu	103	40	43	37	45	50	40	50	27	43	48	75
Pb	84	81	68	76	7	162	42	126	43	62	41	50
Zn	899	92	107	122	49	345	82	421	106	124	63	160
Ti/Zr	24.9	34.3	37.7	35.3	30.8	35.5	37.5	32.4	31.9	32.9	31.7	30.9

Note p 3

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HOLE	1	1	1	1	1	1	1	1	1	1	1	1
DEPTH	694.8-700.8	700.8-718.3	718.3-742.8	742.8-754.8	754.8-760.8	760.8-784.8	784.8-796.8	796.8-814.8	814.8-838.8	831.00	838.8-851.2	849.90
Litho Unit	2	2	2	2	2	3	3	4	4	4	4	4
No	A701420	A701421	A701422	A701423	A701424	A701425	A701426	A701427	A701428	A295067	A701429	A701201
SiO2	52.50	52.20	54.70	53.30	55.10	56.70	57.30	51.20	46.70	49.60	48.80	48.50
TiO2	0.81	0.82	0.67	0.79	0.67	0.35	0.27	0.85	0.68	0.71	0.60	0.67
Al2O3	12.10	11.82	12.50	13.70	13.90	12.80	13.20	12.80	11.60	13.70	11.20	10.68
Fe2O3	8.74	9.72	8.99	9.96	8.81	9.60	10.00	10.40	10.20	12.50	8.12	11.23
MnO	0.16	0.20	0.28	0.34	0.20	0.40	0.49	0.24	0.32	0.28	0.25	0.21
MgO	7.58	9.81	7.49	7.82	6.38	9.01	10.10	9.50	9.79	10.54	8.97	14.75
CaO	15.10	14.70	12.50	10.87	11.10	9.08	6.67	13.00	18.90	7.79	18.40	12.67
Na2O	2.14	1.56	1.78	3.04	3.63	2.30	1.84	1.92	1.49	0.38	1.92	0.48
K2O	0.96	0.00	0.95	0.00	0.00	0.00	0.22	0.00	0.07	3.88	1.41	0.33
P2O5	0.17	0.18	0.22	0.33	0.29	0.00	0.00	0.28	0.30	0.32	0.35	0.45
LOI	6.25	11.10	4.42	8.75	10.10	7.70	7.75	11.10	13.70	5.57	11.70	12.30
Zr	112	118	120	155	145	82	65	129	127	148	108	120
Nb	10	11	10	12	13	7	8	11	12	5	10	9
Y	23	20	21	26	22	13	9	22	23	0	20	18
Cr	629	584	585	576	377	1046	1187	1498	1501	1234	1399	1038
Sr	501	259	565	547	323	228	206	225	255	254	283	154
Rb	36	0	33	5	0	11	16	3	8	85	32	0
Cu	70	31	26	41	22	72	61	56	30	47	43	64
Pb	38	36	194	257	50	574	759	101	191	194	164	30
Zn	55	118	1193	483	278	1430	2060	551	371	434	215	91
Ti/Zr	32.7	31.5	33.4	30.5	27.8	25.5	24.9	30.1	32.0	29.1	33.4	33.5

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HOLE	1	1	1	1	1	1	1	1	1	1	1	1
DEPTH	851.2-851.5	851.30	851.5-854	853.00	854-856	856.60	856-858.4	858.4-860.2	860.2-862	862.80	862-864	864-865
Litho Unit	5	5	5	5	5	5	5	5	5	5	5	5
No	A701430	A701202	A701222	A701203	A701223	A701204	A701224	A701225	A701226	A701205	A701227	A701228
SiO2	69.20	69.95	69.77	64.14	70.61	69.73	66.76	68.14	68.75	70.72	69.87	68.68
TiO2	0.39	0.39	0.39	0.51	0.40	0.49	0.45	0.41	0.42	0.44	0.42	0.46
Al2O3	14.70	13.44	15.11	18.40	14.24	15.28	15.81	15.69	15.34	15.54	15.12	15.89
Fe2O3	4.67	4.57	4.84	6.34	4.69	4.90	5.30	3.94	3.51	2.49	2.75	4.30
MnO	0.07	0.08	0.06	0.06	0.06	0.06	0.09	0.09	0.09	0.08	0.10	0.09
MgO	2.40	1.92	2.53	2.66	2.19	1.73	2.18	2.30	2.32	1.32	1.49	1.55
CaO	2.75	3.22	1.55	1.00	1.68	1.01	2.60	3.60	3.78	4.00	4.21	3.12
Na2O	3.27	4.97	2.69	2.31	4.63	5.52	4.83	2.53	2.42	2.54	2.22	2.47
K2O	2.46	1.41	2.92	4.43	1.40	1.13	1.77	3.22	3.30	3.59	3.66	3.49
P2O5	0.08	0.10	0.10	0.15	0.12	0.15	0.16	0.13	0.11	0.14	0.14	0.17
LOI	3.94	3.70	3.50	3.80	2.72	2.08	3.64	5.05	5.15	5.00	5.30	4.52
Zr	187	156	207	301	195	214	208	221	211	221	211	220
Nb	15	13	17	23	14	16	16	16	17	17	16	16
Y	29	29	29	40	29	26	33	40	37	32	32	29
Cr	81	54	97	0	134	18	93	121	93	0	88	79
Sr	104	119	0	120	0	194	0	0	0	95	0	0
Rb	100	44	0	203	0	36	0	0	0	137	0	0
Cu	6	16	16	18	5	10	0	5	5	9	5	5
Pb	25	21	16	25	15	12	0	11	11	15	21	5
Zn	50	46	83	52	85	49	0	95	58	18	48	63
Ti/Zr	12.5	15.1	11.4	10.1	12.3	13.6	12.9	11.1	11.9	12.0	12.0	12.5

HOLE	1	1	1	1	1	1	1	1	1	1	1	1
DEPTH	865.70	867.80	867.3-870	870-872	871.00	872-874	874-875.6	877.90	875.6-878	878-880	880-882	885.10
Litho Unit	5	5	5	5	5	5	5	5	5	5	5	5
No	A701206	A701207	A701230	A701231	A701208	A701232	A701233	A701209	A701234	A701235	A701236	A701210
SiO2	73.05	71.13	69.90	67.95	69.61	68.66	66.34	68.53	63.90	72.22	67.38	72.71
TiO2	0.47	0.40	0.43	0.50	0.49	0.50	0.55	0.42	0.57	0.50	0.47	0.32
Al2O3	15.24	14.80	15.15	14.98	14.29	14.81	15.35	14.33	15.30	16.73	15.61	15.12
Fe2O3	1.76	3.78	3.59	5.62	6.01	5.39	3.79	5.65	6.03	5.87	5.48	3.52
MnO	0.05	0.08	0.08	0.11	0.09	0.09	0.09	0.10	0.13	0.10	0.09	0.04
MgO	0.79	1.12	0.96	1.21	1.25	1.27	1.09	1.31	1.99	1.07	1.00	1.02
CaO	3.30	1.95	3.18	3.52	2.80	3.09	3.91	3.87	4.49	2.70	2.52	1.09
Na2O	0.17	5.29	4.39	3.50	3.25	3.56	5.92	3.29	2.85	6.87	6.41	3.60
K2O	4.96	1.36	2.12	2.46	2.05	2.38	2.60	2.34	5.11	1.07	1.00	2.45
P2O5	0.17	0.12	0.18	0.21	0.20	0.21	0.40	0.13	0.60	0.03	0.03	0.10
LOI	4.66	2.60	3.72	4.40	3.64	3.84	3.82	4.82	4.80	4.80	3.34	2.46
Zr	210	226	208	194	202	192	192	210	200	200	202	236
Nb	16	15	16	15	16	15	17	16	16	15	14	15
Y	31	33	33	31	29	31	29	32	32	34	31	29
Cr	0	20	119	58	12	83	54	9	76	110	129	41
Sr	46	185	0	0	135	0	0	103	0	0	0	97
Rb	194	41	0	0	79	0	0	88	0	0	0	100
Cu	7	12	5	5	13	5	5	13	5	5	5	11
Pb	10	15	10	10	12	10	10	13	11	16	5	8
Zn	7	36	42	58	39	62	47	37	68	63	62	25
Ti/Zr	13.5	10.6	12.5	15.5	14.6	15.5	17.0	11.9	17.1	15.0	13.8	8.1

HOLE	1	1	1	1	1	1	1	1	1	1	1	1
DEPTH	886.20	888.20	890.2-892	892-894	894-896	896-898	898.00	906.00	898-900	900-902	902-904	904-906
Litho Unit	5	5	5	5	5	5	5	5	5	5	5	5
No	A701211	A701212	A701243	A701244	A701245	A701246	A701213	A701214	A701247	A701248	A701249	A701250
SiO2	78.86	73.33	68.24	67.86	69.17	68.12	70.32	68.45	68.47	67.43	67.01	68.74
TiO2	0.20	0.32	0.44	0.44	0.42	0.43	0.38	0.41	0.42	0.44	0.43	0.45
Al2O3	12.06	13.44	14.68	14.71	14.25	14.51	13.50	14.84	14.15	14.87	15.18	14.06
Fe2O3	2.12	2.77	4.78	4.79	5.30	5.36	4.40	5.41	5.36	5.42	5.50	5.30
MnO	0.04	0.06	0.10	0.12	0.10	0.12	0.10	0.11	0.11	0.11	0.13	0.13
MgO	0.64	0.86	2.04	2.12	1.98	1.86	1.55	1.87	2.05	1.98	2.02	2.05
CaO	1.84	2.58	3.37	4.26	3.35	3.72	3.63	2.78	3.70	3.10	3.31	3.30
Na2O	0.89	5.59	5.38	3.74	3.31	3.99	4.40	3.98	3.79	5.21	4.19	3.55
K2O	3.36	0.95	0.85	1.85	1.97	1.69	1.41	2.02	1.81	1.20	2.08	2.18
P2O5	0.04	0.08	0.14	0.14	0.14	0.17	0.15	0.16	0.20	0.22	0.21	0.24
LOI	3.22	2.68	4.08	5.30	4.56	4.68	4.34	3.90	4.68	3.86	4.38	4.22
Zr	207	206	219	222	220	220	209	229	220	218	220	209
Nb	14	15	16	16	17	16	14	16	16	17	15	16
Y	23	27	35	36	34	31	31	31	34	31	31	29
Cr	7	53	162	153	141	184	38	42	131	177	136	110
Sr	41	103	0	0	0	0	183	208	0	0	0	0
Rb	129	31	0	0	0	0	48	75	0	0	0	0
Cu	11	11	5	5	5	21	19	15	10	8	5	42
Pb	8	8	5	5	0	21	17	21	10	26	37	42
Zn	10	21	73	79	89	121	75	125	126	166	183	188
Ti/Zr	5.7	9.3	12.2	11.9	11.3	11.7	10.8	10.8	11.3	12.2	11.7	13.0

HOLE	1	1	1	1	1	1	1	1	1	1	1	1
DEPTH	906-908	908.50	908-909.1	909.2-911	911-913	912.00	913-915	915-917.9	917.9-918.9	918.9-921.1	921.1-922	923-932
Litho Unit	5	5	5	5	5	5	5	5	6	6	6	6
No	A701252	A701215	A701253	A701254	A701255	A701216	A701256	A701257	A701258	A701259	A701260	A701261
SiO2	67.93	73.25	68.43	68.24	66.49	71.68	69.38	69.23	54.48	64.00	67.52	53.38
TiO2	0.43	0.36	0.45	0.43	0.44	0.25	0.41	0.41	0.44	0.51	0.45	0.57
Al2O3	14.97	12.90	14.44	14.70	15.60	12.66	14.38	14.43	13.33	14.55	15.34	13.98
Fe2O3	4.38	1.40	2.07	4.70	5.39	4.79	4.92	4.96	9.25	6.19	5.48	10.51
MnO	0.13	0.13	0.17	0.14	0.14	0.13	0.10	0.10	0.13	0.16	0.11	0.37
MgO	1.78	0.55	1.09	1.95	2.18	1.75	1.97	2.00	6.15	3.52	2.96	9.47
CaO	3.91	6.08	7.06	3.72	3.43	3.61	2.75	2.76	12.41	5.97	3.24	7.70
Na2O	3.77	2.28	2.50	3.61	3.41	2.72	4.00	3.97	1.93	1.91	2.81	2.71
K2O	2.47	2.96	3.53	2.33	2.68	2.10	1.90	1.90	0.90	3.13	2.90	0.92
P2O5	0.24	0.12	0.29	0.23	0.26	0.12	0.24	0.23	0.28	0.34	0.28	0.41
LOI	4.86	6.00	7.10	4.81	4.70	4.46	3.86	4.58	11.60	7.20	4.90	9.05
Zr	221	202	215	221	220	199	208	220	147	205	221	170
Nb	18	16	15	17	17	14	16	17	14	15	16	13
Y	32	30	32	34	34	27	29	29	29	32	32	24
Cr	90	28	151	80	101	42	94	90	398	172	110	517
Sr	0	106	0	0	0	152	0	0	0	0	0	0
Rb	0	112	0	0	0	82	0	0	0	0	0	0
Cu	11	45	5	5	10	10	5	5	8	5	5	44
Pb	32	40	43	16	21	27	10	16	68	22	28	68
Zn	147	12	86	147	147	110	130	115	385	167	158	407
Ti/Zr	11.7	10.7	12.6	11.7	12.0	7.5	11.7	11.1	17.8	14.9	12.1	20.1

HOLE	1	1	1	1	1	1	1	1	1	1	1	1
DEPTH	934.40	984.00	967.5-971.4	971.30	971.4-972.5	972.5-974.9	982.00	974.9-988	988.8-994.8	994.8-998.2	996.80	998.2-1001.
Litho Unit	6	7	7	7	7	7	7	7	7	7	7	7
No	A701218	A701219	A701267	A701220	A701268	A701269	A701221	A701270	A701272	A701273	A701286	A701274
SiO2	57.67	67.94	65.94	76.08	69.69	67.28	70.40	66.90	67.20	64.22	66.11	69.57
TiO2	0.48	0.38	0.42	0.36	0.39	0.41	0.34	0.42	0.38	0.42	0.42	0.36
Al2O3	12.91	14.64	15.54	12.09	14.89	15.02	13.91	15.59	15.38	16.86	17.26	15.16
Fe2O3	7.46	6.44	7.92	2.17	4.63	6.01	4.42	5.63	5.90	7.34	5.60	4.32
MnO	0.41	0.12	0.13	0.04	0.08	0.14	0.11	0.12	0.13	0.12	0.09	0.08
MgO	7.57	2.33	2.84	0.41	1.41	1.77	1.47	2.05	1.92	2.09	2.02	1.26
CaO	8.52	2.03	0.92	1.24	1.29	3.43	3.47	2.79	2.86	2.42	1.82	2.55
Na2O	3.92	5.03	4.70	2.78	3.57	4.72	4.07	3.57	4.34	3.89	3.68	4.01
K2O	0.86	1.01	1.42	4.71	4.02	1.91	1.67	2.66	1.75	2.52	3.10	2.62
P2O5	0.26	0.07	0.17	0.09	0.18	0.09	0.07	0.23	0.12	0.11	0.09	0.09
LOI	6.00	3.30	2.78	1.75	2.22	4.28	4.00	4.04	3.96	4.10	3.00	3.60
Zr	154	207	206	188	189	198	188	203	208	229	227	202
Nb	13	14	17	15	15	16	15	17	17	16	18	16
Y	23	21	23	24	27	31	29	31	31	33	36	31
Cr	383	60	66	43	189	73	60	90	60	35	39	41
Sr	351	88	0	117	0	0	109	0	0	0	165	0
Rb	11	37	0	98	0	0	87	21	0	0	139	0
Cu	88	11	5	45	174	31	19	16	0	0	68	0
Pb	28	17	21	12	15	21	27	146	0	0	21	0
Zn	112	68	108	19	148	78	68	0	0	0	60	0
Ti/Zr	18.5	11.1	12.2	11.3	12.3	12.3	11.0	12.5	10.9	11.1	11.1	10.8

HOLE	1	1	1	1	1	1	1	1	1	1	1	1
DEPTH	999.60	1001.2-1004	1004-1006	1006.6-1008	1008.2-1013	1008.60	1013-1014.6	1014.6-1024	1017.80	1024.1-1026	1025.10	1026.4-1028
Litho Unit	7	7	7	7	7	7	7	7	7	7	7	7
Nb	A701287	A701275	A701276	A701277	A701431	A701288	A701432	A701433	A701289	A701434	A701290	A701278
SiO2	74.22	65.45	67.19	66.87	68.70	69.15	69.10	68.60	67.68	69.60	69.15	67.65
TiO2	0.33	0.41	0.39	0.37	0.37	0.36	0.38	0.35	0.39	0.34	0.31	0.36
Al2O3	13.71	16.57	15.30	14.81	14.70	14.47	14.50	14.50	15.18	13.40	13.40	15.44
Fe2O3	1.98	6.61	4.93	5.48	5.02	5.43	4.63	3.88	5.14	3.74	3.17	4.98
MnO	0.04	0.13	0.12	0.13	0.09	0.09	0.08	0.08	0.07	0.10	0.11	0.09
MgO	0.38	2.29	1.24	1.11	1.14	1.23	0.80	0.67	0.84	0.64	0.51	1.08
CaO	1.28	2.48	3.88	3.69	2.43	2.09	2.70	4.11	3.12	5.46	6.38	3.53
Na2O	4.82	3.27	4.42	4.15	4.63	4.40	4.52	3.88	3.33	4.47	5.80	4.35
K2O	3.15	2.75	2.41	3.28	2.97	2.73	3.32	3.84	4.15	2.09	1.09	2.39
P2O5	0.08	0.10	0.09	0.09	0.08	0.08	0.06	0.09	0.07	0.07	0.05	0.11
LOI	1.14	4.46	4.40	3.94	2.78	2.26	2.86	4.04	3.42	5.30	5.30	4.50
Zr	182	220	204	198	195	194	190	182	202	195	169	199
Nb	14	17	15	16	15	15	15	16	18	16	13	16
Y	24	37	33	31	31	27	33	35	29	32	46	31
Cr	69	37	40	36	88	97	140	76	5	171	103	50
Sr	167	0	0	0	216	235	239	109	228	143	164	0
Rb	65	0	0	0	80	65	84	52	124	68	30	0
Cu	69	0	0	0	12	11	29	7	18	17	5	0
Pb	14	0	0	0	23	25	21	16	12	19	21	0
Zn	32	0	0	0	51	49	43	23	26	23	21	0
Ti/Zr	10.9	11.2	11.4	11.1	11.3	11.2	11.3	11.5	11.6	10.4	10.9	10.8

411535

HOLE	1	1	1	1	1	1	1	1	1	1		1
DEPTH	1027.20	1029.6-1035	1040.90	1041.9-1046	1046-1052.2	1052.10	1052.2-1060	1053.60	1060.30	1060-1067.8	1066.60	1067.9-1072
Litho Unit	7	7	HYBRID	8	8	8	8	8	8	8	8	8
No	A701291	A701279	A701292	A701280	A701437	A701293	A701438	A701294	A701297	A701281	A701299	A701439
SiO2	71.90	68.20	67.20	62.16	63.40	56.10	64.60	63.90	63.00	62.22	63.47	65.10
TiO2	0.35	0.39	0.53	0.61	0.58	0.65	0.58	0.58	0.56	0.61	0.57	0.56
Al2O3	14.70	14.48	13.40	16.36	15.80	17.70	15.10	15.40	15.10	15.53	15.58	15.20
Fe2O3	4.22	5.72	8.19	9.98	8.09	12.10	7.10	7.07	7.48	7.66	9.79	6.81
MnO	0.05	0.12	0.14	0.19	0.19	0.21	0.13	0.11	0.15	0.15	0.16	0.13
MgO	0.73	2.22	2.81	4.49	2.89	4.04	2.18	1.99	2.44	2.67	3.79	2.00
CaO	0.79	3.59	1.57	0.81	3.36	2.66	4.58	4.10	5.41	5.30	1.69	4.28
Na2O	5.10	2.67	2.86	3.77	3.82	4.34	3.24	3.05	3.57	3.04	1.94	2.96
K2O	2.04	2.50	3.17	1.44	1.80	2.11	2.36	3.21	2.25	2.64	2.86	2.83
P2O5	0.07	0.15	0.17	0.22	0.13	0.20	0.12	0.17	0.18	0.21	0.17	0.11
LOI	1.59	5.00	3.08	3.64	4.44	4.10	4.36	4.08	3.94	4.80	3.88	4.12
Zr	203	195	134	156	147	162	141	146	135	147	146	130
Nb	15	14	11	12	13	13	10	14	10	11	14	11
Y	28	27	21	17	27	26	29	25	26	29	21	29
Cr	30	72	66	31	98	35	54	4	26	40	35	101
Sr	147	0	175	0	220	219	293	240	398	0	125	323
Rb	63	0	74	0	69	52	79	109	50	0	98	83
Cu	0	0	0	0	4	0	5	0	0	0	6	2
Pb	0	0	0	0	13	0	10	0	0	0	19	11
Zn	0	0	0	0	147	0	131	0	0	0	100	130
Ti/Zr	10.3	12.0	23.7	23.4	23.7	24.1	24.6	23.8	24.8	24.8	23.4	25.8

411536

HOLE	1	1	1	1	1	1	1	1	1	1	1	1
DEPTH	1070.80	1072-1074.3	1074.3-1077	1074.80	1077.8-1081	1080.00	1081-1085	1085.10	1085-1086	1086-1092.2	1086.60	1096.3-1096
Litho Unit	8	8	8	8	8	8	8	8	8	8	Tuff	Tuff
No	A701402	A701440	A701441	A701403	A701442	A701404	A701282	A701405	A701284	A701443	A701406	A701285
SiO2	64.57	63.50	63.90	64.83	62.9	60.65	62.45	63.70	60.02	60.20	53.81	65.24
TiO2	0.53	0.52	0.57	0.57	0.56	0.62	0.57	0.59	0.63	0.59	0.74	0.49
Al2O3	14.30	14.00	15.30	15.68	15.50	16.46	15.40	14.70	16.82	15.10	17.43	14.23
Fe2O3	5.71	5.59	6.70	6.04	6.85	8.29	7.12	7.51	8.67	7.32	10.40	6.60
MnO	0.13	0.19	0.13	0.12	0.14	0.15	0.15	0.16	0.17	0.20	0.23	0.16
MgO	1.78	1.30	1.84	1.81	1.96	2.72	2.25	2.75	3.64	3.38	5.66	2.64
CaO	6.72	8.51	5.60	4.47	6.07	5.03	6.00	4.92	3.76	7.22	6.05	4.09
Na2O	3.01	3.40	3.04	4.15	3.25	3.27	3.23	3.03	4.37	4.27	2.74	4.65
K2O	3.03	2.82	2.81	2.44	2.74	2.61	2.51	2.47	1.78	1.72	2.79	1.82
P2O5	0.17	0.18	0.14	0.16	0.13	0.18	0.19	0.16	0.19	0.08	0.15	0.14
LOI	5.26	6.90	5.50	3.96	6.00	4.86	6.35	4.92	4.96	6.80	6.70	4.64
Zr	137	124	138	146	138	147	144	142	153	118	129	157
Nb	12	12	11	11	13	13	12	13	14	10	10	14
Y	23	27	30	28	30	27	30	25	25	24	21	28
Cr	23	87	85	52	69	23	32	37	34	106	91	44
Sr	348	290	243	292	245	305	0	242	0	225	214	0
Rb	80	82	48	75	100	86	0	78	0	45	88	0
Cu	36	3	2	8	2	5	0	18	0	16	41	0
Pb	36	12	11	27	13	21	0	21	0	10	73	0
Zn	55	124	138	37	138	53	0	48	0	118	354	0
Ti/Zr	23.3	25.2	24.8	23.5	24.3	25.1	23.9	24.7	24.8	30.0	34.5	18.6

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411537

HOLE	1	1
DEPTH	1107.00	1131-1133
Litho Unit	Epiclastic	9
Nb	A701407	A701449
SiO2	67.30	63.1
TiO2	0.59	0.51
Al2O3	12.30	15.5
Fe2O3	8.20	6.52
MnO	0.11	0.11
MgO	3.05	5.26
CaO	3.20	3.11
Na2O	4.58	3.85
K2O	0.60	1.94
P2O5	0.14	0.15
LOI	3.98	5.65
Zr	92	154
Nb	8	12
Y	17	25
Cr	109	111
Sr	193	132
Rb	10	55
Cu	69	5
Pb	52	12
Zn	54	154
Ti/Zr	38.5	19.9

529

TABLE 2: Wholerock analyses for lavas from BRD-02 and BRD-03						
HOLE	2	2	2	2	2	
DEPTH	382.60	442.60	502.60	547.60	607.60	
Litho Unit	1	2	2	2	2	
No	A295052	A295057	A295061	A295062	A295063	
SiO2	58.10	53.60	51.80	50.50	58.10	
TiO2	0.34	0.54	0.60	0.56	0.52	
Al2O3	12.50	12.30	16.50	12.53	11.30	
Fe2O3	8.22	9.94	10.20	10.50	7.68	
MnO	0.19	0.23	0.14	0.25	0.15	
MgO	9.16	9.67	6.79	8.67	6.79	
CaO	8.16	8.89	5.77	12.10	9.89	
Na2O	2.16	2.82	4.09	2.35	1.97	
K2O	0.32	0.95	1.56	1.05	2.57	
P2O5	0.11	0.35	0.42	0.65	0.36	
LOI	9.01	5.89	3.47	4.14	3.57	
Zr	94	138	145	157	114	
Nb	3	4	7	8	9	
Y	22	21	21	26	21	
Cr	1010	393	114	595	737	
Sr	275	404	663	605	290	
Rb	11	27	47	31	73	
Cu	88	102	85	105	71	
Pb	33	39	12	121	18	
Zn	90	84	73	167	57	
Ti/Zr	21.7	23.5	24.8	21.4	27.3	
HOLE	3	3	3	3	3	
DEPTH	336.30	404.40	413.10	422.30	450.80	
Litho Unit	1	2	2	3	4	
No	A321402	A321405	A321407	A321409	A321414	
SiO2	52.10	52.60	52.10	50.80	64.10	
TiO2	0.65	0.59	0.60	0.61	0.48	
Al2O3	13.20	16.60	16.70	15.30	15.40	
Fe2O3	10.10	11.10	11.40	9.92	6.89	
MnO	0.15	0.19	0.19	0.19	0.16	
MgO	8.15	8.08	8.65	7.79	3.53	
CaO	11.50	5.18	5.36	8.46	2.27	
Na2O	2.79	3.79	3.44	2.60	5.60	
K2O	0.59	1.60	1.15	3.03	0.52	
P2O5	0.88	0.18	0.12	0.39	0.15	
LOI	10.43	3.75	4.02	3.71	3.55	
Zr	190	114	104	104	176	
Nb	3	7	6		10	
Y	28	21	21	21	26	
Cr	503	197	187	301	156	
Sr	502	457	479	395	311	
Rb	17	26	31	78	16	
Cu	113	18	10	91	27	
Pb					37	
Zn	66	61	69	52	139	
Ti/Zr	20.5	31.0	34.6	35.2	16.4	

411539

TABLE 3: Wholerock analyses of rocks from BRD-05												
HOLE	5	5	5	5	5	5	5	5	5	5	5	5
DEPTH	532-533	533-545	545-569	569-570.8	689-692	692-698	698-710	710-713	713-724.5	724.5-752	752-761	761-773
Litho Unit	1	1	1	1	ALTERED HYALOCLASTITES		2	2	2	2	HYBRID	3
No	A704310	A704311	A704313	A704314	A704315	A704316	A704317	A704318	A704319	A704320	A704321	A704323
SiO2	44.90	60.00	57.20	55.10	71.10	71.40	50.80	64.30	49.80	53.70	55.90	55.10
TiO2	0.49	0.52	0.57	0.51	0.77	0.80	0.55	0.41	0.57	0.45	0.61	0.60
Al2O3	11.71	12.70	13.50	11.60	13.60	13.80	9.70	7.55	9.64	12.00	15.90	14.10
Fe2O3	14.20	9.41	7.84	9.94	6.39	6.42	8.71	6.55	8.59	8.19	8.74	8.00
MnO	0.17	0.13	0.14	0.12	0.04	0.03	0.20	0.15	0.18	0.14	0.13	0.15
MgO	4.64	6.11	7.41	4.05	3.18	3.19	11.10	8.44	9.87	10.40	8.42	6.96
CaO	19.90	6.81	9.12	14.50	1.13	0.53	17.80	11.67	19.30	12.10	5.42	10.10
Na2O	2.65	3.16	3.41	2.21	0.67	0.67	0.85	0.66	1.03	2.22	3.85	2.46
K2O	1.15	0.77	1.08	1.40	3.09	3.13	0.00	0.00	0.71	0.49	0.88	2.00
P2O5	0.33	0.36	0.39	0.35	0.12	0.12	0.30	0.21	0.34	0.21	0.39	0.48
LOI	18.90	6.05	6.85	13.80	5.50	5.10	14.10	10.70	14.40	9.15	6.50	8.35
No	A704310	A704311	A704313	A704314	A704315	A704316	A704317	A704318	A704319	A704320	A704321	A704323
Zr	136	138	156	133	122	137	128	92	123	83	139	147
Nb	9	12	11	10	14	15	12	9	11	8	11	11
Y	17	21	24	19	19	23	28	13	21	15	24	24
Cr	253	355	262	255	167	147	1149	888	1247	809	297	507
Sr	866	436	451	371	63	51	268	224	409	297	235	393
Rb	47	14	17	51	122	132	0	0	13	15	32	72
Cu	94	75	69	139	61	55	107	47	56	101	176	98
Pb	42	30	27	44	40	42	42	20	82	33	30	38
Zn	72	49	52	180	143	100	81	76	111	106	98	85
Ti/Zr	21.7	22.5	22.0	22.9	37.9	35.0	25.7	26.8	27.9	32.7	26.3	24.4

534

HOLE	5	5	5	5	5	5	5	5	5	5	5	5
DEPTH	773-797	797-823	824-833	833-857	857-875	875-893	893-905	905-911	911-924	924-953	953-971	971-977
Litho Unit	3	3	3	3	3	4	4	4	4	5	5	5
No	A704324	A704325	A704326	A704327	A704328	A704329	A704330	A704332	A704333	A704334	A704335	A704336
SiO2	51.10	48.90	49.40	50.80	49.80	52.40	51.70	51.90	53.05	50.49	47.86	48.92
TiO2	0.58	0.57	0.52	0.52	0.51	0.56	0.52	0.54	0.55	0.53	0.68	0.81
Al2O3	13.10	12.60	12.70	13.00	12.60	12.20	11.60	11.90	11.70	11.39	12.90	14.32
Fe2O3	8.70	9.57	10.50	8.78	8.69	9.18	9.19	9.17	9.14	8.16	9.04	8.19
MnO	0.18	0.21	0.21	0.17	0.17	0.15	0.17	0.17	0.22	0.18	0.13	0.13
MgO	7.46	8.82	11.00	8.00	7.27	7.62	8.44	9.55	8.47	8.16	8.60	8.57
CaO	14.50	16.10	13.20	15.00	17.10	14.00	12.70	13.10	13.71	17.19	15.99	13.99
Na2O	3.11	2.04	1.85	2.20	1.99	2.50	2.29	2.15	2.15	2.41	3.07	2.80
K2O	0.65	0.56	0.00	0.96	1.33	1.03	0.84	1.10	0.68	1.12	1.27	1.72
P2O5	0.57	0.59	0.61	0.62	0.62	0.35	0.35	0.36	0.32	0.38	0.46	0.53
LOI	7.90	12.00	12.80	9.00	7.85	6.90	7.65	7.60	9.59	9.31	7.55	6.25
No	A704324	A704325	A704326	A704327	A704328	A704329	A704330	A704332	A704333	A704334	A704335	A704336
Zr	157	148	149	148	136	118	114	114	116	106	130	155
Nb	12	14	5	5	5	4	2	0	4	4	3	6
Y	28	30	23	22	20	19	17	19	20	20	24	32
Cr	802	692	701	712	665	971	937	962	963	927	1345	1697
Sr	478	388	109	527	781	376	390	422	387	584	443	523
Rb	12	12	0	22	35	24	18	24	13	22	22	32
Cu	103	136	149	137	98	81	58	89	53	84	52	82
Pb	35	34	34	42	37	38	32	28	51	37	43	41
Zn	67	82	112	75	83	71	65	74	122	75	89	139
Ti/Zr	22.1	23.1	20.9	21.0	22.5	28.4	27.4	28.5	28.2	29.8	31.6	31.5

HOLE	5	5	5	5	5	5	5	5	5	5	5	5
DEPTH	977-995	995-1007	1007-1031	1031-1048	1048-1055	1055-1061	1061-1067	1067-1079	1079-1089	1089-1094	1094-1099	1099-1112
6	5	5	5	5	6	6	6	6	6	6	6	6
No	A704337	A704338	A704339	A704340	A704342	A704343	A704344	A704345	A704346	A704347	A704348	A704349
SiO2	50.97	46.23	44.40	46.09	69.00	68.89	69.14	69.29	69.53	68.87	65.48	66.70
TiO2	0.69	0.68	0.61	0.59	0.34	0.35	0.35	0.37	0.36	0.39	0.46	0.37
Al2O3	13.08	11.98	11.30	11.20	14.31	14.84	14.28	14.56	14.72	14.39	15.19	14.78
Fe2O3	8.39	8.96	8.43	8.94	5.52	5.10	5.86	5.18	4.67	5.61	7.49	6.87
MnO	0.15	0.16	0.16	0.17	0.12	0.15	0.16	0.14	0.08	0.09	0.11	0.14
MgO	8.81	9.46	8.49	11.03	2.88	1.38	1.18	1.10	1.80	2.78	4.39	3.26
CaO	12.98	18.25	22.60	18.92	1.27	1.39	1.93	1.67	0.82	0.96	0.73	1.52
Na2O	2.06	1.91	2.39	1.66	5.16	2.83	3.51	4.35	5.99	5.46	5.07	4.10
K2O	2.45	1.91	1.17	0.98	1.31	4.97	3.49	3.24	1.92	1.32	0.88	2.11
P2O5	0.43	0.46	0.46	0.42	0.09	0.09	0.10	0.11	0.12	0.14	0.19	0.14
LOI	5.05	9.35	11.40	12.20	2.40	1.82	1.85	1.69	2.20	2.10	2.96	2.74
No	A704337	A704338	A704339	A704340	A704342	A704343	A704344	A704345	A704346	A704347	A704348	A704349
Zr	132	121	106	114	205	183	188	193	204	204	206	206
Nb	3	3	3	3	8	9	9	9	10	9	9	9
Y	23	24	20	18	33	33	33	33	33	31	31	33
Cr	1481	1361	1159	1072	0	121	0	109	52	128	0	72
Sr	474	408	440	308	359	377	418	356	136	199	185	216
Rb	51	40	19	16	39	148	102	87	35	25	23	68
Cu	57	62	63	50	7	8	2	6	7	6	3	25
Pb	38	38	45	39	57	29	20	16	10	14	19	39
Zn	88	77	77	103	236	326	122	107	80	94	124	555
Ti/Zr	31.2	33.7	34.4	31.2	9.9	11.4	11.0	11.4	10.4	11.4	13.4	10.8

HOLE	5	5	5	5	5
DEPTH	1112-1130	1130-1136	1136-1154	1154-1160	1160-1181
6	6	6	6	6	6
No	A704350	A704351	A704352	A704353	A704354
SiO2	67.47	63.97	68.21	68.03	68.49
TiO2	0.36	0.37	0.36	0.36	0.34
Al2O3	15.30	15.07	14.64	14.64	14.88
Fe2O3	5.42	8.66	5.59	5.54	5.10
MnO	0.13	0.18	0.16	0.15	0.10
MgO	2.55	5.74	2.42	2.64	1.63
CaO	1.40	0.72	1.88	1.64	2.03
Na2O	5.62	4.14	5.24	5.64	4.99
K2O	1.59	0.98	1.38	1.23	2.32
P2O5	0.15	0.15	0.12	0.12	0.12
LOI	2.32	3.38	2.30	2.60	2.24
No	A704350	A704351	A704352	A704353	A704354
Zr	215	207	215	205	205
Nb	9	8	8	8	9
Y	33	31	33	31	35
Cr	87	99	88	142	0
Sr	184	119	276	164	245
Rb	49	29	35	31	72
Cu	4	3	2	7	5
Pb	12	21	18	21	12
Zn	113	166	174	133	94
Ti/Zr	10.2	10.7	9.9	10.4	9.9

SECTION 10: PETROCHEMICAL LOGS of the DRILLED VOLCANICS

10.1: Introduction

The following summary of the petrochemical logs for the five holes of interest is largely illustrated on the accompanying visual colour logs (Figures 7a-e), but is included here because the text is somewhat more informative and complete than could be fitted on the visual logs. **It is emphasized here that Units defined for each drillhole (eg. Figure 6a-d) are not meant to correlate with the same numbered unit in the other holes; that is, Unit 2, for example, in BRD01/1A is not a correlate of Unit 2 defined in BRD05. Units defined apply only to the hole for which they are described.**

10.2: BRD-01

In this hole, the Que Rv Shale is 456m thick. Basalts underlying the Que Rv Shale commence at 531m. Analyses are given in Table 1.

Unit 1 consists of pillowed augite+ olivine-phyric basaltic lavas that extend down to around 615m. The uppermost basalts (Unit 1a) are exceptionally altered (mainly carbonated), but from 527-547m, have a Ti/Zr = 25 and P2O5 (0.34%) higher than the underlying basalts (Unit 1b), which have Ti/Zr from 34 -38 (except 295065 (Ti/Zr=31.6) which was analyzed by a different laboratory early in the exploration program), P2O5 values from 0.21 - 0.30%, and 400 - 600 ppm Cr.

Unit 2 includes the thick pile of pillow basalts, basaltic breccias and basaltic lapilli tuffs between 615m and 760m. These are mainly quite augite-phyric basalts, with olivine being either sparse or absent. Ti/Zr values range from 31.5 - 33, Cr abundances are high, mainly between 500 - 600ppm, and most P2O5 abundances are low, between 0.15 and 0.22%, although several values are higher, around 0.3%.

Unit 3 is a compositionally distinctive unit extending approximately from 760m - 800m. A single thin section from this unit shows it to be an augite-phyric basalt, essentially identical to Unit 2 basalts. It has distinctive low TiO2 abundances (0.27 - 0.35%), P2O5 below the detection limit (0.05%), and Ti/Zr = 25, a lower value than for the enclosing basalts.

Unit 4 consists of pillowed and massive basaltic lavas and lava breccias extending from around 800m to the top of the dacites at 850m. They are augite+olivine-phyric basalts, very similar petrographically to those in Unit 2. Unit 4 basalts are generally somewhat more magnesian (9 - 10%) than

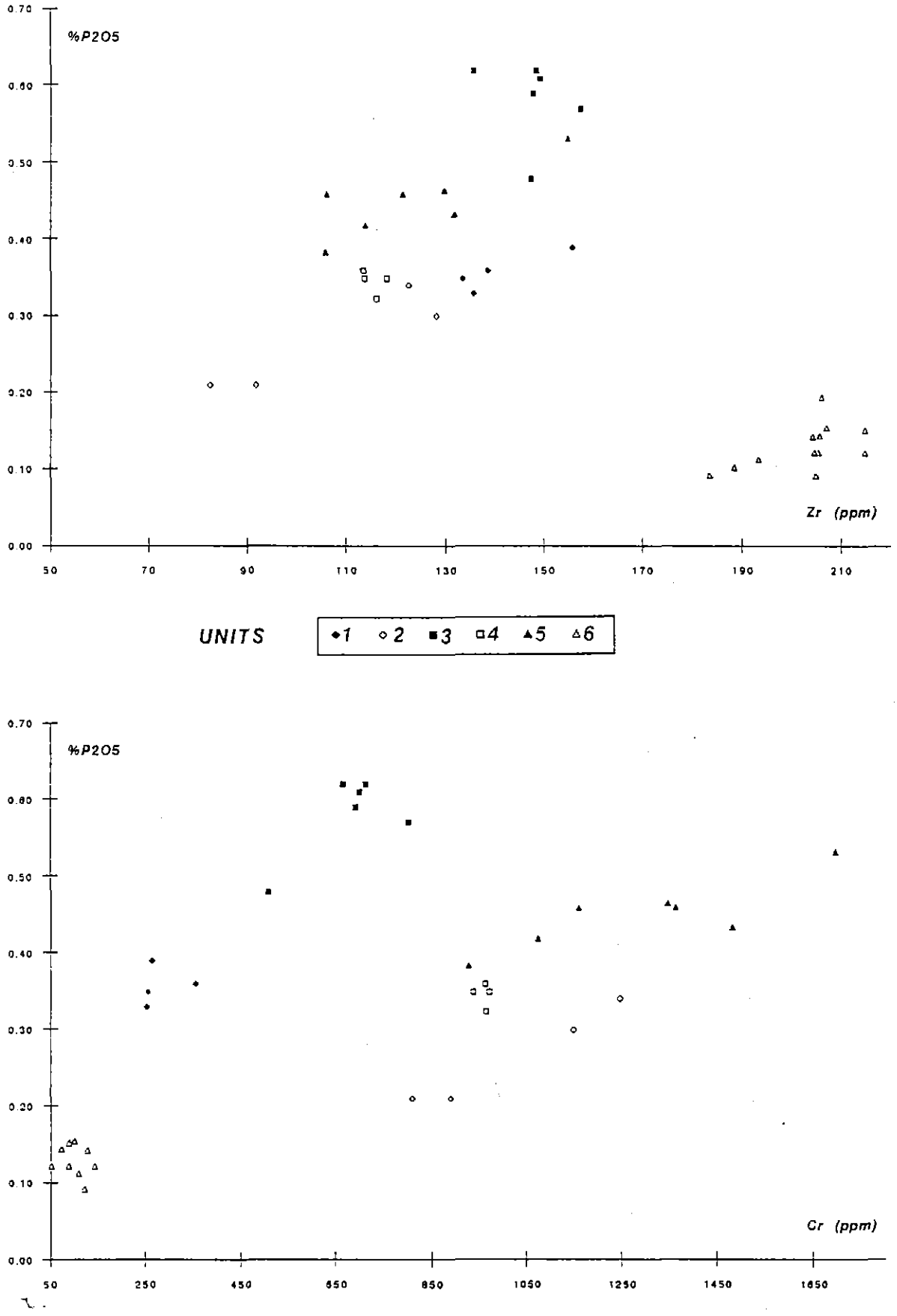


FIGURE 6a-d: Immobile element variation diagrams showing the effective separation of compositional fields of the various lithological -geochemical units recognized in BRD05. The same applies equally as well for rocks from BRD01/01A.

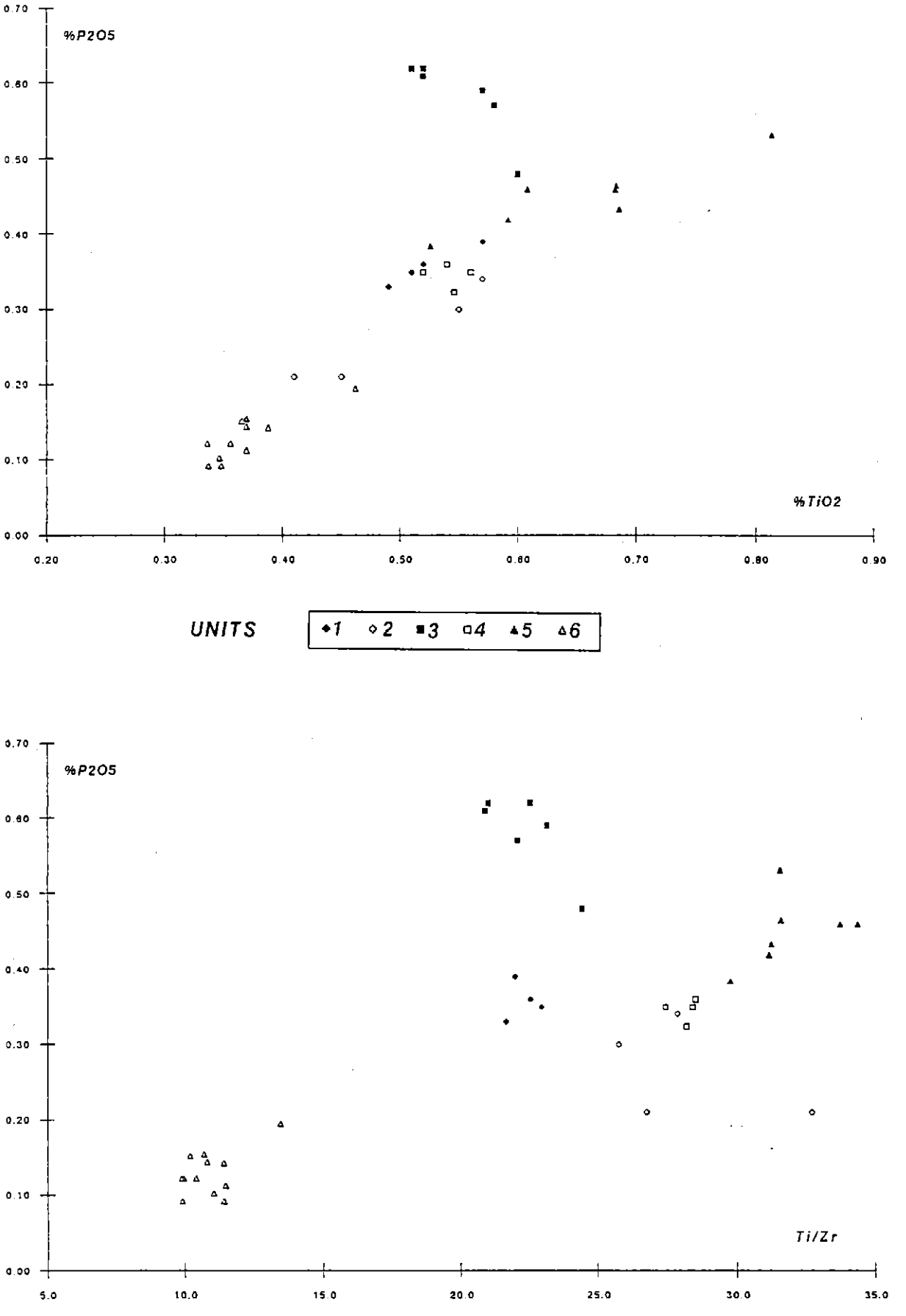


FIGURE 6a-d: Continued: Immobile element variation diagrams showing the effective separation of compositional fields of the various lithological -geochemical units recognized in BRD05. The same applies equally as well for rocks from BRD01/01A.

Unit basalts 2 ((7 - 8%), and consequently are more Cr-rich (1100 - 1200 ppm Cr), but have similar Ti/Zr (30-34). They have notably higher P2O5 abundances (0.28 - 0.45%) than Unit 2 basalts, despite being more MgO-rich.

Unit 5 is a massive unit of dacitic lavas, lava breccias, polymict lava breccias and crystal-lithic tuffs extending from 850m to 918m depth in the hole. This sequence can be compositionally separated into a number of subunits. For example, dacites with Ti/Zr from 14 - 18 dominate the section from 870m - 882m, whereas those from 850m - 870m have Ti/Zr mainly < 13. A few of the higher Ti/Zr group have SiO2 contents in the andesite range (eg 7012343 from 875.6m - 878m has 63.9% SiO2, with much higher P2O5 abundances (0.60% in this case) than normal dacites (0.1 - 0.2%). A noteworthy discrepancy exists in the data for Cr for these dacites. Those samples analysed for Cr by ICP have 100-200 ppm Cr, unusually high values, compared with the more reasonable values (<50ppm) for the same rocks analyzed by XRF. Based on experience I accept the XRF values, and consider the ICP data unreliable.

Unit 6: From 917-953m, another basaltic unit occurs. This contains a compositionally.rather diverse group of lavas Uppermost is an olivine+ augite-phyric basalt that is very strongly carbonate-altered; it has Ti/Zr = 20.1, and 0.28% P2O5, and close to 400ppm Cr. It is underlain from 919m - 922m by a 2-3m thick evolved andesitic lava for which no thin section description is available. This has 64-68% SiO2, 3 -3.5% MgO, Ti/Zr from 12 - 15, and 0.28 - 0.34% P2O5. Basalt reappears below this andesite, and extends down to 953m. This lower basalt is sparsely olivine-phyric, with 7.5 - 9.5% MgO, 360 - 470ppm Cr, Ti/Zr from 19 - 20, and quite high P2O5 (0.28 - 0.41%). This basalt is identical compositionally to that at the top of this unit.

Unit 7 is a thick dacite lava and lava-breccia sequence from 953m - 1040m, with flow-banding around the 1000m level. Compositionally this uniform unit extends from dacite to rare rhyolite compositions; it has 0.3 - 0.4% TiO2, Ti/Zr = 9 - 13 and P2O5 mainly from 0.06% - 0.12%.

Unit 8 consists mainly of aphyric to sparsely plagioclase-phyric andesitic lavas, first encountered around 1040m and extending down to 1086. Between 1066m and 1086m, this unit exhibits a most unusual texture that in both hand specimen and thin section appears to be blebs of quenched felsic glass in more andesitic lava. Surprisingly, there is no obvious compositional difference between the massive homogeneous andesites and those showing the unusual 'comingling' textures. They all have around 62 -

64% SiO2, 2 - 4% MgO, Ti/Zr = 24 - 26, 30 - 60ppm Cr and 0.11 - 0.21% P2O5.

Unit 9: Following a mixed epiclastic - tuff- greywacke unit from 1086m to 1131m, a 2m-thick section of andesite was drilled at the very base of the hole. This is compositionally unlike the overlying Unit 8 andesites (see later), and has Ti/Zr = 20, and P2O5 = 0.15%.

10.2: BRD-02

Unfortunately only six wholerock analyses are available for the lavas in this hole (Table 2) and the relevant thin sections were not examined by me, but by Jane Barron. Underlying about 300m of Que Rv Shale is a sequence of basaltic and andesitic lavas at least 300m thick to the end of hole. This has been divided into three units.

Unit 1, the uppermost lavas, are apparently relatively strongly carbonate-chlorite-quartz±pyrite altered formerly olivine (±augite)-phyric lavas that may extend down to around 410m, where an epiclastic unit about 5m thick is recorded. Only a single analysis from this interval is available (295052), from 382.6m. This is a magnesian, low-TiO2 (0.31%) basalt, with very high Cr abundance (1010ppm) as expected, Ti/Zr = 21.7, and low P2O5 (0.11%).

Unit 2, below the epiclastic unit, is composed of augite+olivine-phyric basaltic lavas and breccias Analysis 295057 (from 442.6m) from unit 2 shows notably higher TiO2 and P2O5 contents than Unit 1 low-Ti basalts, but has a similar Ti/Zr (23.5). Unit 2 extends down to ~450m, and overlies a 50m-thick epiclastic unit composed of shale-mudstone in the upper part and coarser lithologies in the basal section., just above 500m depth in the hole. , termed

Unit 3 occurs below about 500m and includes another sequence of augite+ olivine-phyric lavas, with a similar Ti/Zr range (21.4 and 24.8 for the analyzed lavas 295061 from 502.6m and 295062 from 547.6m) to the basalts higher in the hole, but with notably higher P2O5 (0.42% and 0.65%) and Nb contents, leading to Zr/Nb values around 20, compared with values from 30-35 for the overlying basalts. This same unit probably extends to the EOH at 676m, although only a single analysis is available for the thick basaltic section; this sample (295063, from 607.6m) is slightly more evolved, with higher SiO2 and lower FeO, but it stills contains substantial Cr (737ppm). It has a slightly higher Ti/Zr (27.3) than the two analyzed basalts from higher in this unit, but shows the same high P2O5 (0.36%) and lower Zr/Nb (12.7) than the basalts in Units 1 and 2.

10.3: BRD-03

The top 301m of this hole is all Que River Shale.

Unit 1, extending from 301m to around 350m depth, is an augite+olivine-phyric basalt sequence represented by analysis 321402 at 336.3m (Table 2). This has Ti/Zr = 20.5, and exceptionally high P2O5 contents (0.88%), with around 500ppm Cr. Below a shaley interval from 350-361m another basaltic unit about 10m thick occurs, for which no thin section or analytical data are available. This unit is followed by around 16m of epiclastic sediments and tuffs which thin section 321403 (381m depth) showed to be andesitic to dacitic, and unrelated to the basalts. Below this unit occurs 75m of basaltic lavas and breccias, divisible petrographically and compositionally into two units.

Unit 2, which extends from around 394 - 415m depth consists of pyx ± plag-phyric basalts with around 8 -8.7% MgO, yet surprisingly low Cr abundances, from 185-200ppm. Ti/Zr values for Unit 2 basalts are 31-35, and P2O5 abundances are very low (0. 12- 0.18%).

Unit 3 occurs probably between 415m and 424m, and is an augite+olivine-phyric basalt with similar Ti/Zr (for the one analyzed sample, 321409 from 422.3m) values (35) to the petrographically different Unit 2 basalts, but it has much higher Cr (300ppm) and P2O5 (0.39%) abundances.

Unit 4 includes a thin dacitic unit for which no samples were analyzed, and is composed mainly of slightly vesicular aphyric or sparsely plag-phyric andesites that extend from 430m to around at least 451m depth, and possibly down to the base of the lava sequence in this hole. These have for the single analyzed sample, around 64% SiO2, Ti/Zr = 16.4, and low P2O5 abundances (0.15%).

10.4: BRD-05

The top 50m of this hole is composed of interlayered shale and quartz+feldspar-phyric rhyolitic lava; shale continues down to 92.5m, below which a thick epiclastic mass flow unit with a conglomeratic base extends down to 157.6m. Que Rv Shale continues from 157.6m down to 634.6m, but two discrete lava units occur within the shale, one only 10cm thick at 530.6m, for which no petrographic or compositional data are available, and the other, Unit 1, present from 531.8m - 570.7m.

Unit 1: This is composed (Table 3) of basaltic to andesitic lavas ranging from slightly more magnesian augite-phyric basalts (eg. 701510 from 549m; 701511 from 555m and 701513 from 559.5m) to slightly more evolved aphyric basaltic andesites (701507 from 538.5m; 701508 from 539.0m; 701512 from 558.7m and 701514 from 561.5m). Available data suggest that these are all comagmatic, with Ti/Zr from 21.6 - 23, P2O5 from 0.33 - 0.39%, and Cr values from 211 - 334ppm (which may be suspect). Below Unit 1 occurs another 64m of Que Rv Shale (to 634m depth), and below this is ~50m thickness of shale with common epiclastic conglomerate bands. Another 3.5m of black shale passes down into a pepperitic mixture of black shale and explosive basaltic hyaloclastites and subaqueous chill breccias, the uppermost part of which is severly altered.

Units 2 to 5 include the basalts below the pepperite, from 698.6m - 1045.9m in the hole. The uppermost section of this sequence is mainly strongly silicified and carbonate-altered hyaloclastites with altered olivine phenocrysts.

Unit 2 extends from the base of the hyaloclastites to around 755m. It consists of fairly primitive olivine-phyric basalt lavas, lava breccias and basaltic lapilli tuffs with Ti/Zr = 26 - 33, Cr > 700ppm, and P2O5 from 0.21 - 0.34%. These are all quite strongly carbonate-silica altered.

Unit 3, extending from 755m- 875m, includes vesicular pillowed basalts with augite and olivine phenocrysts, that are less altered than the Unit 2 lavas. They have Ti/Zr = 21 - 25, and notably high P2O5 (0.48 - 0.62%) abundances, mainly with 600 - 700ppm Cr.

Unit 4 extends from 875m to 924m in the core, and consists of massive and pillowed augite+olivine-phyric basalts with Ti/Zr = 27-29, 840 - 900 ppm Cr and 0.32 - 0.38% P2O5.

Unit 5 lavas are pillow basalts petrographically identical to those in Unit 4; however these have higher TiO2 (0.6 - 0.8% cf 0.5 - 0.6% in 4) and P2O5

(0.38 - 0.46% cf. 0.32 - 0.38%) contents with Cr mainly around 1100ppm. This unit extends down to around 1046m.

Unit 6: Dacitic lavas and lava breccias make up the remainder of this core to EOH at 1180m Occasional polymict and epiclastic units are present (eg thin section at 1069.8m). The lavas have Ti/Zr 10-12, 67 - 69% SiO2 and 0.09 - 0.12% P2O5. A few slightly more andesitic sections are present (1094 - 1099m, and 1130 -1136m), with somewhat lower SiO2 contents and higher MgO (4 - 5.7%), Ti/Zr up to 13.4 and P2O5 = 0.15 - 0.19%.

10.5: MCH-1:

This Mines Department stratigraphic hole just W of Mt Charter was collared in Que Rv Shale, 10m of which was drilled before passing into the lava sequence. The following log is less well-constrained than for the foregoing Placer holes. It is based on logging notes provided in Corbett and Komyshan (1989) coupled with analyses of the entire core (in fillet sections) for Ti/Zr and Cr provided by Aberfoyle Resources to the Mines Dept. In addition, several wholerock analyses from the core are provided in Stolz and Large (AMIRA Rept 1988), including an upper basalt from 69.5m - 80.6m, a dacite from 134.7 - 176.0m and a lower basalt from 253 - 265m.

Unit 1 is a sequence of dacitic lavas and lava breccias from 10.4m - 57.7m, with Ti/Zr = 8-10 and <10ppm Cr.

Unit 2 consists of basaltic breccias and pillow lavas from 57.7m to 104.5m, with 400 - 600ppm Cr and Ti/Zr from 19-24. Stolz and Large analyzed a core section from this Unit which showed that it has 0.57% TiO2, 8.6% MgO and quite high P2O5 (0.53%).

Unit 3: The section from 104.5m down to 197m includes Corbett and Komyshan's "Mixed Sequence", comprising epiclastic sediments, a single thin basalt flow (116-120m) with Ti/Zr = 34, and felsic lavas, tuffs and lava breccias. The felsic rocks have Ti/Zr = 8-10.

Unit 4 includes a thick sequence of pillow basalts from 197m to 354.3m. These have Ti/Zr values mainly from 34 - 44, and low Cr contents (50 - 70ppm). An analysis from Stolz and Large from this Unit, from 253 - 265m, shows it to be a low-MgO (4,6%) basalt with relatively high TiO2 (1%) and 0.37% P2O5. From 354.3 - 384.6m, epiclastic sandstones and tuffs predominate, then pass down into

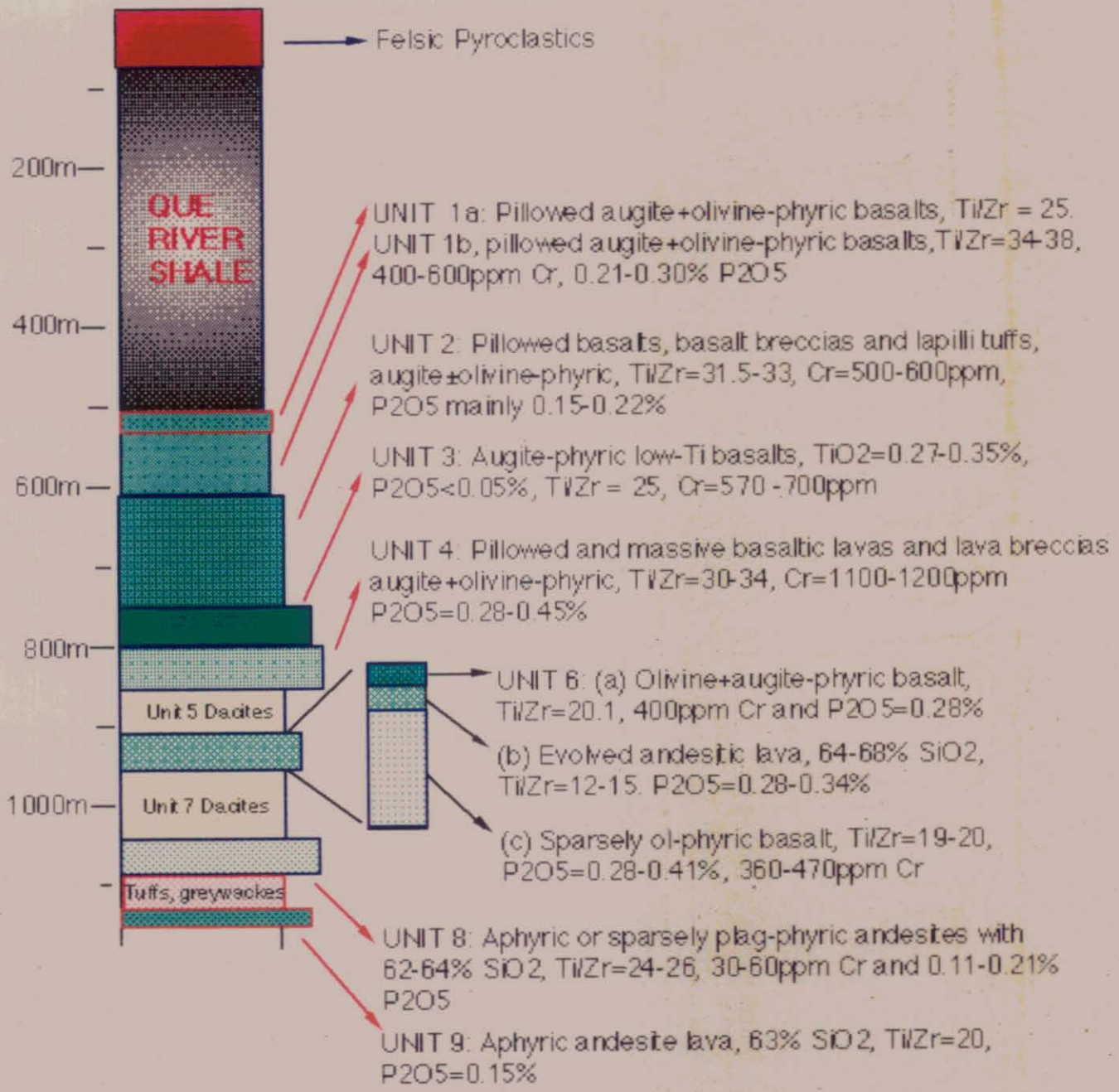
Unit 5, a 15m thick basalt unit, with Ti/Zr = 16-18, and Cr from 370 - 420ppm.

Unit 6 extends from 407m to 460m and is an evolved andesitic unit with Ti/Zr = 11 - 14, and <20ppm Cr.

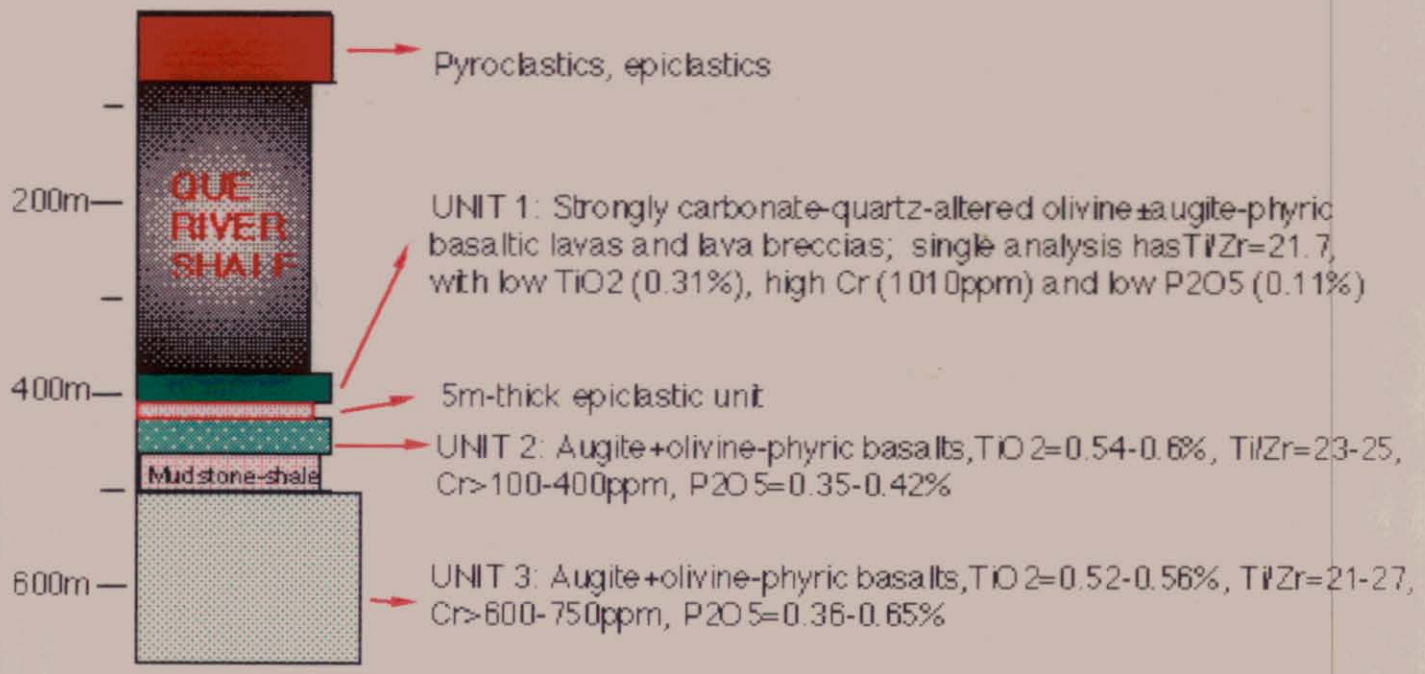
Unit 7, extending down to 494.2m, is also andesitic but has slightly higher Ti/Zr (16 - 18) and Cr (15 - 40ppm). A packet of siltstone 6m thick separates the Unit 7 lavas from

Unit 8, that consists of an upper andesite lava only 1.5m thick with Ti/Zr = 20 and 30ppm Cr, followed below by a basalt 2.3m thick with Ti/Zr = 35, then another andesite about 18m thick with Ti/Zr = 22 - 25. Below Unit 8 follows a sequence of felsic tuffs and tuffaceous sandstones that pass down into the Animal Creek Greywacke.

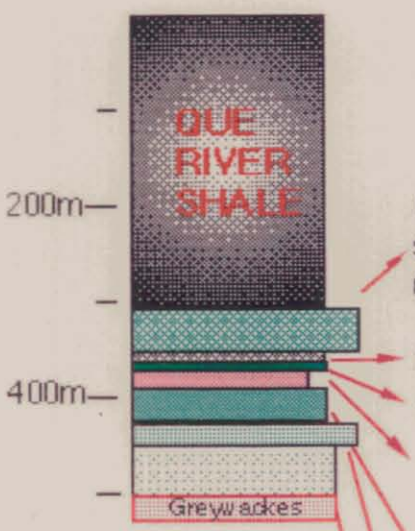
FIGURE 7 a-e: Petrochemical logs based on immobile element data for Placer/CSR Holes BRD01/01A, -02, -03, -05 and Mines Dept Mt Charter Hole MCH-1: *Note that the lithochemical units are not correlated by number between holes. That is, any unit defined in BRD-01/01A, for example, is not necessarily equivalent to the same numbered unit in any of the other holes. Units are defined independently for each hole.*



BRD-01



BRD-02



UNIT 1:Olivine±augite-phyric basaltic lavas and lava breccias; single analysis has Ti/Zr=20.5, with TiO_2 (0.65%), high Cr (500ppm) and very high P_2O_5 (0.88%)

Shale

10m thick basaltic flow ...no data available

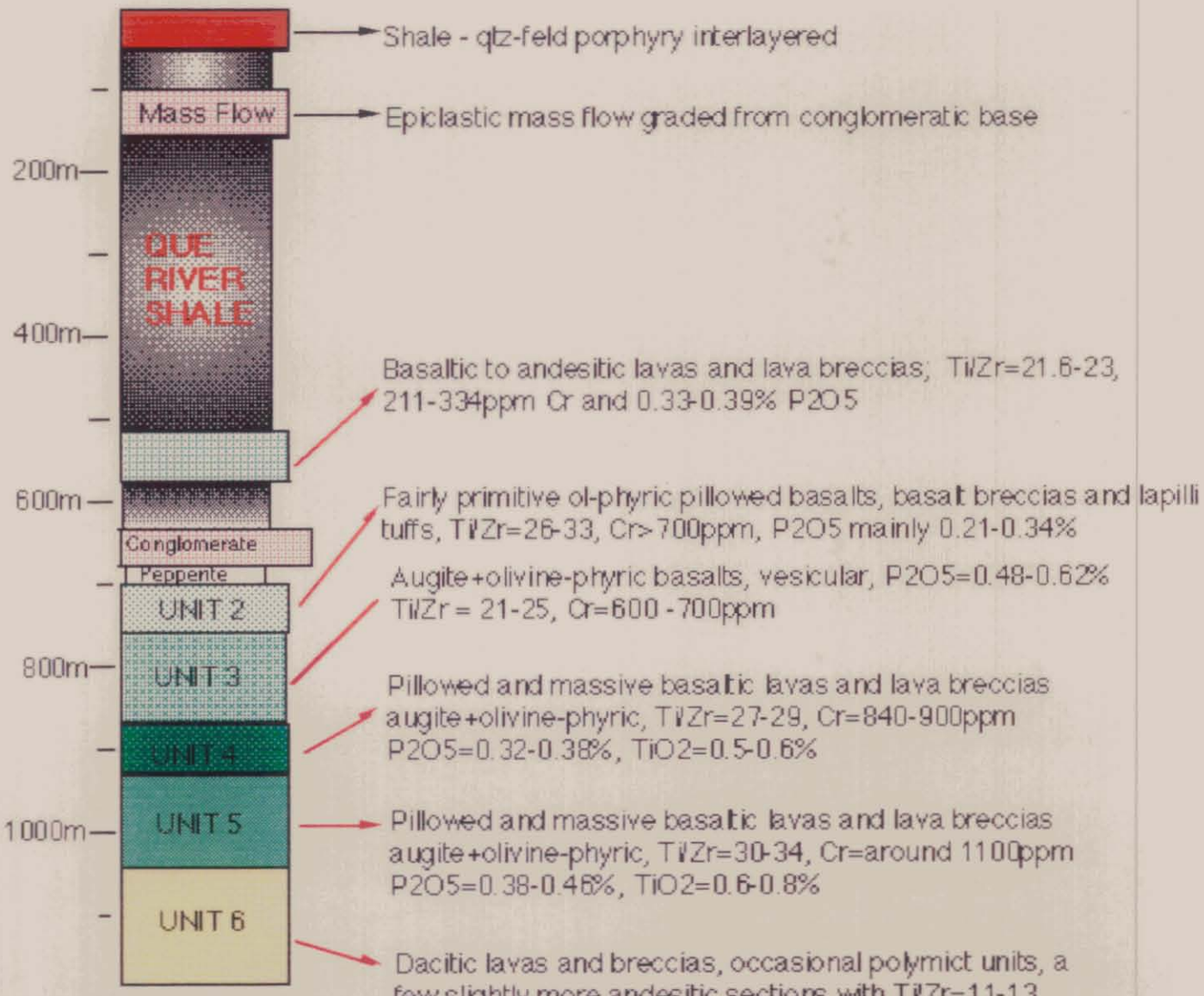
16m of epiclastic sediments and tuffs

UNIT 2: Augite+plag-phyric basalts,8-8.7%MgO, TiO_2=0.52-0.56%, Ti/Zr=31-35, Cr=185-200ppm, low P_2O_5=0.12-0.18%

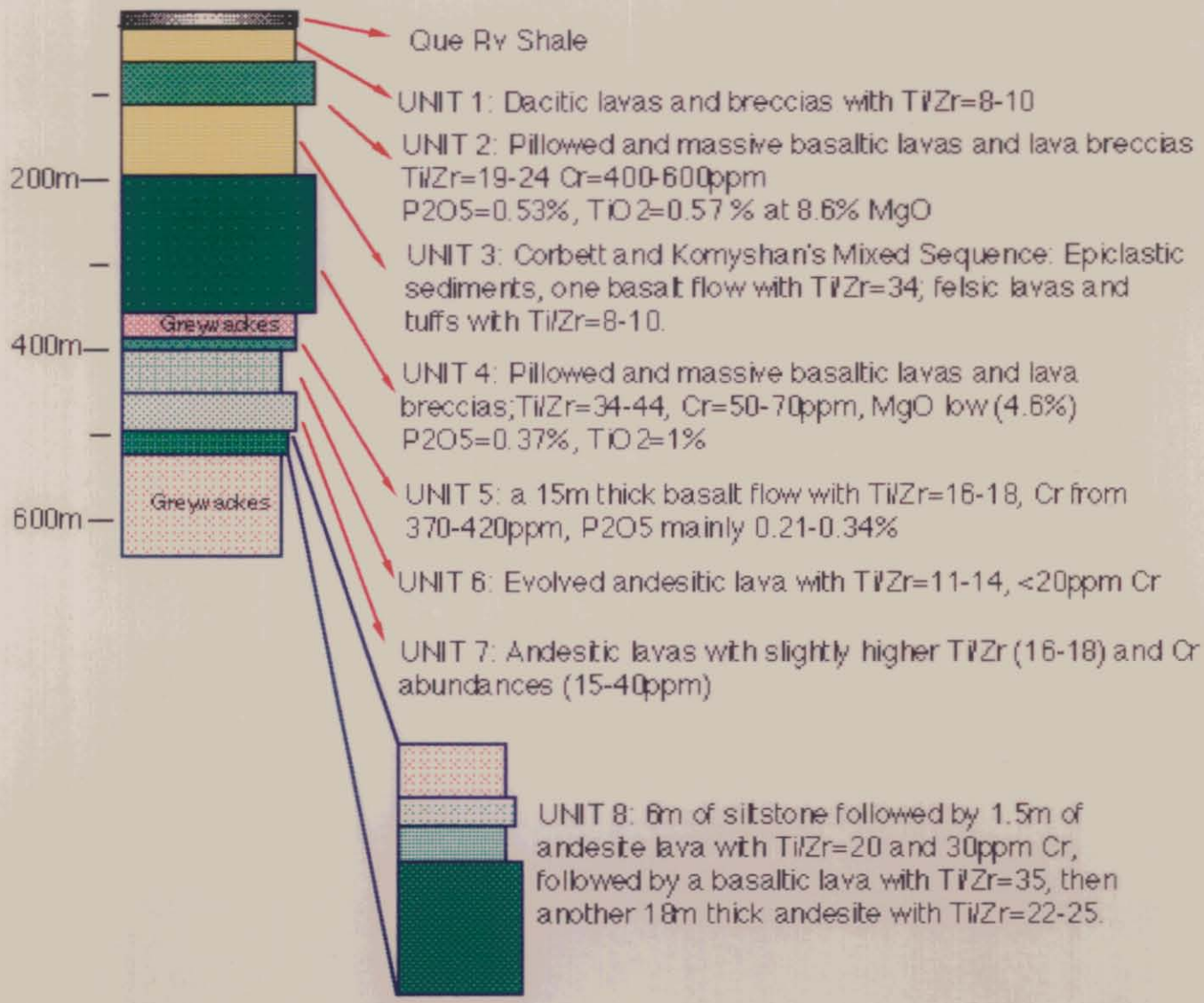
UNIT3: from 415-424m: Augite+olivine-phyric basalts,TiO_2=0.61%, Ti/Zr=35, Cr=300ppm, P_2O_5=0.39%

UNIT 4: Slightly vesicular aphyric to sparsely plag-phyric andesites with 64% SiO_2, 0.48%TiO_2, 3.5% MgO, Ti/Zr=16, 150ppm Cr and 0.15% P_2O_5.

BRD-03



BRD-05


Que Rv Shale
UNIT 1: Dacitic lavas and breccias with Ti/Zr=8-10
UNIT 2: Pillowed and massive basaltic lavas and lava breccias Ti/Zr=19-24 Cr=400-600ppm P2O5=0.53%, TiO2=0.57% at 8.6% MgO
UNIT 3: Corbett and Komyshan's Mixed Sequence: Epiclastic sediments, one basalt flow with Ti/Zr=34; felsic lavas and tuffs with Ti/Zr=8-10.
UNIT 4: Pillowed and massive basaltic lavas and lava breccias;Ti/Zr=34-44, Cr=50-70ppm, MgO low (4.6%) P2O5=0.37%, TiO2=1%
UNIT 5: a 15m thick basalt flow with Ti/Zr=16-18, Cr from 370-420ppm, P2O5 mainly 0.21-0.34%
UNIT 6: Evolved andesitic lava with Ti/Zr=11-14, <20ppm Cr
UNIT 7: Andesitic lavas with slightly higher Ti/Zr (16-18) and Cr abundances (15-40ppm)
UNIT 8: 6m of siltstone followed by 1.5m of andesite lava with Ti/Zr=20 and 30ppm Cr, followed by a basaltic lava with Ti/Zr=35, then another 18m thick andesite with Ti/Zr=22-25.
200m
400m
600m
Greywackes
Greywackes

MCH-1

SECTION 11: CORRELATIONS WITH HELLYER and QUE RV MINES REGION

The stratigraphy of the sequence in the area around the Hellyer mine is essentially Que Rv Shale overlying around 200m of Hellyer (or Hangingwall) Basalt, followed by a thin (~10m thick) correlate of the "Mixed Sequence" , which in turn, overlies feldspar-phyric andesites equivalent to the Que Footwall Andesites. No detailed chemical stratigraphy of the Hellyer Basalt in this area is published, but according to Jack (1989), the majority of basalts have Ti/Zr values from 25-35, with occasional higher values in some units. The Footwall andesites are essentially identical to those at Que River, and have Ti/Zr values mainly from 20-30, low P2O5 (0.05-0.20%), and low Cr (mainly <100ppm) as expected (see Whitford et al. 1989; Corbett and Komyshan 1989). At Que River, only the Mixed Sequence and Footwall andesites section of the stratigraphic pile is exposed,

Two samples of Hellyer Basalt from Aberfoyle Resources hole HL6 in the Hellyer license, and provided to me by Doug Jack for analysis (with permission to quote in AMIRA reports etc) are both high-P2O5 basalt to basaltic andesite (334161 and 334162 in Table A4) typical of the Hellyer basalt, with Ti/Zr = 25, and Cr up to almost 1000ppm in the more mafic sample. Without further data on lavas above and below these two analyzed samples in HL6, it is difficult to draw correlation with the better documented sequences in the Placer holes and MCH-1. However, the combination of low-Ti/Zr (25) with high Cr and high P2O5 suggests a ***broad*** correlation with the uppermost basalts (Unit 1) in BRD-03 and the uppermost basalts (Unit 2) in MCH-1 (noting that these holes are some 5-6km apart).

Finally, basalt MR437 (Corbett and Komyshan 1989) from the Hellyer Basalt near the Farrell-Waratah transmission line crossing (~2km W of Hellyer mine) also has Ti/Zr = 25, relatively high P2O5 (0.36% for a basalt with 8.3% MgO) and 400ppm Cr (Table A4) and is also best correlated with the uppermost basalt (Unit 2) in MCH-1.

SECTION 12: SOME COMMENTS ON CORRELATION AND STRATIGRAPHIC UNITS IN ANCIENT VOLCANIC TERRAINS

The broad scale regional correlations alluded to in the above segment, and attempted in more detail further on, are made with the following provisos and cautions foremost in my mind. Firstly, anybody who has worked in an arc-type volcano-tectonic setting such as might be encountered for example, in Indonesia, the Philippines or Japan, is well aware that individual volcanic facies are likely to be variable and impersistent, both along strike away from the source, and laterally. Some lava flows may be extensive along one flank of a volcano, whereas no record of these flows might be evident on the opposite flank of the same edifice. Likewise, pyroclastic eruptions are notoriously directional, and whereas they may be extensive for tens of kilometers in one direction, little evidence of their existence might be preserved or evident in the opposite direction away from the source.

The examples referred to above in Japan and Indonesia etc would all be essentially subaerial volcanic manifestations. Much less is known of submarine volcanism, particularly deep water, explosive, arc-type volcanism. Underlying greywackes, the presence of thick pillow lava sequences, and marine fossils in the Que Rv Shale all indicate that the volcanism that produced the lava pile at Hellyer and Bulgobac was submarine, and probably quite deep water. Whether volcanism in such a volcano-tectonic rift was fault-controlled and diffusely spread along major submarine fissures, or whether it occurred more focussed, as overlapping eruptions from major volcanic edifices, remains unknown, even for many modern such submarine settings. If, in the case of the Que-Hellyer area, the volcanic pile was generated by eruptions from major cones, there would be little reason to expect to be able to correlate individual basaltic (compositional) units over any distance. If volcanism was more fissure-controlled, it is likely that basaltic units might be more extensive and thus traceable from at least one drillhole to its nearest neighbour. Presently, I don't think enough information is available for the area in question to be able to judge whether fissure or focussed eruptions were more important in building up the Que-Hellyer-Bulgobac lava pile. In fact, there is not even enough data, in my opinion, to rule out the possibility that the area now covered between Bulgobac, Hellyer and Mt Charter, originally constituted several subparallel small rifts or basins within a broader submarine volcano-tectonic rift.

A second point to keep in mind is that some compositional features of basaltic lavas reflect only shallow magma chamber processes, whereas others are inherited from their mantle source, and will not change very much with fractionation. For example, the Ti/Zr value, and especially the abundance of P2O5 in basalts with more than 7-8% MgO, essentially reflect their mantle source value. The abundance of P2O5 in the **basalts** analyzed for this study varies by almost a factor of twenty, from about 0.05 - 0.9%. Fractionation within the basalt compositional range cannot possibly increase P2O5 abundances by more than about twice the original abundance, and even this would be exceptional. This huge variation in immobile P2O5 abundances in the basalts studied, therefore, reflects a source feature, and might be more widespread than would be expected if it were generated by fractionation in small and localized subvolcanic magma chambers.

Furthermore, basalts with broad arc geochemical signatures (eg low TiO2, Nb abundances) but with more than ~0.2% P2O5 are most unusual and distinctive; those with P2O5 in excess of around 0.4 - 0.5% might be referred to as shoshonites, and carry important tectonic implications. It is worthwhile, therefore, to carefully observe the distribution of P2O5 in the cores analyzed. Note that unfortunately, only two samples from the entire MCH-1 core have been analyzed for P2O5, making correlations to this area tenuous.

The approach taken in the following section, in which correlations are attempted between the drillholes detailed above and in Figures 7a-e, is to try to pick temporal changes in composition of lavas in each hole, focussing especially on P2O5 and Ti/Zr, and to correlate these from hole to hole. This procedure is probably the best way to attempt such a correlation given all the potential pitfalls recognized above, but in no way should it be considered to yield watertight correlations.

A final consideration before correlations are attempted is the significance and origin of the felsic rocks in the three deepest holes (BRD-01, -05, and MCH-1). These rocks are dominantly formerly glassy, sparsely plagioclase-phyric dacitic lavas, often with strongly autobrecciated upper sections. These dacitic bodies in the Que - Hellyer area vary from lobed and bulbous shapes, that Corbett and Komyshan (1989) consider to be lava domes, to more tabular bodies thought to be lava flows. It is noteworthy that the dacites intersected in BRD-01 and 05 often show flow banding parallel or subparallel with the lithological layering, and occur interlayered with andesitic lavas with lower SiO2 and higher MgO contents. These

features suggest that the dacites in these holes might be more likely to be flows than domes. Deep water eruption might retain H2O dissolved in the magma, and produce a more mobile, less viscous dacitic magma able to travel some distance from a vent/fissure source, especially if a slope is present. Eruption of the same magma in shallower water would allow degassing and subsequent explosive eruption.

Again, the question remains as to whether the dacites were erupted from major volcanoes, or from fissures. The general bimodality of the SiO2 contents of the samples analyzed from these holes (basalt-dacite) is typical of arc caldera volcanoes rather than arc strato-volcanic cones (Wheller and Varne 1987), reflecting contrasting magma chamber processes in these two styles of arc volcanism. Again, lack of knowledge of styles and products of submarine examples precludes extending the analogy with any certainty to the rocks in question.

SECTION 13: CORRELATION of PETROCHEMICAL UNITS : BULGOBAC-HELLYER AREA

13.1: Discussion of Correlations

Figure 8 shows an attempt to correlate the various lava units identified above across the area covered by drillholes examined. It is emphasized that this does not imply that each unit correlated is a single, remarkably continuous or sheet-like flow. Rather, magmatic groups with general similarities with respect to diagnostic geochemical and petrographic criteria are identified in each hole and correlated (if correlations exist) between holes. With reference to Figure 8, the following points are made:

1. The basal lava sequence in the sections under consideration is the andesitic unit referred to as the Que-Hellyer Footwall andesites and their correlates. In the N of the area of interest, in BRD-03, these andesites are only about 30m thick and pass into Animal Creek Greywacke correlates. In BRD-01, the main andesite sequence is about 34m thick and passes, via a 30m-thick epiclastic sequence into Animal Creek Greywacke correlates. However, to complicate matters, 2m of andesite was recovered in the base of the last drillrod for this hole, at 1131-1133m. This sample is worthy of further attention. Figures 9a-d show diagnostic element variation diagrams for Central Volcanic Sequence Group 1 and 2 lavas (see earlier), data for Que-Hellyer Footwall andesites, the BRD-01 Unit 8 andesites, and this andesite from BRD-01 at 1031-1033m. On each diagram (and several others *not shown*), *and without any ambiguity, this sample* plots as a Central Volcanic Sequence Group 2 lava, quite unlike the overlying Unit 8 andesites above the greywackes in this hole. Moreover, the similarity in compositional space between the Unit 8 andesites and the Que-Hellyer Footwall andesites is supported and amplified ***Therefore, in BRD-01, the Unit 8 andesites correlate very well with the Que-Hellyer Footwall andesites from east of the Murchison Hwy, whereas the basal Unit 9 andesite is a very good match with the Group 2 andesites of the Central Volcanic Complex. The implication here is that the Animal Creek Greywacke is probably only 20-30m thick in the central part of the EL, with its thickness appearing to almost vary in inverse proportion to that of the Que River Shale, that appears to thicken to the west, and certainly thickens significantly to the south. It is very significant that the Central***

Volcanic Complex has been penetrated in this drillhole, and appears to conformably underlie an unexpectedly thin Animal Creek Greywacke correlate.

2. Lavas reasonably correlated with the Que-Hellyer Footwall Andesites also occur at the base of BRD-03 in the N of the area of interest, and in MCH-1 in the southernmost part of the area of interest. From the base of the Que River Shale to the top of this andesitic unit, the lava sequence thickness in each hole is, respectively,

BRD-03 - ~140m: MCH-1 - ~350m: and BRD-01 - ~530m.

The 'andesitic' basement was not reached in BRD-05, despite drilling through a >480m thickness of lavas below the basal Que Rv Shale. Clearly, the 'basin' in which the main lava sequence was erupted between the time of the cessation of eruption of low P2O5 andesites with Ti/Zr mainly <25 (ie Que-Hellyer Footwall andesites), and the beginning of Que Rv Shale deposition, had its deepest portion in the central section, possibly between BRD-01 and -05, or even further to the south. In the Hellyer mine area, this lava section is about 230m thick, including 220m of Hellyer basalt and only 10m of "Mixed Sequence" correlates (Corbett and Komyshan 1989). The latter authors report that this lava sequence 'thins southward, resting on a northward thickening wedge of andesitic lavas, and appears to wedge out. It may, however, be equivalent to the basalt unit above the Mixed Sequence in MCH-1'. The Que Rv Shale shows a parallel thickness variation, being around 430m thick in BRD-01 with few coarse interbeds, and over 450m total thickness in BRD-05 with a number of relatively thick (> 20m) coarse interbeds.. It thins to about 300m thick in BRD-02, and according to Corbett and Komyshan (1989) appears to thin eastwards from around 150m thick at the Murchison Hwy to possibly wedge out altogether SE of the Hellyer Mine. West of the N-S section that includes the drillholes under consideration, the Que Rv Shale is at least 120m thick in BRD-04, where it is truncated by a major fault.

3. Dacitic lava sequences occur in BRD-01, -05 and MCH-1. In the latter, apparently extrusive flow-banded dacites occur immediately under the basal Que Rv Shale and are thus the youngest manifestation of volcanism in this part of the 'basin'. However, further N, towards the centre of the Placer EL, in the deep holes BRD-01 and -05, dacitic lavas are separated from the basal Que Rv Shale by around 330m of basaltic lavas in BRD-01 and 300m of basalts in BRD-05 It is significant that the basaltic unit immediately above the uppermost dacites in each hole appears to be readily

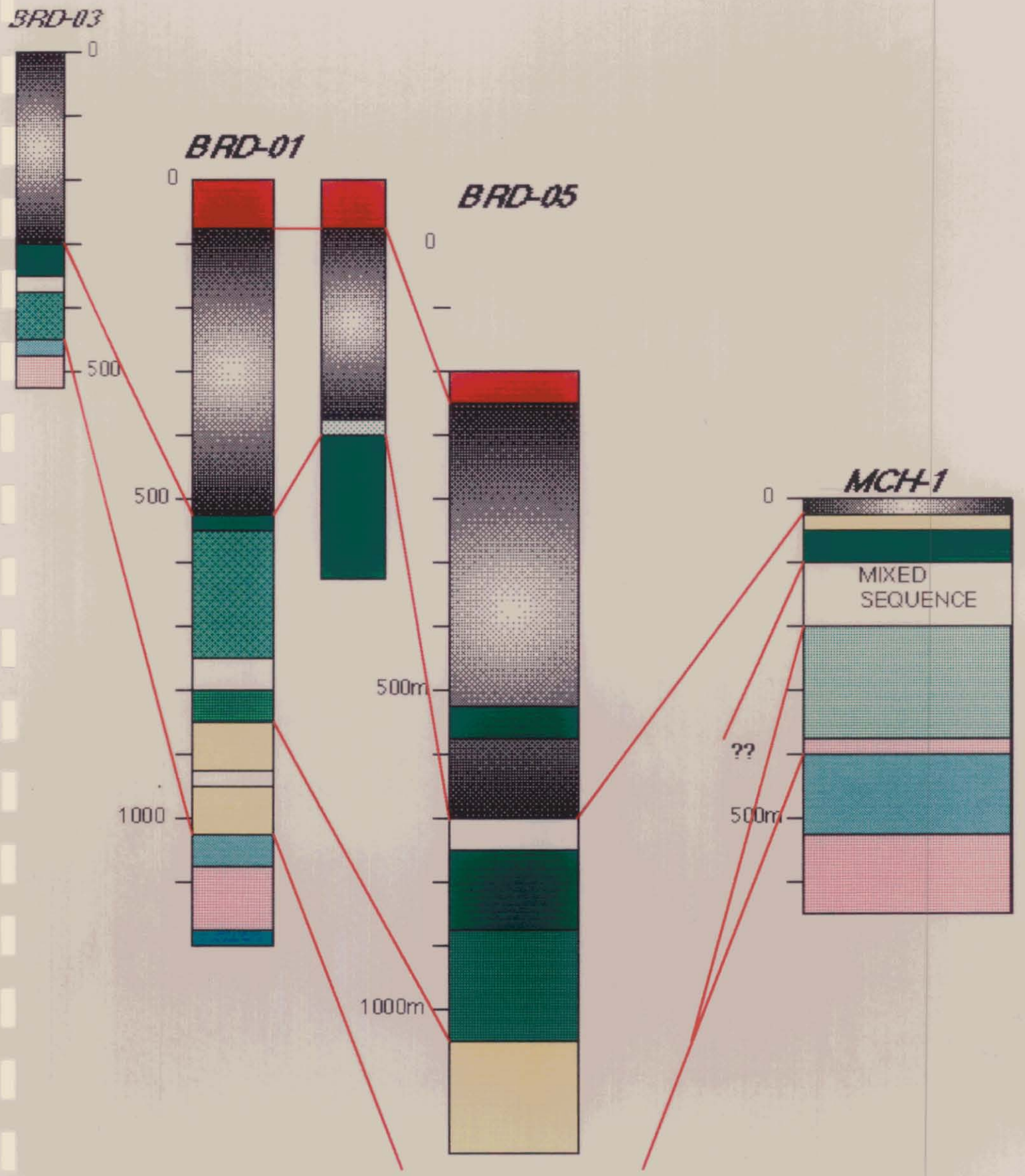


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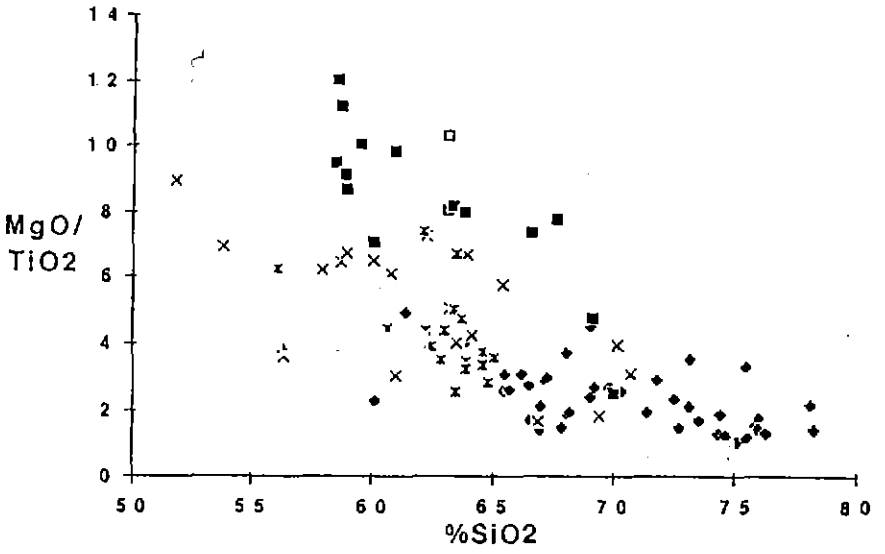
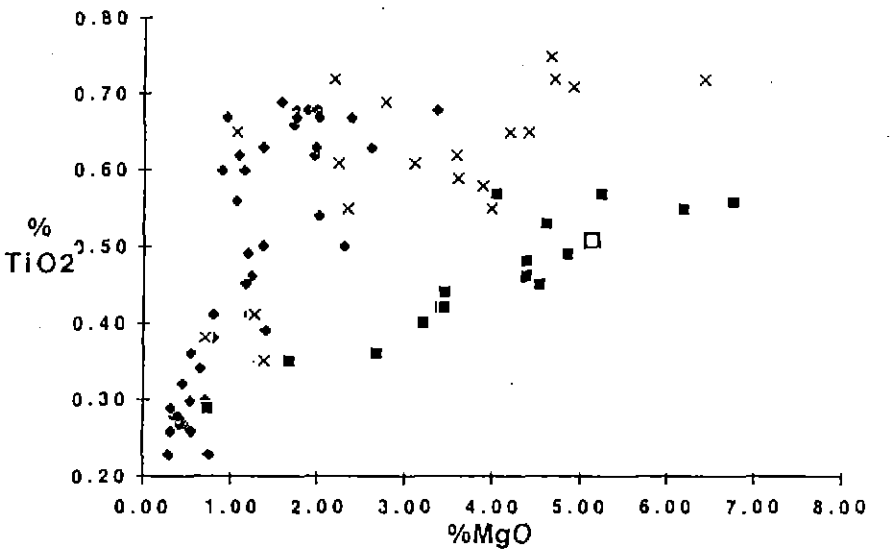
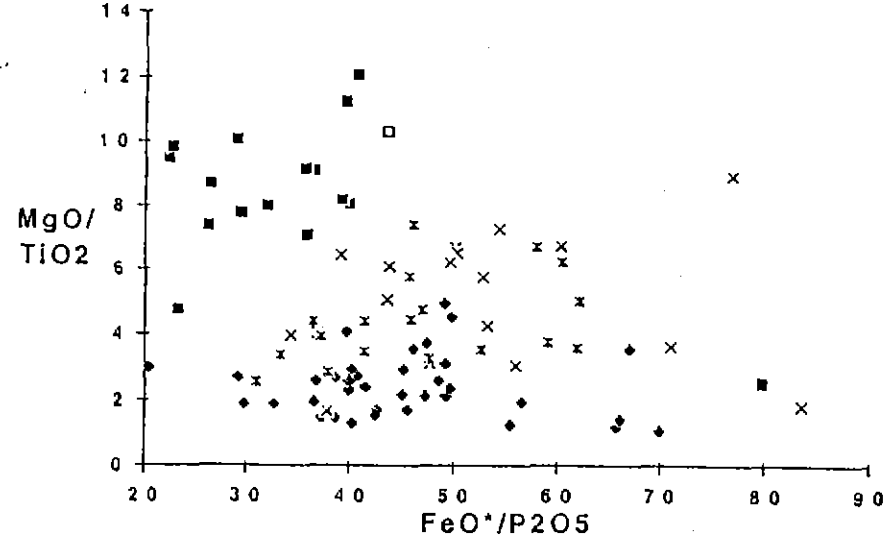
FIGURE 8 Correlation diagram linking suggested Lava unitcorrelates in EL 39/85 area.







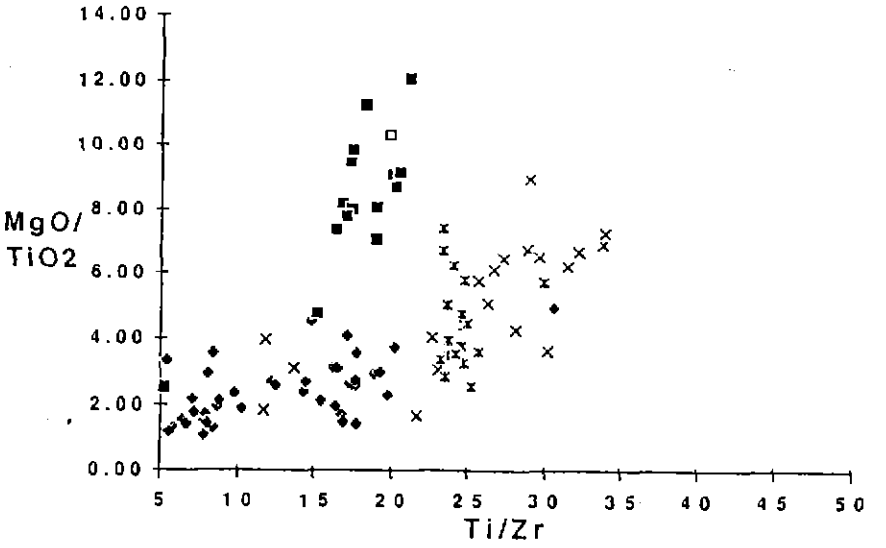
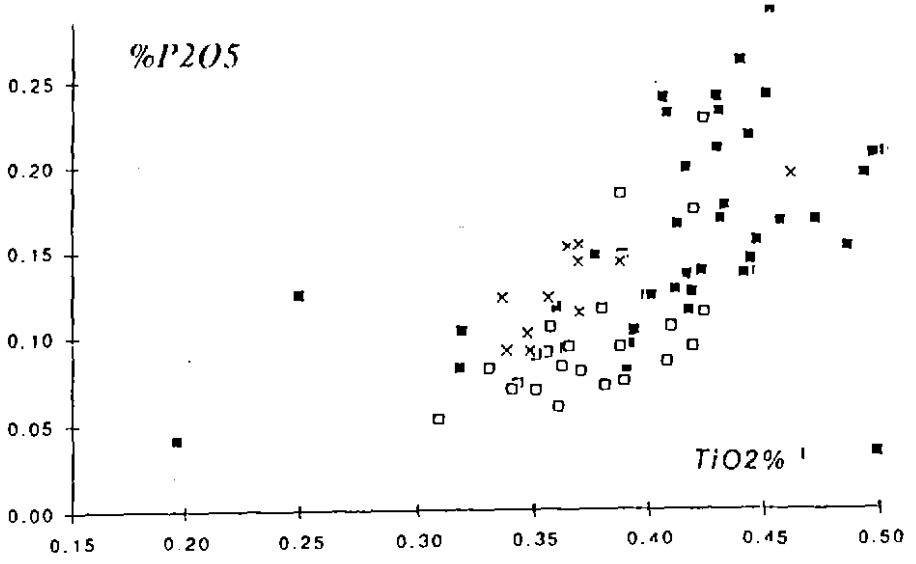
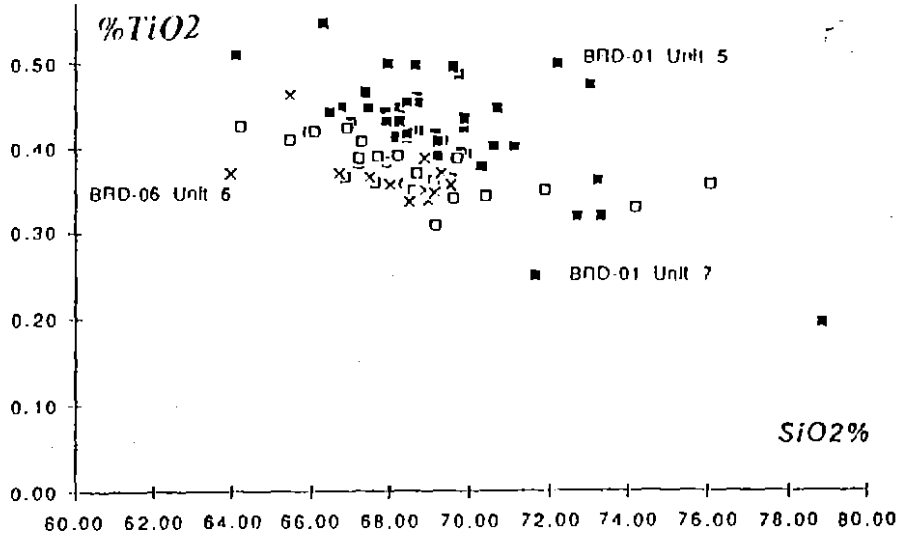


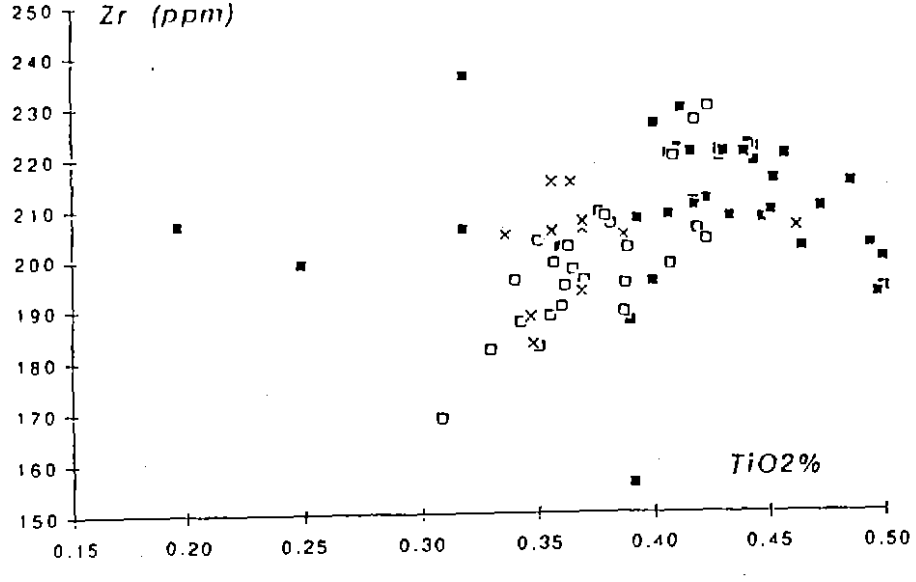
FIGURE 9a-d: Immobile element variation diagrams showing the compositional fields of Central Volcanic Complex lavas from Groups 1(closed diamonds) and 2 (closed squares), Que Footwall andesites (crosses) and Units 8 asterisks) and 9 (open square) from BRD01/01A. *Note that the Unit 9 andesite is best matched with Central Volcanic Complex Group 2 andesites.*

correlated (Unit 5 in BRD-05 and Unit 4 in BRD-01), being composed of augite+olivine-phyric basalts with Ti/Zr = 30-34, >1000ppm Cr, and relatively high P2O5 contents (.28-.46%).. However, as shown on the variation diagrams in Figure 10 a-d, the two dacitic units in BRD-01 and the basal dacites (Unit 6) in BRD-05, show subtle and consistent compositional differences, precluding any one-to-one direct correlation between holes. Note the well-defined difference in the TiO2 contents of Unit 5 dacites in BRD-01 at any SiO2 level compared with those in Unit 7. It is nevertheless probably reasonable to conclude that the dacites in the lower sections of both BRD-01 and -05 are essentially correlates, and represent an episode of strong dacitic volcanism, followed immediately by a more widespread eruptive event in which primitive Cr-rich basalts with Ti/Zr=30-34 and quite high P2O5 contents ((0.28-0.46%) were erupted. The Unit 6 mixed basalt - andesite sequence present in BRD-01 has no counterpart in BRD-05.

4. If the base of the Que Rv Shale may be regarded in the broad sense as a time line, and the basalts overlying the uppermost dacites in BRD-01 and BRD-05 be taken as correlates (and thus another time line), then some 300m of basaltic lavas in -01 (Units 1-3) and around 220m of basalts in -05 (Units 2-4) were erupted through the intervening period between these time lines. The distinctive low-Ti basalts of Unit 3 in BRD-01 have no counterpart in BRD-05, although a comparable (though not identical) low-Ti basalt makes up Unit 1 in BRD-02. Similarly, the well-defined basalts of Units 1 and 3 in BRD-05, with distinctive low Ti/Zr values (21-25) correlate well with the uppermost basalts (Unit 1a) in BRD-01 and also with Unit 3 basalts in BRD-02. Surprisingly, since they are some 5-6km apart, this same petrochemical unit appears to form the uppermost basalt unit in both MCH-1 (Unit 2) and BRD-03 (Unit 1), and may be representative of the last, widespread (basinwide?) phase of basaltic volcanism in the 'basin'.







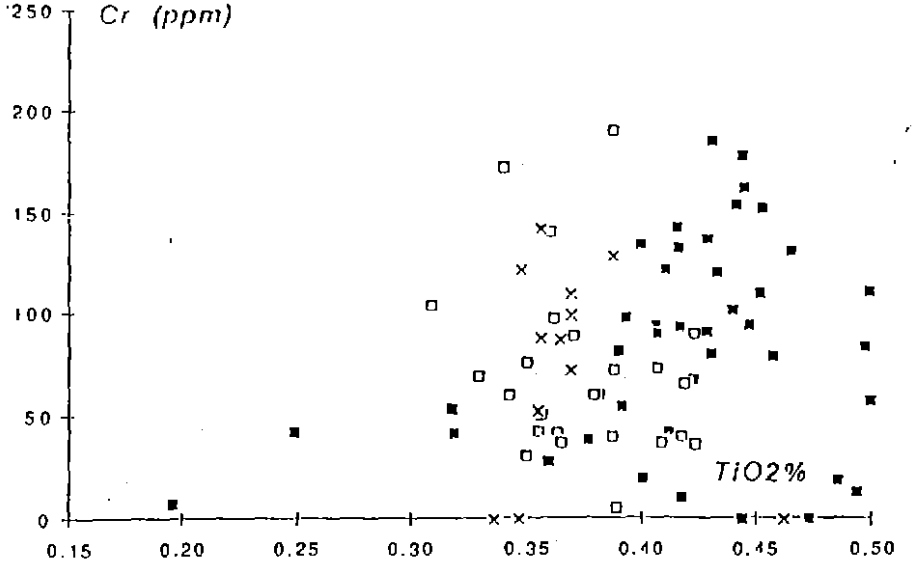


FIGURE 10a-d: Immobile element variation diagrams showing the slightly different compositional space defined by felsic lava units in BRD01/01A (Unit 5, closed squares) and BRD 05 (Unit 5 crosses, Unit 7 open squares).

13.2: WHERE IS THE "MIXED SEQUENCE" ...??

It remains to try to evaluate, on the basis of the correlations shown in Figure 8, where the horizon equivalent to the "Mixed Sequence" of the Que-Hellyer-Mt Charter area must lie. Of course, there is no reason to suppose that the "Mixed Sequence" should be a 'basin-wide' marker. We know already that it pinches out from about 250m thick at Que Rv mine, to apparently 70m thick further south at MCH-1, and only around 10m thick in the Hellyer mine area (Corbett and Komyshan 1989). At Hellyer, it is placed beneath the entire 220m of pillow basalts.

If a search is made for the supposed "Mixed Sequence" in BRD-05, it has to be concluded either that it has not been reached by the 1180m deep BRD-05, or that it is here represented by the dacites and dacitic breccias of Unit 6 (which might be a reasonable assumption). The correlation made previously of both the BRD-01 and -05 dacites and their immediately overlying basalts, forces the mythical "Mixed Sequence" to constitute the Units 5-7 dacites, dacitic breccias and associated rocks in BRD-01. This seems entirely reasonable to me, since these rocks immediately overlie Unit 8 andesites confidently correlated (Figures 9a-d) with the Que-Hellyer Footwall Andesites, that themselves underlie the "Mixed Sequence" where it was defined. Also implied is that the ~350m thickness of basalt in each hole is readily correlated with the 220m thickness of basalt in the Hellyer area. There is no reason to doubt this as far as I am aware.

This implies, with respect to the petrological log for MCH-1 (Figure 7e), that the 50m of basalt constituting Unit 2, must be equivalent time-wise, to the entire 220m-thick basalt sequence underlying the Que Rv Shale in the Hellyer mine lease area, and the entire 350m or so of basalts in BRD-01 and -05. I find this to be unlikely, although it might well be real. It also implies that the 150m-thick Unit 4 basalts in MCH-1 (Ti/Zr =33-44) below the "Mixed Sequence" in MCH-1 have no equivalent at Hellyer, but pinch out against the footwall andesites. Nor do they correlate with anything in BRD-01, and the potential level where they might exist in BRD-05 has not been reached by present drilling.

SECTION 14: IMPLICATIONS FOR BASIN ARCHITECTURE AND CORRELATION

Animal Creek Greywacke correlates have been drilled in MCH-1, BRD-01 and BRD-03. This sequence of pelitic metamorphic-derived micaceous sandstones forms the basement to the thick Hellyer-Bulgobac lava sequence, and conformably overlies the Central Volcanic Complex The Que-Hellyer Footwall Andesites, thought to be hundreds of meters thick in the vicinity of Que Rv mine, appear to pinch out westward, since they (Unit 8) are only around 35m thick in BRD-01. This suggests that at the time that the Que-Hellyer Footwall Andesites were being produced, either the basin/rift in which they were accumulating was centred in the Que-Hellyer area, and shallowed to the west, or else the main source of volcanism in the basin/rift was centred in that area, with lavas pinching out gradually westward. During a hiatus in volcanism presumably (although it is not well defined in the drilled rock record), the Que and Hellyer ore deposits accumulated on the seafloor. .

Increased volcanism and higher heatflow must have accompanied the eruption of the vast amount of Hellyer Basalt across the area. Available evidence suggests that the thickest Hellyer Basalt sequences are along the line between BRD-01 and -05, some 3-5km west of the known thickest accumulations of the underlying andesites. At this time, the volcano-tectonic rift in which this pile was erupting clearly shallowed to the north (BRD-03 has only 125m thickness of Hellyer Basalt), and major growth faults probably bounded this basin on its western side (see D. Leaman's geophysics summaries). This basin configuration, with the deepest section in the west and south, probably continued on after volcanism ceased, and the Que Rv Shale was deposited.. The latter is several hundred meters thicker in BRD-01 and -05 than further east in the Que Rv mine-Southwell River area. The thick epiclastic and mass flow units within the Que Rv Shale in BRD-05 probably indicate basin margin instability to the east, and detailed studies of the provenance of the clasts in these units will be informative. There is therefore, some evidence to suggest that the axis of the volcano-tectonic basin/rift in which this entire sequence accumulated shifted westward with time. This is predicted in the tectonic model presented further on. **If the Hellyer Basalt was erupted dominantly from the area where it is now thickest, the conduits from shallow magma chambers to eruption in probably quite deep water should also be in the area**

west and perhaps south of BRD-01 and -05, and may have seen a great deal of hydrothermal activity into the waning phase of this volcanism. I am aware that the most prospective VMS horizon in the region is at the Mixed Sequence level. However, n my unexpert opinion, there is no reason why the contact between the Hellyer Basalts and the Que River Shale should not be equally as prospective for VMS deposits as the more deeply buried (900-1050m-deep) "Mixed Sequence" correlates. The base of the shale records a time of dramatically decreasing geothermal gradients as basaltic volcanism waned, within a relatively deep marine basin into which only shales were accumulating. The potential exists, in my opinion, for a large amount of hydrothermal alteration of the basalt pile by late stage fluids associated with the waning stage of basalt volcanism (fumarolic stage had it been in shallow water or subaerial). Of course, it is possible that the vast effusion of basaltic lavas into this basin sealed off former hydrothermal systems that generated the likes of Que and Hellyer VMS bodies; these may have been focussed along important faults.

SECTION 15: ALTERATION AND MINERALIZATION

The rocks examined in thin section from each core showed extremely variable alteration, probably most closely related to proximity to major faults that acted as fluid conduits. Intense and extensive alteration of the style associated with the Hellyer VMS deposit was not recorded, although fuchsite was noted at the top of the basalt unit (Unit 6) interlayered between the Unit 5 and Unit 7 dacites. Other sections with alteration more intense than expected in regional burial metamorphism are noted in the thin section descriptions, but do not correspond to intense hydrothermal haloes; rather they are patchy and discontinuous sections of usually intense carbonate-chlorite alteration (basaltic sections), or carbonate-sericite alteration (dacitic sections) Alteration of the dacites is quite obvious chemically, as shown in Figures 11a and b, where plotted against an immobile parameter (Ti/Zr). Both K2O and Na2O show exceptional variation (1-6%) according to whether the originally glassy dacite devitrified to albite-quartz and remained unsericitized (trend to high Na2O at constant Ti/Zr) or was subsequently sericitized (trend to high-K2O).

Basalts, especially the formerly glassy lava breccias and hyaloclastites in BRD-05, show more typically calcite-chlorite alteration. Recalling that few fresh basalts from any tectonic environment have more than 13% CaO, the many basalts with CaO contents notably higher than this (Fig. 12a) indicates that calcite alteration (mainly as veining) is quite widespread, especially in the BRD-05 basalts from 700-1000m depth. This is clearly shown in Figure 12b, where CaO abundances in all the analyzed samples correlate very well with Loss on Ignition. That this Carbonate ± chlorite alteration rarely involves pyrite is shown clearly in Figure 12c, where only a few samples of the BRD-05 basalts deviate away from the expected near-primary trend of constant Fe2O3.

While there is no doubt whatsoever that the lava stratigraphy sampled here is directly correlatable with that in the Hellyer mine area, the alteration is less intense than developed in the vicinity of Hellyer (either hangingwall or footwall), and is not favourable for the presence of a VMS deposit of any size within close proximity of any of the holes drilled in this EL.

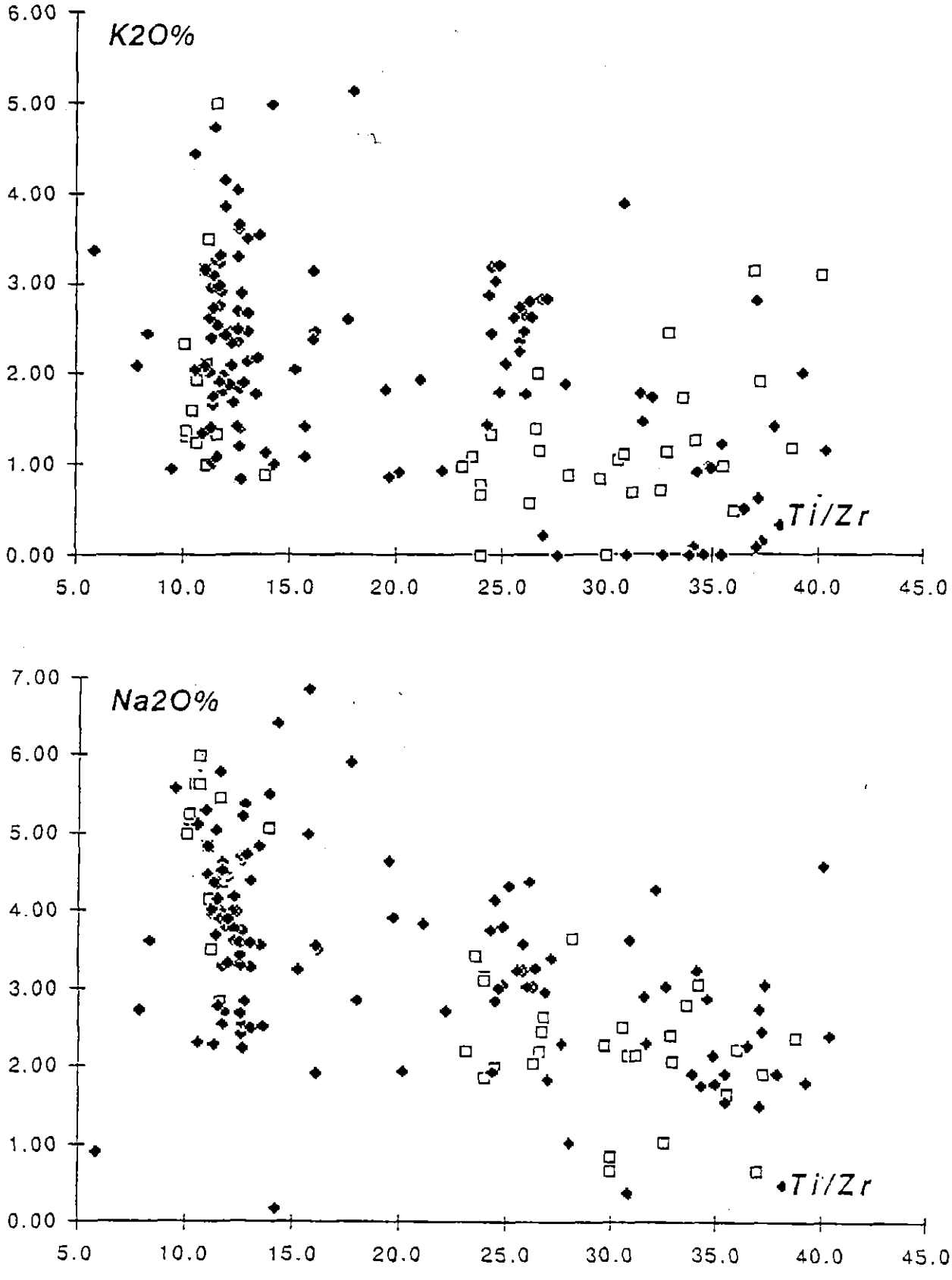
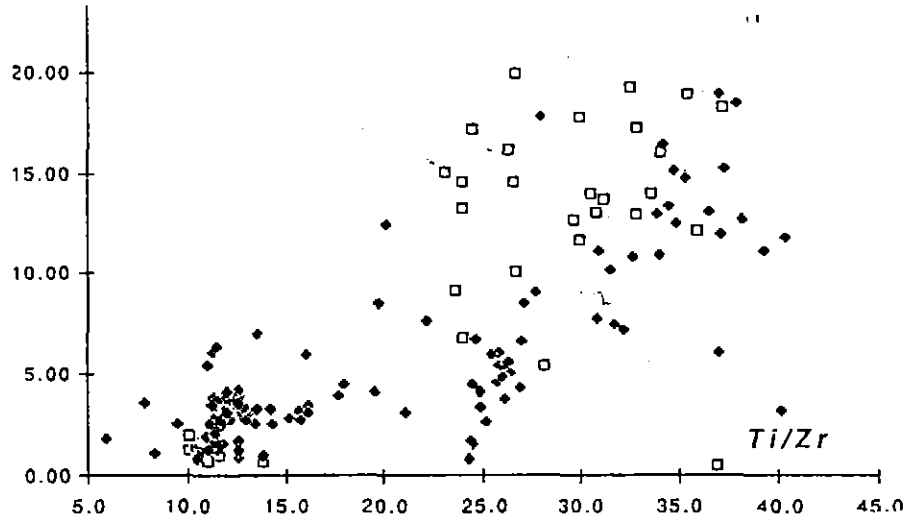
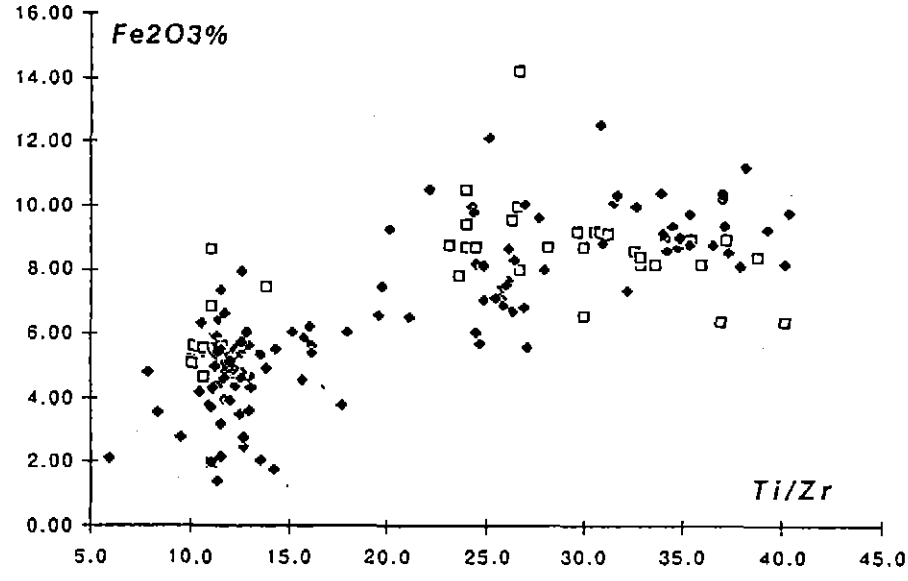


FIGURE 11: Variation of K2O and Na2O plotted against an immobile parameter (Ti/Zr) to show the effect of sericitization (increasing K2O) or albite-quartz alteration (increasing Na2O) of glass in the felsic lavas (those with Ti/Zr < 15) from BRD01/01A (closed diamonds) and BRD05 (open squares).





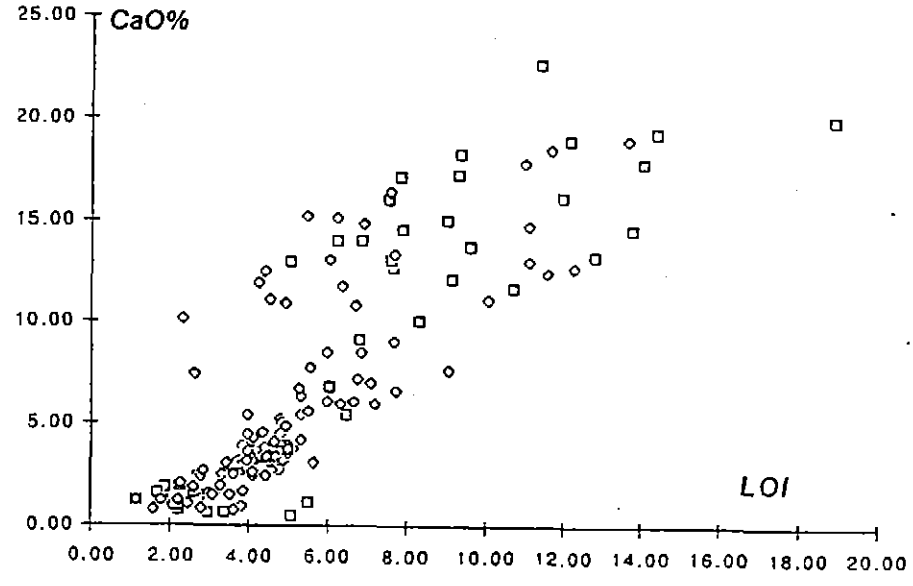


Figure 12: (a): CaO - Ti/Zr for BRD-01 (closed symbols) and BRD-05 (open symbols) showing anomalous CaO enrichment, particularly in -05, due to carbonate veining.
(b) same data as (a) plotted against Fe2O3, showing the near-constant Fe2O3 for most BRD-05 basalts that are strongly carbonated, implying absence of pyrite in the alteration assemblage.
(c): *same data (BRD-01 diamonds), BRD-05 (squares) showing* strong corrleation of CaO with Loss on Ignition, indicating calcite-dominated alteration.

SECTION 16: TECTONIC MODEL FOR THE CAMBRIAN GEOLOGICAL EVOLUTION OF WESTERN TASMANIA

The following tectonic model only briefly outlined here is based in large part on a paper (Crawford and Berry 1990) in preparation. It is worth noting that none of the huge amount of new data resulting from the present study argue against the model. In fact, several features previously unknown to me support the model strongly.

In essence, we envision that a Late Proterozoic thinned, rifted continental margin, now represented by the Rocky Cape Block, collided with and was overthrust by an oceanic island arc now represented by the large allochthonous (but now folded) sheets of ophiolite of Middle to Upper Cambrian age, along an E-dipping subduction zone . Continued underthrust-ing of the passive margin (which contained small en-echelon rift basins floored by tholeiitic basalt sequences such as the Crimson Ck Formation, the Smithton basalts and the Motton Spilite) led, as it has done in many better exposed examples such as Oman and Taiwan, to backthrusting, uplift and excavation of the underthrust passive margin. This is represented by the Tyennan Metamorphics, which record metamorphic ages around 550-500Ma. High-K arc-type magmatism accompanied this stage, represented by the Central Volcanic Complex lavas. As the excavated Tyennan core continued to rise, the ophiolite sheet that covered the Tyennan partially or completely slid off and/or was partially eroded off. ***Large red chromites noted in several thin sections of Animal Creek Greywacke from BRD-01 and -03 are unambiguously from the ophiolite, and demand that the ophiolite was emplaced prior to eruption of the Que-Hellyer lava sequence.*** The Animal Creek Greywacke was probably eroded from the recently uplifted Tyennan to be deposited in a basin (the Dundas Trough) formed along the western margin of this uplifted block. There is no reason to suppose that the Dundas Trough existed as such before this time.

Faults along the margins of the upthrusting Tyennan may have focussed the subsequent magmatism in this region, constraining eruption of the Que-Hellyer Footwall andesites to the same general basin that the Animal Creek Greywackes were dumped in. Continued uplift of the Tyennan to the east pushed this basin westward, and magmatism accompanying the closing stages of this collision changed to very distinctive shoshonitic basaltic lavas that characterize the bulk of the Hellyer Basalt.

It is emphasized here that the Hellyer Basalt shoshonites are not products of normal arc magmatism in a continental margin magmatic arc. They have no counterparts in such a setting, modern or ancient. However, the Hellyer Basalt shoshonites are very typical and characteristic of post-collisional basaltic magmatism, and have followed arc-continent collision in a number of better preserved, better studied, more recent arc-continent collisions than that preserved in a fragmentary way in W Tasmania. This model is incomplete, but provides a better constrained and realistic scenario for the geological evolution of W Tasmania than any existing models.

I consider that attempting to assess and discuss any compositional similarities and differences between the MRV and lavas and tuffs of the type Kuroko setting (where individual orebodies are smaller than Hercules) is hardly worthwhile. The presence of the Hellyer orebodies within this post-collisional shoshonitic sequence is evidence enough that these rocks are prospective for further VMS exploration, and that similar ancient post-collisional lava suites are also worthy of attention. Similarly, the existence of the Mt Lyell and Rosebery deposits within the medium K- to mainly high-K Central Volcanic Complex lavas proves their prospectivity, and the prospectivity of similar suites elsewhere in the Tasman Foldbelt System.

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APPENDIX TABLES A1 - A8:

Appendix Table A1: Wholerock analyses of Central Volcanic Complex Group 1 lavas:

Appendix Table A2: Wholerock analyses of Central Volcanic Complex Group 2 lavas:

Appendix Table A3: Wholerock analyses of lavas from the Western Volcanic Sequence south of the Henty Fault:

Appendix Table A4: Wholerock analyses of lavas from the Western Volcanic Sequence north of the Henty Fault:

Appendix Table A5: Wholerock analyses of Que-Hellyer Footwall andesites:

Appendix Table A6: Wholerock analyses of lavas from the Tyndall Group:

Appendix Table A7: Wholerock analyses of lavas from the Noddy Ck Volcanics, Sorell Peninsula:

Appendix Table A8: Wholerock analyses of basalts from the Henty Dyke Swarm:

TABLE 1: Wholerock XRF analyses of Group 1 lavas from the Central Volcanic Complex

SAMPLE	MR396*	MR644	44078	MR654*	36113	40140A	44063	40140	427240	MR650	44041	30039A	44067	PRR/D	LDP11A	44045	30039B	BP269/C
SiO2	60.1	60.7	61.4	63.9	65.0	65.5	65.5	65.7	65.7	66.2	66.5	66.6	67.0	67.0	67.1	67.2	67.8	68.0
TiO2	0.69	0.78	0.68	0.63	0.67	0.62	0.68	0.66	0.67	0.63	0.68	0.62	0.67	0.63	0.68	0.67	0.60	0.54
Al2O3	17.0	16.4	16.3	16.2	15.3	15.8	15.4	15.4	15.7	15.6	14.9	15.5	15.1	15.9	15.0	15.0	14.5	14.6
FeO*	5.97	6.64	7.37	5.96	6.00	5.92	5.83	5.57	4.82	5.63	5.72	5.11	4.84	6.40	5.24	5.52	4.85	4.75
MnO	0.12	0.12	0.13	0.11	0.08	0.10	0.07	0.07	0.08	0.09	0.11	0.09	0.08	0.17	0.10	0.09	0.07	0.26
MgO	1.57	2.97	3.35	2.59	2.37	1.94	1.74	1.71	1.75	1.96	1.88	1.08	0.94	1.35	1.98	2.01	0.88	2.01
CaO	9.58	7.90	4.61	3.86	3.17	3.71	3.36	3.12	4.90	3.49	2.96	2.33	3.29	2.18	2.04	1.91	6.99	3.75
Na2O	3.52	3.90	4.03	4.23	4.25	3.74	4.50	4.20	3.23	3.78	4.31	4.43	4.04	3.60	3.33	4.35	3.34	3.02
K2O	0.85	0.39	1.88	2.24	3.05	2.53	2.78	3.43	3.02	2.57	2.83	4.18	3.97	2.64	4.45	2.92	0.82	2.92
P2O5	0.15	0.15	0.15	0.15	0.13	0.12	0.12	0.14	0.12	0.10	0.14	0.12	0.13	0.13	0.13	0.27	0.13	0.10
LOI	2.06	3.26	2.42	3.42	2.30	2.23	1.67	1.52	1.88	1.76	1.44	0.95	1.89	3.76	1.28	1.49	1.56	4.30
Ni	10	14	22	3	6	4	5	4	6	8	4	5	5		3	4	5	
Cr	145	77	81	60	23	9	23	12	23	96	13	12	23		9	12	15	
V	145	163	161	140	111	92	107	91	94	121	92	88	104		92	94	269	
Sc	13	13	22	13	15	11	13	12	12	12	11	13	15		11	11	13	
Zr	210	146	133	220	227	228	231	228	232	229	231	221	226	246	216	209	213	160
Nb	11	8.7	10	10	13	14	13	13	12.9	12.1	13	12	12	13.4	14	12	12.5	9.4
Y	33	30	31	28	37	40	39	37	38	42	37	39	39	50	34	34	35	34
Sr	390	31	465	200	191	204	264	182	365	247	184	188	218	111	182	172	435	97
Pb	27	10	48	89	75	101	58	88	124	64	119	118	105	105	155	89	25	118
Ba	200	151	664	530	658	696	620	882	835	640	764	927	819		1099	860	218	34
Ti/Zr	19.7	32.0	30.7	17.2	17.7	16.3	17.6	17.4	17.3	16.5	17.6	16.8	17.8	15.4	18.9	19.2	16.9	20.2
Zr/Y	6.4	4.9	4.3	7.9	6.1	5.7	5.9	6.2	6.1	5.5	6.2	5.7	5.8	4.9	6.4	6.1	6.1	4.7
Zr/Nb	19.1	16.8	13.3	22.0	17.5	16.3	17.8	17.5	18.0	18.9	17.8	18.4	18.8	18.4	15.4	17.4	17.0	17.0
Y/Nb	3.0	3.4	3.1	2.8	2.8	2.9	3.0	2.8	2.9	3.5	2.8	3.3	3.3	3.7	2.4	2.8	2.8	3.6
V/Sc	11.2	12.5	7.3	10.8	7.4	8.4	8.2	7.6	7.8	10.1	8.4	6.8	6.9		8.4	8.5	20.7	
Zr/Sc	16.2	11.2	6.0	16.9	15.1	20.7	17.8	19.0	19.3	19.1	21.0	17.0	15.1		19.6	19.0	16.4	
Ti/V	28.5	28.7	25.3	27.0	36.2	40.4	38.1	43.5	42.7	31.2	44.3	42.2	38.6		44.3	42.7	13.4	
La		22.3	32.8							35.6		34			29.8			
Ce		50.1	62.9							77.5		74.1			69.5			
Pr		6	7.01							9.37		8.27			7.86			
Nd		22.1	27							35.3		32.6			31.6			
Sm		4.63	4.34							7.7		6.64			6.86			
Eu		0.94	0.88							1.69		1.37			1.66			
Gd		4.18	4.45							6.91		6.21			5.89			
Dy		4.81	4.67							6.87		5.87			5.56			
Er		2.97	3.27							4.37		4.05			3.7			
Yb		2.71	2.96							4.09		4.04			3.8			

TABLE 1 (continued) : Wholerock XRF analyses of Group 1 lavas from the Central Volcanic Complex

SAMPLE	CI27/7	PRR/C	RED87/1	Hx1/C	80R/B	30050	30051A	H955A	HX1/A	PRR/H	HCL	PRR/G	MRDDH	40136	85R/A	80R/D	CI27/4	36117
SiO2	68.1	68.1	69.0	69.0	69.2	69.8	70.3	71.4	71.8	72.5	73.1	72.7	73.1	73.5	74.3	74.4	74.6	75.1
TiO2	0.56	0.60	0.49	0.50	0.50	0.46	0.45	0.41	0.41	0.30	0.39	0.36	0.38	0.27	0.28	0.34	0.26	0.29
Al2O3	15.2	14.9	14.5	14.9	14.4	15.6	15.2	15.2	14.9	14.1	15.5	14.5	14.6	13.9	14.2	13.8	13.9	12.9
FeO*	4.17	5.13	4.98	5.49	4.39	3.86	3.67	2.83	4.07	3.47	2.68	3.09	2.84	2.73	2.01	2.61	2.22	2.80
MnO	0.08	0.09	0.07	0.12	0.12	0.04	0.07	0.08	0.06	0.09	0.04	0.07	0.07	0.04	0.05	0.07	0.05	0.05
MgO	1.06	1.15	1.19	2.28	1.36	1.23	1.16	0.79	1.20	0.71	1.40	0.54	0.80	0.46	0.37	0.65	0.32	0.32
CaO	3.71	3.62	2.71	1.38	3.39	0.69	1.54	1.67	0.43	3.19	0.64	1.70	1.28	1.39	1.08	2.78	0.52	0.64
Na2O	3.59	3.73	3.56	3.49	3.60	2.87	2.93	3.75	3.67	2.12	4.20	3.56	2.40	3.29	3.46	3.15	4.09	2.82
K2O	3.40	2.52	3.39	2.75	2.87	5.36	4.52	3.85	3.47	3.45	2.09	3.44	4.55	4.34	4.20	2.08	4.03	5.05
P2O5	0.14	0.14	0.12	0.11	0.15	0.10	0.10	0.05	0.09	0.07	0.04	0.08	0.06	0.06	0.05	0.08	0.04	0.04
LOI	4.39	4.20	3.33	3.43	4.07	1.44	1.22	1.16	1.97	4.03	1.99	2.68	2.50	1.66	2.17	2.87	0.97	0.83
Ni	3					3	3							2			1	2
Cr	6					7	9							5			3	4
V	54					55	51				10		18	11			5	12
Sc	10					11	9				4		5	5			3	8
Zr	286	219	205	203	207	227	216	285	308	184	280	275	259	205	292	199	274	225
Nb	14.7	12.6	11.3	12.2	10.4	15	15	14.2	13.3	10.5	16	17.4	15	15	18.6	10.3	16.4	13
Y	37	34.5	31	28	27	30	36	40	41	23	40	47	40	40	42.3	30	37	45
Sr	174	118	188	116	215	156	238	360	93	120	248	116	98	153	135	302	131	134
Rb	131	102	119	110	112	218	169	179	113	154	104	136	216	134	156	80	131	133
Ba	757		4	8	7	1463	1033	4	14	2	840	2	839	1093	6	6	985	987
Ti/Zr	11.7	16.4	14.3	14.8	14.5	12.1	12.5	8.6	8.0	9.8	8.4	7.8	8.8	7.9	5.7	10.2	5.7	7.7
Zr/Y	7.7	6.3	6.6	7.3	7.7	7.6	6.0	7.1	7.5	8.0	7.0	5.9	6.5	5.1	6.9	6.6	7.4	5.0
Zr/Nb	19.5	17.4	18.1	16.6	19.9	15.1	14.4	20.1	23.2	17.5	17.5	15.8	17.3	13.7	15.7	19.3	16.7	17.3
Y/Nb	2.5	2.7	2.7	2.3	2.6	2.0	2.4	2.8	3.1	2.2	2.5	2.7	2.7	2.7	2.3	2.9	2.3	3.5
V/Sc	5.4					5.0	5.7				2.5		3.6	2.2			1.7	1.5
Zr/Sc	28.6					20.6	24.0				70.0		51.8	41.0			91.3	28.1
Ti/V	62.2					50.1	52.9				233.8		126.6	147.2			311.7	144.9
La											51.8		46.6					
Ce											111		108.4					
Pr											12		12.1					
Nd											45.8		43.9					
Sm											7.53		7.63					
Eu											0.92		1.5					
Gd											5.98		6.41					
Dy											6.03		6.43					
Er											4.11		4.52					
Yb											4.03		4.2					

TABLE 1 (continued) : Wholerock XRF analyses of Group 1 lavas from the Central Volcanic Compl								
SAMPLE	LPD6	CI27/2	427244	RED87/1(	JD2001A	42610	PD1	427230
SiO2	75.4	75.5	75.8	76.0	76.0	76.3	76.1	78.3
TiO2	0.23	0.26	0.27	0.30	0.32	0.23	0.26	0.28
Al2O3	14.5	13.4	13.2	13.7	13.2	13.8	12.6	13.4
FeO*	2.37	1.97	2.12	2.04	2.64	1.82	1.35	0.99
MnO	0.02	0.03	0.07	0.07	0.07	0.04	0.07	0.01
MgO	0.76	0.31	0.42	0.53	0.45	0.30	0.56	0.40
CaO	0.03	0.23	0.14	1.39	1.33	0.10	1.34	0.03
Na2O	2.61	3.86	4.02	2.20	2.89	4.32	2.09	2.57
K2O	3.87	4.34	3.89	3.74	3.02	2.99	3.19	4.01
P2O5	0.01	0.03	0.05	0.02	0.04	0.01	0.03	0.01
LOI	1.74	0.84	1.11	2.49	2.71	1.35	2.83	1.96
Ni	2	1	1					1
Cr	6	3	4			3		2
V	6	7	6			10	13	10
Sc	7	3	1			7	3	4
Zr	256	279	252	252	288	165	223	209
Nb	17	16.6	14.8	15.5	15.5	11	13	15.01
Y	35	30	38	34	42	27	29	24
Sr	52	118	91	104	93	120	61	55
Rb	114	150	116	148	120	76	140	126
Ba	808	1008	915	16	3	1189	750	1171
Ti/Zr	5.4	5.6	6.4	7.1	6.7	8.4	7.0	8.0
Zr/Y	7.3	9.3	6.6	7.4	6.9	6.1	7.7	8.7
Zr/Nb	15.1	16.8	17.0	16.3	18.6	15.0	17.2	13.9
Y/Nb	2.1	1.8	2.6	2.2	2.7	2.5	2.2	1.6
V/Sc	0.9	2.3	6.0			1.4	4.3	2.5
Zr/Sc	36.6	93.0	252.0			23.6	74.3	52.3
Ti/V	229.8	222.7	269.8			137.9	119.9	167.9
La	20.2					36.5	41.4	
Ce	47					75.8	92.6	
Pr	4.99					7.52	9.3	
Nd	19.4					26.3	34.4	
Sm	4.11					4.39	5.68	
Eu	0.85					0.87	0.93	
Gd	3.87					3.72	4.47	
Dy	5.11					4.07	4.22	
Er	3.8					3.03	2.82	
Yb	4.58					3.46	2.79	

TABLE 2 : Wholerock XRF analyses of Group 2 lavas from the Central Volcanic Complex																
SAMPLE	AR6	39233	W93	M189	39232	32522	3399	AR11	Z632	3402	M235	HR71	HR65	HR70	AR10	PRR/E
SiO2	58.5	58.5	58.7	58.8	58.8	58.9	59.5	60.0	60.9	63.1	63.3	63.8	66.6	67.6	69.1	70.0
TiO2	0.46	0.56	0.55	0.48	0.57	0.53	0.45	0.57	0.49	0.42	0.42	0.40	0.36	0.44	0.35	0.29
Al2O3	16.0	14.2	14.2	15.9	14.4	15.0	15.5	15.9	14.3	14.9	14.7	15.0	14.6	16.9	17.2	16.6
FeO*	7.41	8.11	7.90	7.65	7.83	8.99	7.26	7.87	7.29	6.79	7.42	6.38	4.98	6.76	3.49	3.19
MnO	0.11	0.13	0.12	0.21	0.12	0.14	0.13	0.14	0.13	0.11	0.16	0.07	0.11	0.02	0.04	0.04
MgO	4.37	6.75	6.19	4.37	5.24	4.62	4.53	4.03	4.84	3.39	3.45	3.20	2.66	3.43	1.67	0.73
CaO	6.26	5.18	5.05	6.35	5.62	6.62	5.45	3.19	6.29	5.75	4.51	4.96	2.30	0.10	0.72	1.54
Na2O	6.75	4.76	3.97	4.40	4.24	3.24	5.36	5.20	4.07	2.55	4.05	3.64	5.53	1.44	4.55	3.45
K2O	0.37	1.61	3.15	1.59	2.97	1.57	1.56	2.95	1.39	2.77	1.77	2.32	2.74	3.02	2.78	4.19
P2O5	0.33	0.20	0.20	0.21	0.22	0.34	0.25	0.22	0.32	0.17	0.19	0.20	0.19	0.23	0.15	0.04
LOI	1.65	2.11	1.65	1.81	1.85	1.81	2.03	1.71	1.94	3.62	2.96	1.72	1.26	4.28	2.04	2.87
Ni	40	53	52	15	49	47	38		39	32	25	24	17	24		
Cr	142	224	157	68	160	321	139		130	72	40	59	52	64		
V	206	196	188	181	201	198	184		175	155	172	157	140	177		
Sc	27	30	30	27	31	28	29		25	22	24	22		26		
Zr	160	159	181	144	167	157		180	169	133	150	138	132	155	138	339
Nb	8	8	10	8.4	9	9		9.1	8	7	7.8	7.6	6.8	7.1	6.1	20.7
Y	23	27	26.5	25	35	26		27	24	21	26	21	23	27	36	51
Sr	516	363	354	716	262	682		320	683	620	418	488	1004	94	511	110
Pb	14	53	93	49	85	65		74	42	74	52	70	116	105	112	162
Ba	188	572	1160	1403	1068	1067	1143	14	1184	1148	2720	773		747	12	1
Ti/Zr	17.2	21.1	18.2	20.0	20.5	20.2		19.0	17.4	18.9	16.8	17.4	16.4	17.0	15.2	5.1
Zr/Y	7.0	5.9	6.4	5.8	4.8	6.0		6.7	7.0	6.3	5.8	6.6	5.7	5.7	3.8	6.6
Zr/Nb	20.0	19.9	18.1	17.1	18.6	17.4		19.8	21.1	19.0	19.2	18.2	19.4	21.8	22.6	16.4
Y/Nb	2.9	3.4	2.9	3.0	3.9	2.9		3.0	3.0	3.0	3.3	2.8	3.4	3.8	5.9	2.5
V/Sc	7.6	6.5	6.3	6.7	6.5	7.1	6.3		7.0	7.0	7.2	7.1		6.8		
Zr/Sc	5.9	5.3	6.0	5.3	5.4	5.6			6.8	6.0	6.3	6.3		6.0		
Ti/V	13.4	17.1	17.5	15.9	17.0	16.0	14.7		16.8	16.2	14.6	15.3	15.4	14.9		
La	71.7	40.7		88.8	44.1				63.7				51.7	68.4		
Ce	149	87		162	93.9				131				97.7	124		
Pr	15	10.9		16.5	10.5				14.1				9.96	12.1		
Nd	55	41.1		57.2	40.1				52.5				35.8	42.5		
Sm	8.79	8.26		9.06	6.93				8.87				6.07	6.97		
Eu	1.41	1.97		2.08	1.45				2.34				1.38	1.63		
Gd	6.11	6.32		6.07	5.78				6.67				4.17	5.38		
Dy	4.07	4.49		4.19	4.61				4.32				3.23	4.17		
Er	2.28	2.99		2.71	2.63				2.25				2.05	2.5		
Yb	1.85	2.73		2.56	2.52				2.13				2.19	2.73		

TABLE 3 : Wholerock XRF analyses of matic lavas from the Western Volcanic Sequence S of the Henty Fault

SAMPLE	Z627	Y408	482080	31767A	482074	482071	RM49	Z102	C11*	Z96	C9*	C8*	B6*
SiO2	49.5	51.8	52.1	52.4	52.6	52.9	53.3	54.2	55.05	56.8	56.9	57.2	61.1
TiO2	0.32	0.41	0.57	0.42	0.81	0.50	0.60	0.38	0.57	0.47	0.55	0.47	0.52
Al2O3	8.9	12.5	17.5	11.9	18.1	19.1	16.6	12.0	18.2	13.7	17.5	15.9	15.0
FeO*	10.50	10.00	12.50	9.44	9.53	9.21	10.10	9.10	8.50	8.82	7.78	7.95	7.23
MnO	0.20	0.18	0.15	0.16	0.11	0.09	0.09	0.14	0.18	0.17	0.16	0.14	0.26
MgO	16.40	11.40	6.16	10.70	4.18	4.97	9.37	9.84	5.09	6.91	5.04	6.26	3.55
CaO	11.90	9.48	4.53	10.30	7.38	6.45	2.92	9.20	5.19	6.55	5.99	5.73	4.49
Na2O	1.35	2.02	4.28	2.46	4.85	3.32	2.50	2.92	4.36	3.23	3.99	3.41	4.70
K2O	0.70	1.66	1.83	2.08	1.36	3.15	4.19	2.21	2.39	3.11	1.66	2.61	2.61
P2O5	0.17	0.48	0.36	0.19	1.00	0.26	0.31	0.28	0.35	0.23	0.24	0.28	0.29
LOI	3.28	4.07	3.41	2.43	3.53	2.82	4.44	2.87	4.06	2.59	4.28	3.87	3
Ni	303	130	70	132	34	73	125	115	39		42	57	19
Cr	819	580	85	601	47	75	295	640	74		85	152	20
V	221	240	294	255	305	264	284	240	300		217	227	256
Sc	49	39	33		36	30	47	42	26		19	21	20
Zr	53	105	168	80	254	103		76	130		114	137	147
Nb	4	4	9.3	4.3	9.8	4.5		1.5	6		9	<5	6
Y	34	32	22	23	35	27		17	25		20	24	23
Sr	182	420	372	252	1025	410		185	516		372	636	696
Rb	155	41	41	44	31	92		45	45		35	34	63
Ba	382	1300	1052	1869	1352	1404	2599	1750	1740		825	1650	1500
Ti/Zr	36.2	23.4	20.3	31.7	19.1	29.1		30.0	26.3		28.9	20.6	21.2
Zr/Y	1.6	3.3	7.6	3.5	7.3	3.8		4.5	5.2		5.7	5.7	6.4
Zr/Nb	13.3	26.3	18.1	18.6	25.9	22.9		50.7	21.7		12.7		24.5
Y/Nb	8.5	8.0	2.4	5.3	3.6	6.0		11.3	4.2		2.2		3.8
V/Sc	4.5	6.2	8.9		8.5	8.8	6.0	5.7	11.5		11.4	10.8	12.8
Zr/Sc	1.1	2.7	5.1		7.1	3.4		1.8	5.0		6.0	6.5	7.4
Ti/V	8.7	10.2	11.6	9.9	15.9	11.4	12.7	9.5	11.4		15.2	12.4	12.2
La		112.5		51.2			94.1	54.3		63.3	40.2	60.1	
Ce		209		96.1			153	99.9		117.1	79.7	124	
Pr		26.2		11.3			21.7	11.4		12.9	8.41	13.5	
Nd		103.4		42.6			78.2	43.6		47.8	33.5	50	
Sm		18.8		7.49			12.9	7.65		8.18	5.81	8.17	
Eu		4.49		1.85			3.41	1.96		1.69	1.37	2.16	
Gd		13.2		6.23			8.63	6.09		6.03	4.57	5.79	
Dy		7.51		4.01			6.36	3.84		4.41	3.81	4.33	
Er		3.67		2.38			3.34	2.15		2.75	2.69	2.67	
Yb		2.87		1.92			2.65	1.78		2.14	2.21	2.16	

TABLE 4: Wholerock XRF analyses of mafic lavas from the Western Volcanic Sequence from N of the Henty Fault to Hellyer											
SAMPLE	MC1B	334161	HL55B	BBP253	HL55A	MAC10A	LPD11c	334162	MR437	Z7251	Z7252
SiO2	48.1	48.3	51.1	51.8	53.6	54	55	55.6	56.2	52.9	56.1
TiO2	0.59	0.82	0.48	0.89	0.65	0.86	0.68	0.77	0.60	0.52	0.49
Al2O3	18.0	13.6	14.2	12.5	12.9	12.8	15.7	16.6	13.1	13.6	12.3
FeO*	11.29	9.45	9.11	9.94	9.06	8.60	11.10	10.50	9.02	8.51	7.28
MnO	0.28	0.16	0.19	0.16	0.15	0.27	0.15	0.23	0.16	0.14	0.14
MgO	8.95	11.20	11.47	8.39	9.87	8.53	10.50	4.60	8.20	15.22	11.50
CaO	8.12	8.54	10.76	10.10	9.04	9.94	4.08	3.08	7.96	6.50	9.11
Na2O	2.80	1.18	1.52	1.12	2.90	2.11	1.34	4.12	3.06	1.53	2.34
K2O	1.39	2.97	0.95	4.07	1.59	2.05	1.33	1.93	1.31	0.99	0.65
P2O5	0.55	0.42	0.17	0.98	0.31	0.80	0.19	0.57	0.41	0.12	0.15
LOI	3.63	3.29	6.28	1.88	3.69	7.3	5.22	3.99	2.64	5.37	4.58
Ni				45			113	17	87	380	337
Cr				181			868	5	370	1133	1084
V				267			303	302	282	223	201
Sc				37				31	32	28	29
Zr	142	195	71	295	160	363	97	187	131	75	74
Nb	10.4	13.1	5.3	14	10.3	13.1	7.4	11	8.3	5.4	5.6
Y	30	32	18	37	26	34	35	32	21	16	18
Sr	796	404	341	881	576	403	209	595	612	183	272
Rb	34	50	22	111	28	56	54	46	24	27	22
Ba				2500			400	3407	1114	1337	1059
Ti/Zr	24.9	25.2	40.5	18.1	24.4	14.2		24.7	27.5	41.6	39.7
Zr/Y	4.7	6.1	3.9	8.0	6.2	10.7		5.8	6.2	4.7	4.1
Zr/Nb	13.7	14.9	13.4	21.1	15.5	27.7		17.0	15.8	13.9	13.2
Y/Nb	2.9	2.4	3.4	2.6	2.5	2.6		2.9	2.5	3.0	3.2
V/Sc				7.2				9.7	8.8	8.0	6.9
Zr/Sc				8.0				6.0	4.1	2.7	2.6
Ti/V				20.0			13.5	15.3	12.8	14.0	14.6
La		58.6					29.9	93.5	50.5	21.3	
Ce		137					64.4	193.8	105	42.1	
Pr		15.6					7.27	21.4	11.7	4.71	
Nd		59.3					28.8	84.1	44.5	18.2	
Sm		10.5					5.9	15.1	7.33	3.49	
Eu		2.59					1.21	3.8	1.06	1.02	
Gd		7.18					4.35	10.7	5.58	3.17	
Dy		5.79					4.1	6.93	3.94	2.77	
Er		3					2.56	3.92	1.97	1.77	
Yb		2.03					2.28	2.93	1.62	1.67	

TABLE 5: Wholerock XRF analyses of lavas from the Que-Hellyer Footwall sequence								
SAMPLE	69717	QR1001A	502650	72504	72506	72507	71917	69866
				CSIRO	CSIRO	CSIRO		
SiO2	61	63.2	63.9	51.8	60	57.9	70.1	70.7
TiO2	0.72	0.61	0.58	0.72	0.72	0.75	0.35	0.41
Al2O3	17.9	15.4	15.3	19.2	16.4	16.6	16.3	14.3
FeO*	9.54	7.41	8.04	9.20	8.05	7.95	3.44	5.26
MnO	0.11	0.12	0.12	0.19	0.16	0.16	0.10	0.16
MgO	2.18	3.09	3.88	6.44	4.70	4.66	1.39	1.27
CaO	2.05	3.53	3.24	6.08	5.00	5.28	2.49	1.78
Na2O	4.19	4.49	3.49	5.20	3.58	1.89	2.97	3.59
K2O	2.23	1.92	1.20	0.23	0.80	3.92	2.59	2.30
P2O5	0.17	0.17	0.16	0.12	0.16	0.16	0.10	0.11
LOI	4.48	3.71	5.25	4.88	4.38	3.85	3.37	5.21
Ni			26					
Cr	57		153	139	124	94	16	
V	96		228	246	207	234	40	33
Sc			33					
Zr	187	139	108	149	146	143	177	179
Nb	9.5	10.4	7.3				10.5	9.6
Y	39	29	24	28	28	29	30	30
Sr	318	308	174	792	557		152	133
Rb	72	57	34	10	21		73	82
Ba	1137		701				1826	1012
Ti/Zr	23.1	26.3	32.2	29.0	29.6	31.4	11.9	13.7
Zr/Y	4.8	4.8	4.5	5.3	5.2	4.9	5.9	6.0
Zr/Nb	19.7	13.4	14.8				16.9	18.6
Y/Nb	4.1	2.8	3.3				2.9	3.1
V/Sc			6.9					
Zr/Sc			3.3					
Ti/V	45.0		15.3	17.5	20.9	19.2	52.5	74.5
La	57		23.1					
Ce	100		49.7					125
Pr	10.6		5.51					
Nd	39.8		21.4					44.8
Sm	7.53		3.39					7.29
Eu	1.7		0.54					1.56
Gd	6.7		3.4					5.58
Dy	6.25		3.59					4.45
Er	3.64		2.49					2.78
Yb	3.27		2.2					2.84

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TABLE 6: Wholerock and REE analyses of Tyndall Gp. lavas and granite intrusives

SAMPLE	AR1	AR4	T04069	T04130	T04137	T04087	T04082	JD13
Unit	TG	TG	TG	TG	TG	TG	TG	
Lithology	pink qz-fsp pprtc rhyolite	Pink tuff banded	Andesite Lake Selina	Rhyolite Lake Selina	Murchison Granite	Dacite	Dacite	Darwin Granite
SiO2	75.81	66.35	66.77	76.48	67.93	70.8	68.23	75.37
TiO2	0.18	0.5	0.72	0.15	0.53	0.44	0.42	0.22
Al2O3	12.87	16.48	16.15	12.34	14.11	15.32	14.2	14.27
Fe2O3	2.69	4.58	7.7	2.5	4.6	6.34	6.37	1.71
MnO	0.02	0.11	0.09	0.03	0.24	0.19	0.35	0.02
MgO	0.81	1.73	2.15	0.32	1.93	0.98	2.39	0.37
CaO	0.03	0.88	0.01	0.05	3.47	0.23	3.21	0.28
Na2O	4.47	7.67	0.1	0.25	3.11	0.2	0.1	3.1
K2O	3.08	1.5	6.28	7.79	2.53	5.55	4.61	4.59
P2O5	0.03	0.19	0.11	0.02	0.13	0.09	0.15	0.03
TOTAL	100	100	100	100	100.26	100	100	99.73
LOI	1.34	1.18	3.42	0.82	1.58	2.54	6.33	1.56
Ni	<1	3	8	1	3	1	14	1
Cr	<2	6	15	1	16	5	7	1
V	5	63	168	14	104	52	90	21
Sc	5	15	28	4	18	14	9	3
Zr	200	314	195	140	218	272	183	132
Nb	19	13	10	13	13	16	11	14
Y	46	35	25	16	36	34	24	18
Sr	107	253	80	148	345	23	35	138
Rb	62	27	290	233	148	278	300	135
Ba	1560	574	1758	2637	604	1062	387	1385
Zn	41	71	311	66	198	867	624	
Cu	2	7	24	1	3	65	7	
Pb	3	44	36	19	32	116	145	
Ti/Zr	5.4	9.5	22.1	6.4	14.6	9.7	13.8	10.0
Zr/Nb	10.5	24.2	19.5	10.8	16.8	17.0	16.6	9.5
Zr/Y	4.35	8.97	7.80	8.75	6.06	8.00	7.63	7.33
Zr/Sc	33.33	20.93	6.96	35.00	12.11	19.43	20.33	44.00
K/Rb	412	461	180	278	142	166	128	282

SAMPLE	La	Ce	Pr	Nd	Sm	Eu	Gd	Dy	Er	Yb
AR1	53.2	143	15.9	63.7	11.4	1.14	9.63	8.27	4.49	3.53
AR4	37.1	84.8	9.27	36.9	7.07	1.55	5.76	5.52	3.87	3.37
JD13	44.7	89.5	9.21	26.5	4.15	0.87	2.58	2.38	1.85	1.85
T04130	35.1	74.9	6.86	23.6	3.45	0.36	2.22	2.22	1.69	2.16
T04137	32.8	73.7	8.31	32	5.51	0.83	4.87	5.36	3.73	3.48

TABLE 7: Wholerock XRF analyses of lavas from the Noddy Creek belt, S of Macquarie Harbour																
SAMPLE	462A	925	462	385A	123	385	52	977	47	X	58	85	413	150	65	98
SiO2	51.8	52.9	55.2	55.9	57.2	58.1	58.2	59.4	60.1	60.7	62.1	62.2	63.2	63.4	64	64.2
TiO2	0.59	0.56	0.55	0.61	0.67	0.61	0.57	0.48	0.68	0.62	0.66	0.66	0.72	0.55	0.54	0.53
Al2O3	13.9	14.4	15.5	14.9	16.4	16.4	14.6	14.1	14.7	14.9	16.6	16.9	16.5	15.6	15.8	16.2
FeO*	10	10.3	9.06	10	9.03	9.14	9.44	7.35	9.72	7.44	6.5	6.2	6.41	8.03	5.78	5.18
MnO	0.28	0.18	0.21	0.07	0.13	0.12	0.27	0.08	0.1	0.1	0.08	0.11	0.11	0.07	0.06	0.07
MgO	8.9	9.78	5.05	6.06	3.5	5.1	7.27	6.27	3.27	3.3	2.45	2.1	1.94	2.71	1.9	1.97
CaO	9.24	6.01	7.58	5.97	5.13	5.43	3.66	4.26	3.73	7.91	4.86	5.54	3.89	1.89	4.47	4.87
Na2O	2.64	4.58	4.93	2.79	3.21	3.36	3.11	6.67	5.53	2.37	3.21	2.94	2.87	3.6	3.38	3.35
K2O	2.56	1.24	1.72	2.26	4.45	1.59	2.56	1.33	1.99	2.59	3.43	3.15	4.16	4.04	3.9	3.48
P2O5	0.1	0.08	0.11	0.11	0.24	0.16	0.14	0.07	0.14	0.13	0.15	0.16	0.17	0.12	0.16	0.13
LOI	2.37	3.79	1.15	1.45	2.1	2.96	3.27	1.73	1.33	2.93	1.7	2.44	1.6	2.56	1.49	1.6
Ni	198	291	91	81	26		61	112	36	16	11	11	13	16	10	9
Cr	342	638	70	213	82		250	134	151	116	29	30	20	39	19	16
V	211	196	225	185	195		218	182	186	182	152	132	135	169	125	130
Sc	32	28	25	29	24		33	30	28	29	19	18	15	20	16	15
Zr	55	81	74	145			145		107		199	184	228	161	204	199
Nb	3.2	3.4	4.1	7.3			8		7		14	13	13	8	13	14
Y	18	21	20	28			26		24		34	28	38	37	29	29
Sr	262	177	350	271			200		243		292	247	371	123	281	285
Pb	101	15	104	116			76		61		135	117	148	136	161	148
Ba	919	310	403	288	1019		1032	226	695	702	667	793	927	839	721	692
Ti/Zr	64.3	41.4	44.6	25.2			23.6		38.1		19.9	21.5	18.9	20.5	15.9	16.0
Zr/Y	3.1	3.9	3.7	5.2			5.6		4.5		5.9	6.6	6.0	4.4	7.0	6.9
Zr/Nb	17.2	23.8	18.0	19.9			18.1		15.3		14.2	14.2	17.5	20.1	15.7	14.2
Y/Nb	5.6	6.2	4.9	3.8			3.3		3.4		2.4	2.2	2.9	4.6	2.2	2.1
V/Sc	6.6	7.0	9.0	6.4	8.1		6.6	6.1	6.6	6.3	8.0	7.3	9.0	8.5	7.8	8.7
Zr/Sc	1.7	2.9	3.0	5.0			4.4		3.8		10.5	10.2	15.2	8.1	12.8	13.3
Ti/V	16.8	17.1	14.7	19.8	20.6		15.7	15.8	21.9	20.4	26.0	30.0	32.0	19.5	25.9	24.4
La	22.7	21.6		25.4					27.3		55.3				44.9	
Ce	49.9	43.3		57.1					57.8		113.4				97.2	
Pr	5.71	5.14		6.26					6.56		11.6				10.1	
Nd	22.6	20.1		24.7					26		42.3				37.1	
Sm	4.42	3.93		4.87					4.86		7.31				7.08	
Eu	1.15	1.09		1.27					1.1		1.36				1.59	
Gd	3.86	3.82		4.14					4.34		5.95				5.27	
Dy	3.24	3.76		4.43					4.18		5.5				4.75	
Er	2.07	2.37		2.94					2.68		3.54				3.09	
Yb	1.88	2.27		2.47					2.18		3.26				2.88	

TABLE 8: Wholerock analyses of basaltic dykes from the swarm in the Central Volcanic Complex N of the Henty Fault System (R8 to R227), of lavas from the Henty Fault wedge (HR23 to 1984/11) and Miners Ridge (W64 to C2*). Analyses marked by asterisks are Mines Dept. analyses (Corbett 1979).

SAMPLE	R8	R14	STP234	R195	R227	HR23	HR24	1984/9	1984/11	W64*	LE196*	C1*	C2*
SiO2	49.8	50.8	50.3	50.6	50.9	60.5	60.4	58.3	52.8	48.7	47.9	49.7	51.9
TiO2	1.02	1.32	1.13	0.99	0.88	0.76	0.75	1.59	1.59	0.71	0.40	0.51	0.52
Al2O3	16.7	15.9	17.1	17.0	17.7	14.7	14.7	18.0	14.8	15.3	16.5	15.7	15.1
Fe2O3	10.5	10.1	9.8	9.1	10.3	7.42	8.72	13.2	14.4	11.4	9.59	8.98	12.1
MnO	0.19	0.19	0.24	0.48	0.17	0.10	0.10	0.14	0.25	0.2	0.18	0.19	0.22
MgO	11.3	7.47	7.73	9.42	7.08	4.53	5.72	4.02	5.04	12.7	10.3	11.1	10.3
CaO	6.84	9.59	8.81	7.04	7.44	6.68	3.46	1.21	5.99	6.28	10.91	9.04	4.32
Na2O	4.09	4.16	3.94	4.76	4.93	1.95	2.36	4.13	3.52	3.07	3.26	3.53	4.00
K2O	0.1	0.33	0.73	0.5	0.43	3.24	3.67	0.37	1.30	1.56	0.34	0.88	1.16
P2O5	0.07	0.13	0.15	0.07	0.12	0.12	0.13	0.18	0.21	0.06	0.08	0.03	0.05
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100
LOI	4.3	2.64	7.98	4.24	3.29	2.71	3.24	4.62	3.24	4.3	3.87	4.45	4.82
Ni	202	40	70	72	47	45	40	3	11	177	160	182	52
Cr	528	118	175	293	39	182	166	5	<5	365	470	376	21
V	218	241	223	205	233	184	183	200	380	254	290	253	279
Sc	42	32	30	47	33	27	26	28	29	78	43	33	41
Zr	61	84	71	66	73	183	194	89	105		27	19	19
Nb	<3	<3	<3	<3	0.9	12	11	<3	<3		<3	<5	<5
Y	22	32	25	30	33	30	38	48	35		12	18	18
Sr	415	255	184	495	320	375	192	220	290		150	356	66
Rb	2.5	9	30	13	13	100	93	17	34		41	36	37
Ba	132	188	173	960	185	901	1316	185	590	730	170	237	430
Cu	43	51	75	156	8	19	60			30	46	132	137
Pb	20	3	6	15	24	24	16			3	<4	<6	<6
Zn	105	118	148	375	131	115	260			60	80	54	96
Ti/Zr	100.24	94.21	95.41	89.93	72.27	24.90	23.18	107.10	90.78		88.81	160.92	164.07
Zr/Nb					81.11	15.25	17.64						
Zr/Y	2.77	2.63	2.84	2.20	2.21	6.10	5.11	1.85	3.00		2.25	1.06	1.06
Zr/Sc	1.45	2.63	2.37	1.40	2.21	6.78	7.46	3.18	3.62		0.63	0.58	0.46
K/Rb	332	304	202	319	275	269	328	181	317		69	203	260

SAMPLE	La	Ce	Pr	Nd	Sm	Eu	Gd	Dy	Er	Yb
HR23	30.9	67.5	7.71	29.2	5.98	1.39	5.73	5.34	3.47	3.54
R8	5.32	13.62	2.19	9.88	2.77	0.91	3.66	4.46	2.79	2.45
R195	7.39	18.4	2.27	11.93	3.43	1.30	4.86	5.2	3.33	2.85
STP234	9.78	24.3	3.23	15.5	3.95	1.43	4.73	4.93	2.74	2.45
W64	1.54	4.20	0.70	3.83	1.39	0.4	2.76	3.71	2.45	2.21