ABERFOYLE MEMORANDUM

Date	25 January, 1990	Ref	
To	D. Wallace	From	A. McNeill
At	Burnie	At	Burnie
Copies to	RJH, EHS, RGP, JWH	Keep	

Subject **DIAMOND DRILL PROPOSAL - DDH MAC-25**

SOUTHWEST MOUNT CHARTER

A 450m diamond drill hole is proposed to test the Hellyer and Que River ore positions southwest of Mount Charter.

Two previous DDH's (MC-9 and 10) in this area intersected the H.O.P., with syngenetic mineralisation recorded in MC-9 (0.4m @ 1.17% Zn, 0.4% Pb, 13 g/t Ag), and were terminated in what was interpreted to be footwall andesites. A review of petrological and geochemical data from these holes indicate that lithologies below the H.O.P. are dacitic, not andesitic, and thus the Que River ore position has not been tested in this area.

Revised drill logs have been combined with recent mapping and soil geochemistry, for lithological indicator elements, to produce an updated geological interpretation (Fig. 1 and 2) that suggests the Que River ore position is below the range of effective UTEM for a Que River size target and at the limits of detection for a Hellyer size target.

It is proposed to test this potential ore position by a 450m drill hole collared adjacent to the south Charter access track (Fig. 1). It is interpreted that the target position will be intersected at -370m by a hole dipping at -75^{o} (to allow for core orientation) however, as the thickness of the dacite and the effects of Devonian cross folding are poorly known the target may be deeper and thus additional metreage has been allowed.

The presence of the Mount Charter fault, interpreted to the South of the drill collar (Fig. 1) has affected the design of the proposed hole as:

i. The fault is considered to have been active in the Cambrian, controlling the deposition of the QHV, and possibly acted as a focus for hydrothermal fluids.

ii. The orientation of this structure is poorly known, but generally assumed to be steeply north dipping, although DDH MC-18 indicates a dip of 50^{o} albeit in an area of structural complexity.

The hole has therefore been designed to intersect the Que River position as close as possible to the fault but far enough north not to intersect this structure (Fig. 2). Normal routines such as logging, petrology, core grinding and DHEM will be completed.

Collar Details:

Number:	MAC-25	Azimuth:	010° Mine grid
Location:	3700N, 4100E	Length:	450m
Dip:	-75°		

A. W. McNeill,
GEOLOGIST.

Attachments: Figure 1. Southwest Mount Charter - Interpretive geology
Figure 2. Southwest Mt. Charter, Prognostic section MAC-25.

Aberfoyle Resources Limited

EXPLORATION DIVISION

NORTH WEST TASMANIA

MACKINTOSH E.L. 106/87

SOUTH WEST MT. CHARTER
INTERPRETIVE GEOLOGY

REVISIONS			
Init.	Date	Init.	Date

Location Code :

Scale : 1 : 2500

Date : January, 1990

Compiled : AMcN

Drawn : AMcN

Traced : RJE

Checked :

Plate No. : MAC 278

1511

MC5

A

MC 10

35mW

MC 9

B

PROPOSED HOLE
(MAC 25)

Access track

A.I.

B.I.

B.I.

B.I.

700 RL

Yvc

600

Hellyer Ore Position

20mW

135mE

500

D.I.

D.I.

Minimum probable Dip of Charter fault

Mss

D.I.

400

A.I.

300

Que River Ore Position

A.I.

450 m

A.I.

200

FIG. 2

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EXPLORATION DIVISION

REVISIONS			
Init.	Date	Init.	Date

Location Code :

NORTH WEST TASMANIA

MACKINTOSH E.L. 106/87

SOUTH WEST MT. CHARTER

PROGNOSTIC SECTION - MAC 25

Scale : 1:2500

Date : January, 1990

Compiled :	AMcN
Drawn :	AMcN
Traced :	RJE
Checked :	AMcN
Plate No. :	MAC. 277

1511

MACKINTOSH / HATFIELD DATA BASE ENTRY FORM 1 of 2

DRILL HOLE NAME MAC-25

LOCATION S.W. M1 CHARTER

TOTAL DEPTH 530.3 m.

NUMBER SURVEYS (Incl. collar P.U.) 18

NUMBER ASSAY INTERVALS

COLLAR NORTHING 3702.12 (5390572.91 AMG) N

COLLAR EASTING 4098.76 (389162.03 AMG) E

COLLAR R.L. 711.89

COLLAR DEPTH 0

SECTION (To nearest 50m)

STATUS OF DATA NEW

DATE STARTED 31/1/90

DATE FINISHED 3/3/90

LOGGED BY RJH

FROM	TO	HOLE SIZE	CASING TYPE	CASING I.D.
0	51.0	HQ		
51.0	530.3	NQ.		
0	530.3	36 MM ID	PVC	

3M HQ CASING TOP OF HOLE.

COMMENTS (Casing lost etc.)

MACKINTOSH / HATFIELD DATA BASE ENTRY FORM 2 of 2

PICK UP AZI 10.5° GRID(MINE)
DIP -74.7°

DRILL HOLE NAME

DEPTH	DIP (- forD.H.)	AZIMUTH (Grid)
0	-74.7	14.5
25	-75.1	12.5
50	-74.8	11
75	-74.4	9
100	-74.2	6.5
125	-74.4	4
150	-74.6	2.5
175	-74.1	2
200	-74	1.5
225	-73.9	1
250	-73.7	0
275	-73.5	1
300	-73.3	2.5
325	-73.1	3
350	-73.1	3
375	-73.5	3
400	-73.3	1
425	-73	0
450	-72.8	.5
475	-72.5	1
500	-72.5	0
525	-72.5	356.5
530.3 ~~550~~	-72.5	356
575		
600		

N.B. Results for E.O.H. must be included

Aberfoyle Resources Limited
Incorporated in Victoria
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27 April, 1990

Dr. Tony Crawford
University of Tasmania
Department of Geology
GPO Box 252C
HOBART TAS 7001

Dear Tony,

Please find enclosed 18 split core samples from DDH MAC-25 drilled southwest of Mount Charter on the Mackintosh EL. All samples require thin section examination and description with some of them also requiring polished section preparation. Summary descriptions are as follows:

#431310	188.9m	Green strongly chlorite altered weakly feldspar-phyric dacite lava.
#431311	241.2m	Green chlorite altered feldspar-phyric dacite lava.
#562243	29.8m	Green basalt lava breccia/volcaniclastic with calcite stockwork.
#562244	59.5m	Pale green basalt lava breccia with weak calcite/silica alteration and calcite stockwork.
#562245	96.1m	Grey-green basalt pillow lava with inter-pillow chert and minor calcite veining.
#562246*	123.3m	Green basalt lava with fuchsite/minor calcite alteration and abundant sulphide (dominantly pyrite).
#562247*	125.2m	Green schistose basalt lava with abundant sphalerite/minor pyrite mineralisation.
#562248*	156.3m	Green basalt/dacite? volcaniclastic with abundant pyrite mineralisation and some fuchsite alteration.
#562249	233.0m	Pink-green variably chlorite altered dacite lava breccia with fine chlorite stockwork and quartz/chlorite/minor calcite veining.

#562451	297.6m	Green weakly vesicular basalt lava with calcite stockworks.
#562452	301.3m	Green vesicular basalt lava.
#562453	361.5m	Green massive strongly chlorite altered felspar-pyric dacite lava.
#562454	368.2m	Green chlorite/silica altered dacite lava volcaniclastic.
#562455*	402.8m	Green chlorite altered dacite lava volcaniclastic with cherty/pyrite matrix.
#562456	446.6m	Pale green silica/chlorite altered dacite lava.
#562457	485.9m	Green silica altered basalt lava.
#562458	503.6m	Green calcite/silica altered basalt lava with minor blebs pyrite and moderate calcite veining.
#562459	526.2m	Green schistose basalt lava. (Perhaps lava volcaniclastic with Animal Creek Greywacke component).

Samples with asterisk require polished section examination. Please comment on the mode of sulphide mineralisation in these samples. I think it is possibly "interpillow" type sulphide deposition (in the basalts anyway).

We are still struggling with the dacite versus silicic andesite problem. Texturally there is no difference between rock that everybody is happy to call dacites and those which are strongly chlorite altered versions of the same thing which some people call andesites. Certainly, immobile element geochemistry suggests they are also dacites. Please keep this problem in mind when examining the sections of rocks I have called dacites. Unfortunately, geochemistry results for these samples is not yet available but I can supply them at a later date if you wish.

I look forward to hearing from you.

Yours faithfully,
ABERFOYLE RESOURCES LTD.,

R. J. Henham,
GEOLOGIST.

PETROGRAPHIC REPORT

Rocks from Mackintosh EL DDH M 25

for Aberfoyle Resources Ltd
Attn. Rod Henham

by

Anthony J. Crawford
Geology Department
University of Tasmania

25/5/90

SAMPLE NUMBER: 431310 188.9m

SUMMARY:

This is a monomict sparsely plagioclase-phyric dacitic lava breccia dominated by formerly perlitic-cracked glassy lava fragments. It has suffered relatively strong chloritic alteration

HAND SPECIMEN:

This sample is a dark green massive andesitic lava breccia with diffuse-margined fragments to at least 1cm across and disseminated very fine-grained pyrite.

THIN SECTION:

This is a chloritized monomict dacitic lava breccia made up of fragments, mostly less than 5mm across, of sparsely plagioclase-phyric dacitic lava with originally perlitically cracked glassy groundmass. Albitized plagioclase phenocrysts are elongate to blocky prisms from 0.5-2mm long that mainly occur in small multi-crystal clots, and make up less than 5 modal% of the lava fragments. They are fairly thoroughly sericitized, and commonly contain small chloritized melt inclusions. No mafic silicate phenocrysts were present, but occasional small leucoxene-altered FeTi oxide microphenocrysts are preserved.

The groundmass of this sample is composed mainly of texturally distinctive lava fragments composed of devitrified glass that shows clear perlitic cracks still evident, due to their being picked out by chlorite. The remainder of the glass has altered to fine-grained variably textured mosaics composed of quartz-albite ± minor sericite. This altered formerly glassy groundmass assemblage has been overprinted significantly by relatively abundant fine-grained and patchy chlorite alteration. The chlorite is pale to deep green and forms felted masses of quite fine-grained plates that are concentrated along former perlitic cracks, but that also permeate the remainder of the groundmass of many fragments.

Small opaque grains scattered sparsely through the groundmass, but lacking obvious secondary breakdown features, are probably pyrite. A few lava fragments were slightly less glassy, with groundmasses composed of masses of tiny aligned albite microlites. These probably represent slightly more slowly cooled fragments from the same flow.

The rock was probably a lava breccia, although it cannot be ruled out that it was the brecciated marginal phase of an emerging dacitic lava dome from which quenched, largely glassy fragments were crackling and spalling off into water. The extent of chlorite alteration

is much greater than normally seen in dacites from this area, and suggests localized chloritization. A few small fractures and veinlets are filled by quartz-calcite, or quartz-chlorite-fuchsite(?) (the latter in a single fracture as a highly birefringent and well-crystallized very pale green mica rather unlike standard sericite).

SAMPLE NUMBER: 431311 241.2m

SUMMARY:

This is a weakly chloritized, formerly perlitic, sparsely plagioclase-phyric dacitic lava or lava breccia with zones of silica-Kspar(sericite) alteration. The protolith was essentially identical to 431310.

HAND SPECIMEN:

This sample is a dacitic chloritized lava breccia with very poorly defined fragments, suggesting the possibility that the fragmental texture may be false, and due to alteration. Parts of the sample appear to be somewhat silica-altered.

THIN SECTION:

This sample is essentially identical to the previous sample in most respects. The main difference, hardly significant, is that, as noted in the hand specimen, discrete lava fragments are not nearly as obvious as in 431310. The rock was clearly a sparsely plagioclase-phyric perlitic dacitic lava. Between 'fragments' the rock is made up of extremely fine-grained granular quartz and sericite (after Kspar?), lacking chloritized perlitic cracks, that might represent zones of fluid passage through the cracked lava flow, along which alteration was more intense than within the lava fragments themselves.

Narrow veinlets, almost stylolitic in places, are filled by chlorite-quartz, with minor calcite, sericite and quite crystalline sphene grains in a few places. In a few spots, the sericite intergrown with quartz is quite coarse-grained, and again looks quite like fuchsite, although no fuchsite is obvious in either this, or the previous sample in hand specimen. This sample is notably less chloritized than the previous sample, yet still shows more chlorite alteration than most formerly glassy Mount Read Volcanics dacites. The relative tiiming of the silica- versus the chlorite alteration is impossible to determine.

SAMPLE NUMBER: 562243 29.8m

SUMMARY:

This is a strongly carbonate veined probably polymict andesitic lava breccia composed of augite+plagioclase-phyric andesitic lava fragments.

HAND SPECIMEN:

This sample is a brecciated and strongly carbonate-veined and altered andesitic lava or lava breccia. Fragments of lava between veins of calcite are generally bleached and more pinkish than the more chlorite-rich dark green fragments further from veins.

THIN SECTION:

This thin section is composed of two large lava fragments separated by a calcite vein. The two fragments are both andesitic but are texturally quite different, and almost certainly are not from the same flow unit, suggesting that this lava breccia is polymict. The lighter coloured fragment is vesicular and contains relatively common augite and plagioclase phenocrysts in a microcrystalline to vitrophyric groundmass. The vesicles reach almost 3mm long and are calcite-filled; they make up around 5-10 modal% of the fragment. Augite phenocrysts and microphenocrysts are mainly less than 1mm long, and are blocky subhedral and often fractured prisms with minimal chlorite alteration; they make up about 10 modal% of this fragment. Plagioclase phenocrysts are less abundant than the augite, and are rather elongate prisms of albitized calcic plagioclase with occasional messy patches of epidote inclusions. The groundmass of this fragment is composed of abundant tiny albite microlites and laths and small granular augite crystals immersed in an albite-chlorite matrix spotted by distinctive small, rather angular holes filled by quartz growing into green chlorite; this matrix may have been formerly glassy. Patchy brownish calcite overprints about 30 modal% of the groundmass

The other fragment is less porphyritic, and not apparently vesicular. It is finer-grained and has one margin that appears to be quenched glass. The augite phenocrysts are smaller than in the other lava fragment, and are partially chloritized. Plagioclase phenocrysts are less abundant than augite, and albitized, and also contain small granular epidote-clinozoisite inclusions. The matrix of this fragment is much finer grained, with tiny microlites of albite charged through chloritized glass that is heavily overprinted by calcite.

Both lava fragments are from what are probably compositionally very similar andesitic lavas, although textural differences and phenocryst sizes suggest that they are unlikely to be from the same flow. The calcite vein in the thin section, reaching almost 1cm width, is virtually monomineralic, and shows strained and aligned calcite crystals along its margins, but massive undeformed crystals in the vein centre. Epidote is abundant in the glassy part of the second fragment adjacent to the calcite vein.

SAMPLE NUMBER: 562244 59.5m

SUMMARY:

This is a formerly fairly glassy, sparsely augite+plagioclase -phyric andesitic lava which has developed an unusual alteration texture characterized by abundant quartz blebs; it contains notably less chlorite than the previous samples, and is strongly calcite-veined.

HAND SPECIMEN:

This sample is an andesitic lava or lava breccia, very similar to the paler fragments in the previous sample, with hairlike chlorite veinlets and wider carbonate veins.

THIN SECTION:

The texture of this sample in thin section is deceptively like an epiclastic sediment. However, careful examination shows that the rock has a weakly vesicular volcanic-textured groundmass, and strongly altered phenocrysts are also present, although uncommon. Sparse former augite phenocrysts are replaced by coarse-grained sericite, an alteration mode that I have not seen before in the Mount Reads, but I am sure that this sericite is replacing augite and not plagioclase. A few former albitized plagioclase phenocrysts are replaced by calcite and sericite.

The unusual and distinctive feature of this sample is the abundant small (average around 0.2-0.4mm across) blebs of quartz growing in the groundmass, and giving the appearance of detrital grains of quartz. These make up around 30 modal% of the groundmass of this sample; they show patchy extinction and abundant tiny fluid and solid inclusions, and are so common as to suggest that they may be filling tiny holes in a particularly porous and 'aerated' andesitic lava, with the pores being much smaller than typical vesicles. Alternatively, although less likely in my opinion, the quartz blebs have grown from devitified glassy

groundmass. In the groundmass areas between the quartz blebs, tiny albite microlites are set in devitrified glass replaced y very fine-grained albite, quartz and chlorite, with minor sericite and tiny FeTi oxide granules. Patchy and abundant calcite overprints the groundmass. Calcite veins are mainly coarsely crystalline and composed of pure calcite, but almost foliated schistose sericite-rich margins are present on many veins. Tiny crystals of disseminated pyrite are scattered through the sample.

SAMPLE NUMBER: 562245 96.1m

SUMMARY:

This is a strongly chlorite+calcite-altered formerly glassy pillow margin of an augite+olivine-phyric basalt typical of the upper basalts at Hellyer.

HAND SPECIMEN:

This sample is a dark green chloritized glassy basaltic or andesitic lava breccia with fragments and patches of interpillow(?) grey cherty or chalcedonic material; the brecciation may be alteration-induced rather than primary.

THIN SECTION:

This is clearly the highly altered formerly glassy margin of a pillow basalt. The glass was charged with phenocrysts of augite (possibly up to 20 modal%) and possibly olivine, and much smaller microphenocrysts of albitized plagioclase, and contains angular fragments and streaks of interpillow cherty sediment. Dirty brown calcite thoroughly replaces all former mafic phenocrysts, but shapes characteristic of augite predominate in those grains where former outlines are still visible. However, grains with olivine-like terminations are also present, although much less common, and several of these contain euhedral reddish to opaque chromite inclusions. The albite plagioclase microphenocrysts are unaltered.

The glassy bulk of this pillow lava margin has altered to straky pale green chlorite intergrown with patches of polycrystalline secondary quartz, with the boundaries between these domains often defined by narrow rims of dirty brownish opaque leucoxene.

The common interpillow sediment in this sample is probably composed mainly of extremely finely comminuted glass that has altered to quartz-albite-chlorite and been strongly overprinted by fine-grained calcite in places.

This sample is characteristic of the upper basalt at Hellyer and west of the highway in the Placer holes (don't dob on me for saying so), being pillowed, strongly porphyritic primitive basalts with abundant mafic phenocrysts. The alteration, although apparently intense, is also typical of the pillow rims of such glassy and magnesian lavas.

SAMPLE NUMBER: 562246 123.3m

SUMMARY:

This is a highly altered formerly augite+olivine+plagioclase -phyric basaltic lava breccia containing pyritic veining that has been partially overprinted by sphalerite mineralization associated with later calcite-dominated alteration and veining.

HAND SPECIMEN:

This sample is a brecciated basaltic lava with abundant calcite veinlets and small spots of bright green fuchsite, and abundant fine-grained disseminated and aggregated pyrite, particularly in one corner (fragment?) of the thin section.

THIN SECTION:

This is a texturally well-preserved formerly augite+olivine-phyric basaltic lava. It consists of around 15 modal% of totally altered augite, and probably 5-10 modal% of altered olivine phenocrysts, and about 5 modal% of elongate albitized plagioclase microphenocrysts in a microcrystalline to vitrophyric groundmass. The augite phenocrysts are replaced by dirty brown calcite, and are mainly well-formed euhedra to about 2mm long. Olivine phenocrysts are similar-sized and replaced by either very fine-grained polycrystalline quartz or the same brownish calcite that replaces augite, and much less commonly by pale green chlorite. They frequently contain small chromite inclusions.

The groundmass of this sample is charged with albitized plagioclase laths that vary from about 1mm long microphenocrysts to tiny microlites. The remainder of the groundmass was probably composed of tiny augite plates and FeTi oxide grains with interstitial glassy mesostasis. Common angular holes are filled by pale green chlorite identical to that replacing olivine.

Although calcite veins are not uncommon in the sample, the pyrite mineralization appears to be related to streaky zones of silicification and recrystallization in a single basalt fragment in the rock in which chlorite is much reduced in abundance relative to the remainder of the sample. Reddish sphalerite, however, is clearly related to the calcite

veining, as it occurs intergrown with crystalline calcite in several places.

OPAQUE MINERALOGY

In reflected light, the most obvious sulphides are disrupted trains and augen of fractured and granulated pyrite, that appear to have been originally rather larger entire grains in quartz-rich veinlets that have been broken up and rotated. Interstitial grains of pyrite are occasionally quite rounded, and strongly reminiscent of framboids. Two possibilities of the origin of these are: 1: that they are genuine framboids deposited from hot sulphide solutions in angular interstices with the basalt breccia framework, or 2: that they are small spheroidal framboid-like pyrite grains grown from very localized solutions rich in pyrite dissolved during fracturing and fragmentation of the original euhedral pyrite trains. Both types of pyrite are clearly being overgrown and replaced by bright orange-red Fe-rich sphalerite, that occurs as disseminated anhedral spots throughout the sulphide-rich part of the section, and as the internal parts of the relatively thick calcite veins. Small areas of both chalcopyrite and galena are associated with the sphalerite.

The paragenesis of this sample is pyrite crystallizing with silica as veinlets and fracture fillings, then fractured, partially dissolved and recrystallized during brittle deformation, and finally being overgrown and partially replaced by sphalerite and very minor chalcopyrite and galena during a later alteration event which is best documented by the cross-cutting calcite veins with sphalerite inclusions in the core areas.

SAMPLE NUMBER: 562247 125.2m

SUMMARY:

This is a weakly foliated distinctive almost aphyric basaltic lava, recognized elsewhere in the Hellyer section, which has suffered intense alteration, with silica-pyrite veining being post-dated by spahalerite-calcite alteration

HAND SPECIMEN:

This sample is a streaky, schistose and highly altered basalt with abundant disseminated pyrite and sphalerite.

THIN SECTION:

This sample is a texturally variable and variably veined and altered almost schistose basalt that lacks former mafic phenocrysts although it contains abundant small plagioclase (albitized) microphenocrysts. In the least altered portions of the sample, it is clearly an essentially aphyric basaltic lava which had very little glassy mesostasis compared with the overlying basalts. It varies texturally due more to alteration and shearing rather than primary textural control, with the best preserved areas being composed of intergrown albite and chlorite in which randomly orientated albite microlites are set.

The sample is traversed by common shear zones in which extensive granulation and recrystallization has occurred, with strong sericite-pyrite development along the shears. Very patchy development of silica alteration pervades much of the rock, and is associated with disaggregated pyrite bands in places. Sphalerite is distributed throughout the sample intergrown with calcite in calcite veinlets, or else with quartz and albite in small patches of recrystallized groundmass.

This aphyric basalt unit has been recorded from within the upper basalts at other locations in the Hellyer area, and may be a useful and distinctive marker horizon.

OPAQUE MINERALOGY

This section has an opaque mineral assemblage and paragenesis almost identical to the previous rock. It contains disrupted and granulated bands of fine-grained pyrite being replaced by orange, Fe-rich sphalerite. Many former euhedral pyrite crystals, some up to 1-2mm across, have been broken up and dragged out in augen-shaped bodies with ribbon quartz shadows and sericite defining a weak foliation. Discrete pyrite crystals and anhedral spots of sphalerite also occur disseminated throughout the rock in very minor amounts.

SAMPLE NUMBER: 562248 156.3m

SUMMARY:

This is a polymict lava breccia dominated by small basaltic fragments, but containing at least one distinct formerly glassy dacite lava fragment. It contains weak disseminated pyrite mineralization, but lacks sphalerite.

HAND SPECIMEN:

This sample is a polymict basalt breccia with grey green basaltic, and lighter coloured almost cherty fragments to at least 1cm across set in a basaltic dark green matrix

THIN SECTION:

This is clearly a polymict lava breccia, dominated by a variety of basaltic lava fragments, but also containing a single distinct, well-preserved dacite lava fragment. Three dominant basalt fragments are present. The first is mildly vesicular and very well-preserved texturally, and consists of perfectly euhedral but totally altered olivine and rare augite phenocrysts set in a vitrophyric groundmass charged with tiny albite and augite microlites set in glassy mesostasis that has altered to chlorite and albite. Olivine phenocrysts are chloritized. Other basalts contain dominant augite and albitized plagioclase phenocrysts; augite is ofetn preserved, and albite is partially altered to sericite. The groundmass of these more evolved basaltic fragments was considerably more glassy than the fragment described above, and the glass has altered to microcrystalline quartz, chlorite and sericite. These fragments are traversed by shear zones that have produced mild to strong local foliations and sericite development associated with pyrite mineralization. Chlorite veinlets clearly crosscut and postdate the foliation, as do calcite veinlets.

The dacite fragment is sparsely plagioclase phyric with small (mainly around 0.5mm-long) albite phenocrysts set in a typically felsic formerly glassy matrix that has devitrified to very fine-grained quartz and albite in which spotty chlorite is not uncommon; albite is largely replaced by sericite. Irregular small angular patches of secondary quartz are common in the recrystallized groundmass of the dacite.

The diverse lava fragments, including the dacite fragment mixed in with obvious Hellyer basalts, dictates that this is a polymict lava breccia unit.

OPAQUE MINERALOGY

The opaque minerals in this sample are dominantly sparsely disseminated small discrete pyrite euhedra, but occasional disrupted trains and veinlets of pyrite in quartz are present. As in the previous two samples, the pyrite has often been brittle-fractured; however, unlike the previous two samples, sphalerite-calcite alteration is not present.

SAMPLE NUMBER: 562249 233.0m

SUMMARY:

This is a strongly and variably altered formerly glassy sparsely plagioclase-phyric dacite lava or lava breccia. The most notable alteration is patchy silicification.

HAND SPECIMEN:

This sample is a strongly altered dacite with an alteration-induced 'autobrecciated' texture, with dark grey chlorite-rich domains and pink-brown strongly silicified domains or 'fragments'.

THIN SECTION:

The least altered areas of this sample show that it was a sparsely plagioclase-phyric, glassy dacitic lava before being strongly altered. The strong heterogeneity of groundmass textures makes it very difficult to determine whether this rock was originally a lava breccia, or whether the sample has a false pyroclastic texture due to intense and variable alteration. Former plagioclase phenocrysts are albitized blocky prisms, mainly less than 1mm across, that have been extensively replaced by calcite and sericite. Although plenty of fresh albite can still be found, it is rather pinkish, due to abundant submicroscopic Fe oxide grains. No former mafic silicate phenocrysts were apparently present in this sample, although small leucoxenized FeTi oxide grains are not uncommon.

The groundmass of this sample was essentially glassy. The glass has devitrified to intergrown albite and secondary quartz of variable grainsize, and the various devitrification assembalges and textures have themselves been overprinted by several styles of alteration. Most distinctive is simple silicification, where sugary fine-grained secondary silica and reddish albite replaces irregular patchy areas of the groundmass. In other areas of groundmass, texturally better preserved, relic perlitic cracks are still obvious, being picked out by chlorite and an unusual brownish sericite or similar layer silicate. A fine meshwork of pale sericite traverses much of the sample, but this rock is considerably less chloritized than texturally (initially) similar dacites higher in the hole. Sparsely disseminated euhedral pyrite grains are not obviously associated with any particular style of alteration. A notable vein composed of calcite and coarse-grained quartz, charged with tiny vermiform pale green chlorite crystals, cuts the rock.

SAMPLE NUMBER: 562451 297.6m

SUMMARY:

This is an augite+plagioclase-phyric basaltic lava cut by abundant calcite veins, and is typical of the basalts at Hellyer.

HAND SPECIMEN:

This sample is a dark grey-green finely porphyritic basaltic lava cut by abundant angular networks of calcite veins, some almost 1cm thick.

THIN SECTION:

This is a texturally well-preserved formerly augite+plagioclase - phyric basaltic lava, typical of the Hellyer basalts. Former augite phenocrysts are mainly stubby prisms less than 1mm long that have been completely pseudomorphed by brownish calcite, and make up about 12-15 modal% of the sample. The albitized plagioclase phenocrysts are rather elongate, lath - shaped crystals also less than 1mm long, that are relatively free of alteration, except for a slight pinkish hue from submicroscopic Fe oxide dust. Thay make up about 7-10 modal% of this sample.

The groundmass of this rock is fairly crystalline, and composed of well-formed laths of albite and small altered granular augite grains in subordinate chloritized glassy mesostasis charged with small leucoxene blebs after tiny FeTi oxide grains. Slightly larger abgular patches of green chlorite fill angular fractures, and often contain granular gold epidote crystals. Calcite is abundant as irregular patches overprinting the groundmass of this sample, and as quite thick veins lacking any associated pyrite or other sulphides. Except for the calcite veining, this is a quite well-preserved basaltic lava.

SAMPLE NUMBER: 562452 301.3 m

SUMMARY:

This is an excellent weakly vesicular augite+plagioclase +olivine-phyric basaltic lava typical of the Hellyer basalt.

HAND SPECIMEN:

This sample is a massive vesicular finely porphyritic basaltic lava, with calcite-filled vesicles.

THIN SECTION:

This is a beautifully preserved augite+plagioclase+olivine-phyric basaltic lava. It consists of approximately 20-25 modal% of augite phenocrysts, about 5-8 modal% of albitized plagioclase phenocrysts, and about 1-2 modal% of former olivine phenocrysts. The augite phenocrysts often occur in multi-crystal clots of subhedral stubby, almost equigranular crystals which are perfectly fresh, and usually less than 1mm long. Albitized plagioclase phenocrysts are mainly elongate single crystals less than 1mm long with a mild sericite flecking. Occasional former olivine crystals are euhedra around 1mm long now totally replaced by calcite, but often containing small chromite inclusions.

The groundmass of this sample is essentially identical to the previous sample, with abundant laths of albite, grading continuously from microphenocryst to microlite sized, and small granular augite and leucoxenized FeTi oxides set in a modally subordinate amount of chloritized glassy mesostasis. The rounded to oval vesicles make up about 2-5 modal% of this sample and are filled by chlorite and calcite. A few diffuse veinlets of calcite transect this basalt. This is a typical Hellyer basalt, and well preserved enough for a useful wholerock analysis (I'll see you in Burnie to try to get a 10 cm bit of core from this section if that is OK).

SAMPLE NUMBER: 562453 361.5m

SUMMARY:

This is a strongly chlorite-altered weakly plagioclase-phyric dacite lava (spot-on, Rod).

HAND SPECIMEN:

This sample is a dark green chlorite-altered weakly plagioclase-phyric dacite lava.

THIN SECTION:

This rock was originally a sparsely plagioclase-phyric glassy dacitic lava. The groundmass has altered to a heterogeneous quartz-chlorite-albite mixture subsequent to devitrification. The rock contains around 1-2 modal% of small albite phenocrysts which occur in multi-crystal clots less than 2mm across, or as occasional poorly-formed single crystals often notably reacted and rounded. They are partially replaced by calcite and sericite, but are mainly fairly fresh. No definite former mafic silicate phenocrysts have been observed, but leucoxenized FeTi oxide microphenocrysts are not uncommon.

The groundmass of this sample was undoubtedly glassy, and even though the texture of the groundmass now is exceptionally heterogeneous, I think that the sample was a massive or weakly hydraulically fractured lava rather than a lava breccia. The groundmass varies in both grainsize of the intergrown secondary quartz and albite crytallized from devitrified glass, and in the amount and concentration of chlorite in various domains of the altered groundmass. Chloritic regions appear to define diffuse channels and large angular 'intersections' of channels that probably represent primary cracks in the fractured surface of the cooling dacite lava flow or lava dome. In places the chloritic alteration is so intense that the virtually pure chlorite domains are evident. Weak calcite and sericite alteration is spread diffuselt throughout the rock.

This dacite is certainly more chlorite altered than standard regionally metamorphosed Mount Read Volcanics dacites, and except for the lack of perlitic cracking, this sample is essentially identical to chloritized dacites such as 431310 from 170m higher in the hole.

SAMPLE NUMBER: 562454 and 562455

368·2m 402·8m

SUMMARY:

These are very similar formerly glassy sparsely plagioclase-phyric dacitic lavas showing intense silica alteration and patchy chloritization, and weak pyrite mineralization associated with the silica alteration in 455.

HAND SPECIMEN:

These samples are heterogeneous-textured, strongly altered sparsely plagioclase-phyric dacitic lavas with alteration-induced false pyroclastic textures and trains of small pyrite crystals in 455.

THIN SECTION:

The least altered parts of these samples are beautifully preserved perlitically cracked glass that has crystallized following devitrification to an even-textured mosaic intergrowth of quartz and feldspar. About 5 modal% of each sample is made up of quite large blocky albitized plagioclase phenocrysts to at least 3mm long, that are almost entirely replaced by sericite and vary from euhedral to rounded. No mafic phenocrysts were apparently present in either sample, although quite large leucoxenitized FeTi oxide phenocrysts are not uncommon.

Significant areas of groundmass have been replaced by fine-grained to relatively coarse-grained (to 0.5mm long) silica in domains up to almost a cm long of exceptionally fine-grained even-textured material that resembles shale or tuff. Several angular discontinuous fractures filled by quite clear, relatively large intergrown quartz crystals in 454 are occasionally lined by small pyrite crystals, and the fine-grained intensely silicified areas of 455 are rimmed by trains of small pyrite and contain meandering thin seams of very fine-grained pyrite parallel to the length of the silicification zones. Calcite veinlets containing orange sphalerite clearly crosscut and postdate the silicification-pyrite development. 455 contains a stronger meshwork of sericite than 454, and also more intense silicifcation and chloritization zones.

OPAQUE MINERALOGY

Trains of tiny pyrite varying from euhedral to anhedral are present in the sample, although not abundant. Many pyrite grains are actually aggregates of five or six discrete crystals. A few tiny spots of sphalerite are present, but the pyrite crystals are inclusion- and alteration-free. The pyrite appears to be associated with silicification domains, and pre-dates calcite veinlets that contain coarser-grained orange-red Fe-rich sphalerite.

SAMPLE NUMBER: 562456 446.6m

SUMMARY:

This is a well-preserved sparsely plagioclase-phyric formely glassy dacitic lava probably reasonably considered as a much less altered representative of those chlorite-silica-altered dacites higher in the hole.

HAND SPECIMEN:

This sample is a massive, unbrecciated pale grey dacite lava with tiny spots and veinlets of chlorite.

THIN SECTION:

This is a texturally very well-preserved dacitic lava that contained small phenocrysts of albitized plagioclase and rare augite and FeTi oxide in a formerly glassy groundmass. The plagioclase phenocrysts make up around 12-15 modal% of this rock, and more frequently occur in multi-crystal clots up to 2mm across than as single phenocrysts. The albite phenocrysts are fairly free of sericite or calcite alteration. Occasional small chloritized augite phenocrysts occur intergrown in the albite crystal clots. FeTi oxide microphenocrysts have altered to small euhedral clots of tiny sphene crystals cored by sericite.

The groundmass of this sample was undoubtedly glassy, although perlitic cracking as seen in the dacitic lavas described above is not evident. The glass has devitrified to a uniform intergrowth of mosaic-textured fine-grained quartz and albite with rare chlorite and spotty sericite in which angular voids filled with polycrystalline quartz and relatively coarse-grained sericite are common, and are sometimes cored by calcite. The intense chlorite alteration shown by most of the dacites higher in the hole is missing from this sample, which may therefore be a reasonable example of what those higher lavas were before they were subjected to the intense silica-chlorite alteration. It would thus be a sensible sample to analyze carefully and compare with the more altered dacitic lavas to give some idea of the extents and directions of element mobility accompanying this type of alteration.

SAMPLE NUMBER: 562457 485.9m

SUMMARY:

This is a tuffaceous epiclastic fine sandstone with an intensely carbonate altered matrix; detrital volcanic quartz grains are a notable but not abundant component of this sample.

HAND SPECIMEN:

This sample is an altered massive pale grey-green weakly foliated or laminated lithic tuff or quartz-poor sandstone.

THIN SECTION:

This sample in thin section is clearly an epiclastic tuffaceous sediment that has suffered intense carbonate alteration. Framework grains, mainly in the fine sand range, are dominantly volcanic quartz and sericitized albite phenocrysts, often still with original crystal shapes. These make up only about 15 modal% of the rock, which was dominantly fine-grained matrix material. Quite abundant angular small voids are filled by secondary quartz, and less frequently, chlorite. Calcite rhombs in the carbonate-rich matrix, and also chlorite-filled voids, are quite drawn out into a weak foliation. Much of the matrix may have been dacitic glassy ash that was readily altered to calcite. Small euhedral pyrite grains are disseminated sparsely through the rock, mainly in association with the secondary quartz filling small voids.

The extensive carbonate alteration and weak foliation of the matrix of this sample render a positive identification difficult, but I am sure the sample was a tuffaceous epiclastic sediment derived from felsic volcanics. The presence of indisputable quartz phenocrysts as detrital grains in this sample is notable, and implies some imput from beyond the local dacite source, in which quartz phenocrysts have not been seen (either here or west of the hwy). The intense all-pervading calcite alteration also clearly implies a porous and reactive sediment rather than a massive glassy lava or vitric tuff.

SAMPLE NUMBER: **562458** 503.6m

SUMMARY:

This is a greywacke derived mainly from pelitic metamorphics, but with some volcanic quartz; it is definitely correlatable with the Animal Creek Greywacke.

HAND SPECIMEN:

This sample is a massive pale grey fine sandstone with strong calcite alteration, both through the sandstone and as thick veins and segregations.

THIN SECTION:

This sample is a fine sandstone with a generally finer-grained but more abundant detrital fraction than the previous sample. The framework grains constitute about 30 modal% of this rock, but are occasionally concentrated into thin coarser, sandy layers with much reduced matrix. Most of the detrital grains are angular and irregular strained quartz, of probable metamorphic or vein origin, although even-extinguishing probable volcanic quartz fragments are also present. A notable detrital component is quite coarse-grained flakes of muscovite, sometimes kinked and clearly of pelitic metamorphic origin. The sericitized albite phenocrysts noted as detrital grains in the previous sample are absent from this rock. Occasional small zoned pleochroic tourmaline grains also suggest derivation from a granitic or pelitic metamorphic source.

The matrix of this rock is shaley to silty, and quite strongly overprinted by calcite, and shows a well-developed meshwork of sericite that defines a weak foliation. This is classic Animal Creek Greywacke.

SAMPLE NUMBER: 562458 503.6m

SUMMARY:

This is a greywacke derived mainly from pelitic metamorphics, but with some volcanic quartz; it is definitely correlatable with the Animal Creek Greywacke.

HAND SPECIMEN:

This sample is a massive pale grey fine sandstone with strong calcite alteration, both through the sandstone and as thick veins and segregations.

THIN SECTION:

Welcome to the 'I called the greywacke a basalt' club, founded by me, with about 150 members, and most enthusiastically supported and contributed to by Dougie Jack.

This sample is a fine sandstone with a generally finer-grained but more abundant detrital fraction than the previous sample. The framework grains constitute about 30 modal% of this rock, but are occasionally concentrated into thin coarser, sandy layers with much reduced matrix. Most of the detrital grains are angular and irregular strained quartz, of probable metamorphic or vein origin, although even-extinguishing probable volcanic quartz fragments are also present. A notable detrital component is quite coarse-grained flakes of muscovite, sometimes kinked and clearly of pelitic metamorphic origin. The sericitized albite phenocrysts noted as detrital grains in the previous sample are absent from this rock. Occasional small zoned pleochroic tourmaline grains also suggest derivation from a granitic or pelitic metamorphic source.

The matrix of this rock is shaley to silty, and quite strongly overprinted by calcite, and shows a well-developed meshwork of sericite that defines a weak foliation. This is classic Animal Creek Greywacke.

SAMPLE NUMBER: 562459 526.2m

SUMMARY:

This is a sparsely plagioclase-phyric holocrystalline dacitic dyke rock, probably a feeder to dacites higher in the section.

HAND SPECIMEN:

This sample is a dark grey relatively coarse-grained andesitic lava or volcaniclastic sediment with some calcite veining.

THIN SECTION:

In thin section, this sample is seen to be an unusual virtually holocrystalline sparsely plagioclase-phyric dacitic or andesitic dyke rock. It consists of about 5 modal% of blocky subhedral to anhedral albite phenocrysts to about 1.5mm long with slight sericite speckling, often intergrown at their rims with relatively coarse groundmass albite. No mafic phenocrysts were observed, although small leucoxenized FeTi oxide grains are quite common.

The groundmass of this sample is almost holocrystalline, and composed of stubby laths of albite with interstitial anhedral quartz, Kspar (or sericitized albite) and chlorite. Streaky discontinuous chlorite and sericite veinlets are quite common. Fine-grained calcite is quite abundantly diffused through the rock, and strained calcite veinlets are not uncommon.

The most satisfactory explanation of this sample is that it is a feeder dyke in the Animal Creek Greywacke to the overlying dacites (which dacites should be easily testable with wholerock chemistry). The holocrystalline texture, and sparse blocky plagioclase phenocrysts and lack of mafic phenocrysts all support this interpretation.

ANALABS

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ANALYTICAL REPORT No. 23.3.08.07055

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

Aberfoyle Resources Limited
Exploration Division
P.O. Box 952
Burnie Tasmania 7320

ORDER No.	PROJECT
9819	Mackintosh

DATE RECEIVED	RESULTS REQUIRED
26/04/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
2	04/07/90	1	14

STATE OF SAMPLES		PRE-TREATMENT							ANALYSIS		
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PUL-VERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	Various	SC	Prep: 006,010,011,012,013,016						Cu,Pb,Zn,Ag/101		
	Various	SC							Au,AuChk/309		
	<562,243/245,249,451/459	SC							K2O,MgO,CaO,Na2O/104		
	Various	SC							Ba,As/401		
	<562,243/245,249,451/459	SC							S/613,Cr,Zr,Ti/401		

RESULTS TO

R. de Bomford
Aberfoyle Resources Limited
Exploration Division
P.O. Box 952
Burnie Tasmania 7320

RESULTS TO

REMARKS

MAC-25
PET.

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

AUTHORISED OFFICER Jenkins

ANALABS

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

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	23.3.08.07055	04/07/90	9819	1 OF 2

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	Ba	Ba	As
1	431312	90	45	250	<0.5	0.009	<0.008	>2500	0.38	30
2	562243	90	30	365	<0.5	<0.008	—	824	—	<2
3	562244	20	5	80	<0.5	<0.008	—	139	—	<2
4	562245	50	190	1000	<0.5	<0.008	—	1305	—	25
5	562249	20	<5	50	<0.5	<0.008	—	1540	—	<2
6	562451	40	10	190	<0.5	<0.008	—	807	—	3
7	562452	45	5	310	<0.5	<0.008	—	1122	—	<2
8	562453	15	5	100	<0.5	<0.008	—	334	—	10
9	562454	25	<5	50	<0.5	<0.008	—	1970	—	8
10	562455	25	40	275	<0.5	<0.008	—	1253	—	40
11	562456	20	<5	20	<0.5	<0.008	—	1239	—	<2
12	562457	35	<5	60	<0.5	<0.008	—	145	—	<2
13	562458	15	<5	40	<0.5	<0.008	—	126	—	<2
14	562459	10	<5	55	<0.5	<0.008	—	211	—	<2
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	5	0.5	0.008	0.008	10	0.01	2
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm
25	METHOD	101	101	101	101	309	309	401	403	401

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

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	23.3.08.07055	21/05/90	9819	1 OF 1

TUBE No.	SAMPLE No.	K2O	MgO	CaO	Na2O					
1	431312	--	--	--	--					
2	562243	1.69	4.79	16.92	2.28					
3	562244	2.05	2.20	13.82	1.44					
4	562245	2.07	8.24	4.60	1.02					
5	562249	4.92	1.19	2.08	1.40					
6	562451	1.17	4.67	13.20	3.46					
7	562452	1.77	6.48	9.60	3.60					
8	562453	1.11	2.88	0.84	3.76					
9	562454	3.90	1.31	1.68	2.90					
10	562455	2.59	1.81	2.03	3.80					
11	562456	5.18	0.36	2.20	5.08					
12	562457	1.00	6.76	7.01	1.59					
13	562458	1.73	1.79	12.42	0.88					
14	562459	1.59	4.44	6.87	2.75					
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	0.01	0.01	0.01	0.01					
24	UNITS	%	%	%	%					
25	METHOD	104	104	104	104					

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

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	23.3.08.07055	04/07/90	9819	2 OF 2

TUBE No.	SAMPLE No.	Cr	Zr	Ti	S	Ti/Zr				
1	431312	—	—	—	—					
2	562243	181	100	.1715	0.025	17.15	✓			
3	562244	175	85	1748	0.190	20.56	✓			
4	562245	1050	70	2264	0.230	32.35	✓			
5	562249	31	200	884	0.055	4.42	✓			
6	562451	360	110	2550	0.010	23.18	✓			
7	562452	348	120	2817	0.025	23.47	✓			
8	562453	89	220	2549	0.240	11.59	✓			
9	562454	22	190	2004	0.200	10.54	✓			
10	562455	24	180	2045	1.100	11.36	✓			
11	562456	19	190	1953	0.040	10.27	✓			
12	562457	385	100	2476	0.055	24.76	SEDIMENTS			
13	562458	59	140	925	0.080	6.61	SEDIMENTS			
14	562459	79	140	2640	0.035	18.85	✓			
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	50	0.005					
24	UNITS	ppm	ppm	ppm	%					
25	METHOD	401	401	401	613					

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

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