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ABERFÖYLE EXPLORATION PTY. LTD.

WELDBOROUGH E.L. 19/78

REPORT FOR THE YEAR ENDED

AUGUST 9, 1980

D.R.S.G.

OPEN FILE

J.R. Taylor,
Geologist

August, 1980

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INTRODUCTION

Exploration Licence 19/78 located in North Eastern Tasmania, near Weldborough, was generated with a view to locating economic greisen style tin mineralisation in the Blue Tier Batholith. (Plate Weld. 2).

A late stage, equigranular leucocratic granite (commonly referred to as the tin granite), known to host the major greisen sheet and vein deposits in this region, is recognised in the licence area. Indeed, in the eastern most portion of the exploration licence, two greisen sheet/vein prospects, Cream Creek and Spinks, validate the geological potential of the tin granite.

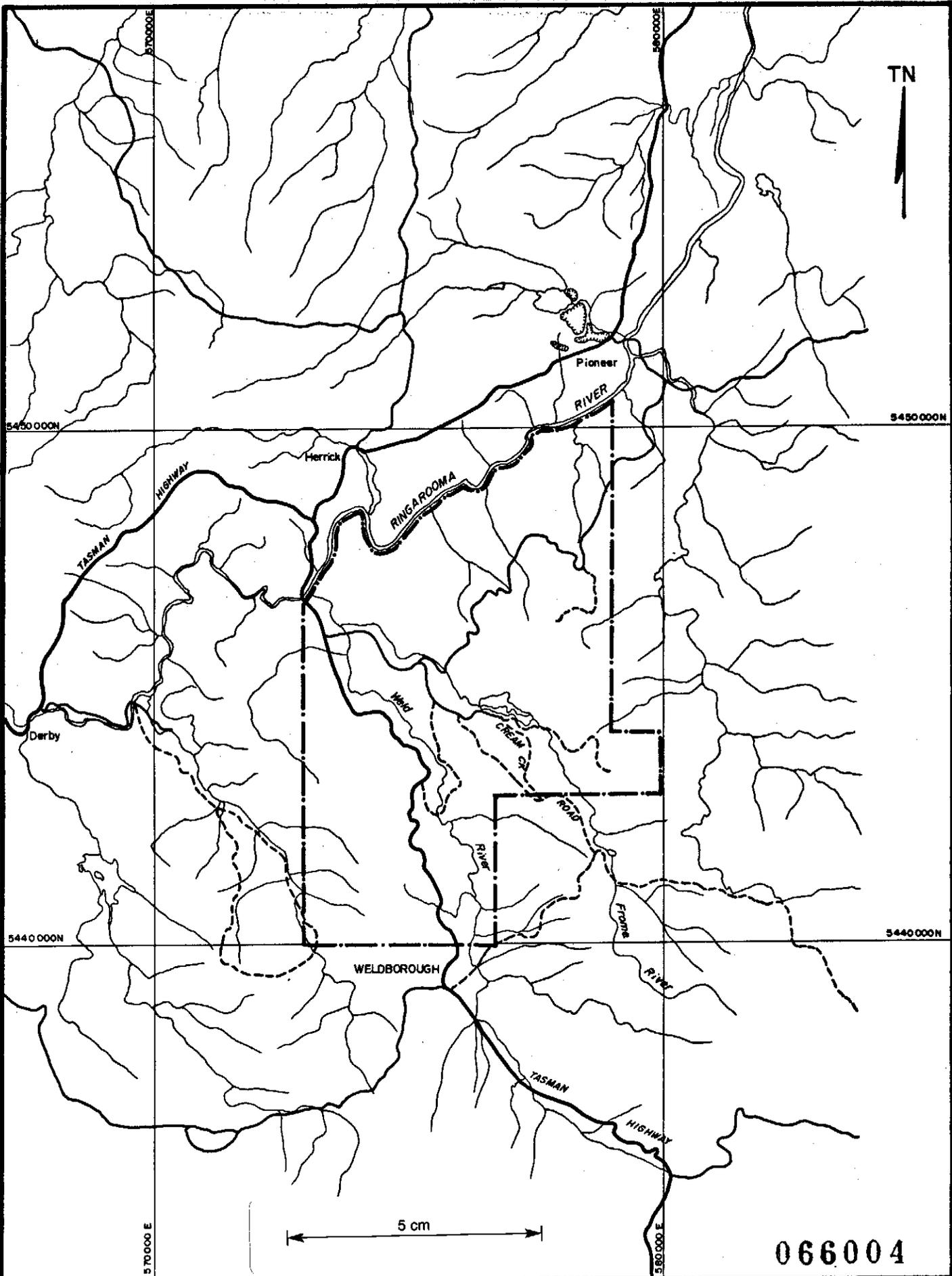
The current programme involved reconnaissance mapping of approximately 10 square kilometres (at 1:15,840 scale), and detailed assessment of the Cream Creek prospect (at approximately 1:600 scale). In order to appreciate the potential of the licence area it was intended to establish:

- (i) The surficial extent of the tin granite, and
- (ii) The nature, mode of occurrence and continuity of the Cream Creek mineralisation.

The field study revealed that:

- (i) A considerable portion of the favourable tin granite outcrops within the licence.
- (ii) Textural variations within a cover of early porphyritic adamellite over the tin granite suggest proximity of the latter can sometimes be predicted.
- (iii) It may be possible, with geological mapping and trace element geochemistry, to accurately locate areas where greisen style mineralisation is covered by an impermeable blanket of porphyritic adamellite or an unaltered layer of tin granite.

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NORTH EAST TASMANIA
 WELDBOROUGH EL. 19/78
Locality Plan

Location code:	
Date:	Sept. 1979
Scale:	1: 100, 000
Plate No	Weld. 2

- (iv) The depth extent of the greisen sheet has not been fully explored.

Groves, in several papers relating to the granites of the Blue Tier Batholith, suggests trace element geochemistry can be utilized to establish differentiation progressions in the tin granite. This technique may enable the detection of hitherto undiscovered mineralised greisen sheets.

A programme specifically designed to evaluate the potential for a large tonnage, mineralised greisen sheet (Sn \pm Cu) is proposed.

PREVIOUS WORK

The texts referred to in the bibliography provide an historical account of all previous work.

Prior to Aberfoyle's interest the most recent exploration on this area was undertaken by Geophoto Resources, Consultants for Texins Development Pty. Limited, in 1974. Geophoto concluded that the exposed mineralisation at Cream Creek was sub-economic. A compilation of all previous data suggests potential for a deposit in the vicinity of 2,000,000 tons of approximately 0.2% Sn (copper unknown), with lateral extension of the mineralisation under a thin cover of porphyritic adamellite considered a distinct possibility.

GEOLOGY

For the purposes of simplicity the author has accepted the basic nomenclature for the classification of granitic rocks as per the Tasmanian Geological Survey. Modifications and additions have been made where necessary.

As observations were restricted by the scope of this study the following field descriptions are not intended to characterise regionally significant granite types.

Major Intrusives

Dbapc: Porphyritic, Coarse Grained Biotite (Minor Muscovite)
Granite/Adamellite.

This volumetrically significant unit consists of a medium to coarse grained, anhedral, quartz, K-feldspar, plagioclase and biotite matrix enclosing subhedral to euhedral phenocrysts of K-feldspar (up to 7-8 cm) and anhedral to rounded quartz (approximately 1 cm). Rare, small patches (3-5 mm) of fine grained micaceous material are considered to represent biotite and muscovite pseudomorphing cordierite. Minor anhedral and acicular tourmaline occurs with quartz as small to medium concentrations (nodules to 5 cm) in finer grained zones within the adamellite.

Rounded, fine grained xenoliths (up to 30 cm) comprised of fine grained anhedral biotite, quartz and K-feldspar occur infrequently. Minor medium to coarse grained biotite clots (1-2 cm) sporadically distributed throughout, could also represent assimilated country rock.

Primary flow features indicated by the preferred orientation of K-feldspar phenocrysts can sometimes be seen in outcrop.

Thin quartz veins (\pm chalcopyrite) and very thin (0.5 cm) feldspar veins as well as aplite and pegmatite dykes are not uncommon in this unit.

Dbap: Porphyritic, Fine to Medium Grained Biotite-Muscovite
Granite/Adamellite.

Based on the following textural variations, this phase is divided into three sub-units.

- (i) Dbap_g: Phenocrysts of K-feldspar and rounded quartz.
- (ii) Dbap_f: Phenocrysts of K-feldspar.
- (iii) Dbap_p: Locally coarse grained porphyritic.

As a result of rapid variations, textural intermediates cannot always be differentiated.

Dbae: Equigranular, Fine to Coarse Grained, Biotite-Muscovite Granite/Adamellite (Tin Granite).

This leucocratic phase represents the final stages of crystallisation in the batholith and accordingly hosts all of the known greisen sheets. Texturally it varies, often rapidly, from fine, to coarse grained equigranular quartz, feldspar, biotite, muscovite granite.

Economic emphasis is placed on the two sub-units of this phase exposed at the Cream Creek prospect.

(i) Dbaem: Equigranular, Medium Grained Biotite-Muscovite Granite/Adamellite (Tin Granite).

This phase contains anhedral, granular, quartz and K-feldspar, subhedral albite and scattered cluster of biotite and subordinate primary(?) muscovite. The average grain size varies from 0.5 to 2.0 mm. Significant microscopic topaz occurs as evenly dispersed anhedral and skeletal crystals. Very small subhedral cassiterite crystals, not necessarily associated with extensively altered rocks, are common. Groves (1972) suggests that minor alteration is an inherent part of the late crystallisation history of this granite. In the area surrounding Cream Creek, an increase in the amount of tourmaline is observed in the vicinity of the contact of the tin granite. The tourmaline occurs in rounded to ovoid, fine grained, anhedral to subhedral concentrations (approximately 10 cm) often associated with fine grained anhedral quartz and feldspar. These tourmaline clots are usually found in comparatively finer grained, biotite depleted zones within the granite and can account for up to 2% by volume of this unit.

At Cream Creek the medium grained tin granite has undergone extensive muscovite greisenisation. The degree of alteration is indicated by the paucity of unaltered biotite and feldspar. The extensively altered granite essentially becomes a quartz-sericite rock with minor topaz, cassiterite, chalcopyrite, fluorite and garnet.

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Fracture/joint surfaces are often impregnated with 2-3 mm bands of biotite (altered to muscovite in places). Disseminated pods of slightly oxidised chalcopyrite occur irregularly throughout this sheet. (There appears to be a vague proportional correlation between the occurrence of chalcopyrite and the amount of fresh biotite remaining in the greisenised granite).

In general the greisenisation is moderate but pervasive with small sporadic zones of intense sericitisation. No greisen veins are observed, however, aplite dykes are common. One such dyke, intruding both altered tin granite and porphyritic adamellite, displays unusual characteristics. The north-eastern extension of this dyke, a thin (0.75 m) very weakly altered, very fine grained aplite, with fresh biotite, intrudes a moderately sericitised medium grained tin granite (sharp contacts). To the south-west the dyke thickens (1.5 m) and resembles the altered tin granite both texturally and mineralogically; the dyke's extremities become diffuse and both rock types are similarly altered.

(ii) Dma: Equigranular, Fine Grained Biotite-Muscovite Granite/Adamellite. Aplitic Tin Granite.

Aplites, occurring as sheets as well as dykes, are typically fine grained saccharoidal rocks containing quartz, albite, K-feldspar and minor biotite. Muscovite, topaz, apatite and garnet are accessory minerals.

Contact relationships at Cream Creek suggest that portions of this phase occurring as sheets, represent a textural end member of the complex tin granite. Accordingly, the greisenised aplite displays a mineralogy virtually identical to that of its medium grained counterpart.

Minor Intrusives

Dbb: Basic (?) Dyke.

This intrusive rock type has only been observed at Cream Creek. It is strongly weathered and often heavily sericitised. Altered phenocrysts (?) (1-2 mm) are randomly arrayed in a once felsic mesostasis. Minute, euhedral, relict feldspar laths, characterise the strong preferred orientation evident in this basic (?) intrusive rock.

Dmp: Pegmatite Dyke.

Pegmatites occur as small sills and irregular pods (Groves 1972). Two varieties have been observed in the licence area;

- (i) Large euhedral to subhedral K-feldspar and quartz phenocrysts set in a coarse aplitic matrix composed of anhedral quartz, K-feldspar, albite and biotite.
- (ii) Numerous, large subhedral K-feldspar phenocrysts, surrounding minor anhedral to rounded quartz and fibrous chlorite/muscovite patches.

Both types may contain albite, muscovite, topaz, chlorite and cassiterite.

Dcdl: Dolerite Dyke.

Subhedral phenocrysts of (?) plagioclase (up to 1 cm) are set in dark, fine grained, chaotic mesostasis of (?) amphibole, plagioclase and quartz.

CONTACT AND AGE RELATIONSHIPS

Coarse grained Porphyritic Adamellite/Fine to medium grained Porphyritic Adamellite.

Dbapc / Dbap (Dbap_g : Dbap_f : Dbap_p)

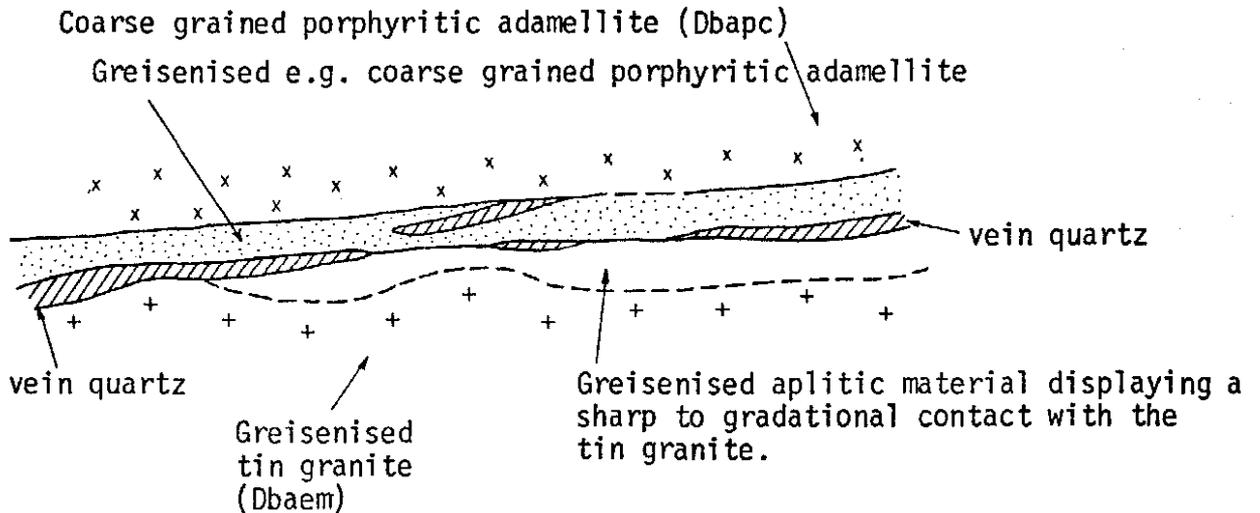
Although this contact was not observed in outcrop in the area covered by this study, it is well documented in literature on the Blue Tier Batholith. Independantly such studies confirm the authors opinion that the contact represents a somewhat arbitrary boundary between two textural end members. The porphyritic fine to medium grained biotite, muscovite granite/adamellite is tentatively interpreted as representing the mixing of partial melts of coarse grained porphyritic adamellite and the tin granite. Hence the range of textural variations are interpreted as genetically the same phase.

Coarse grained Porphyritic Adamellite/Tin Granite
Dbapc / Dbae(m)

Exposed in the south-east portion of the Cream Creek workings this contact is a very sharp, sub-horizontal, distinct textural and compositional boundary between an older porphyritic adamellite and a passively emplaced sheet of tin granite (Figure 1).

FIGURE 1

Diagrammatic Illustration of Contact Between
Porphyritic Granite (Dbapc) and Greisenised
Tin Granite (Dbaem)



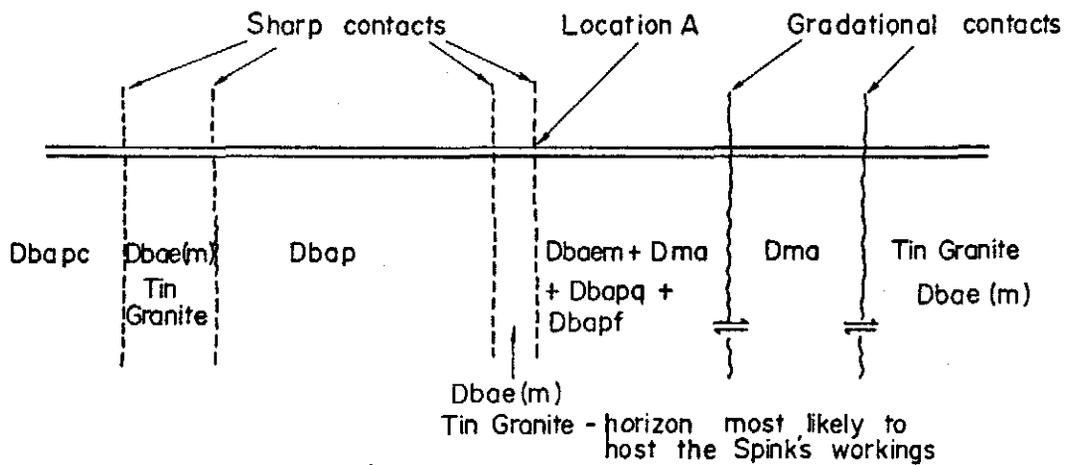
Fine to medium grained Porphyritic Adamellite/Tin Granite
 Dbap / Dbae(m)

By virtue of the nature of these units, the contact relationships are complex and varied. For the most part the contacts are gradational, over several metres displaying both textural and compositional variations. However a very sharp textural contact is observed between fine to medium grained porphyritic adamellite and the tin granite at location A. Figure 2 is a diagrammatic plan view displaying both this contact and the internal textural variations characteristic of the fine to medium grained porphyritic adamellite.

FIGURE 2

Idealised Plan View of Contact Relationships

Location: Track to Cream Creek in vicinity of Location A, Plate Weld. 4.

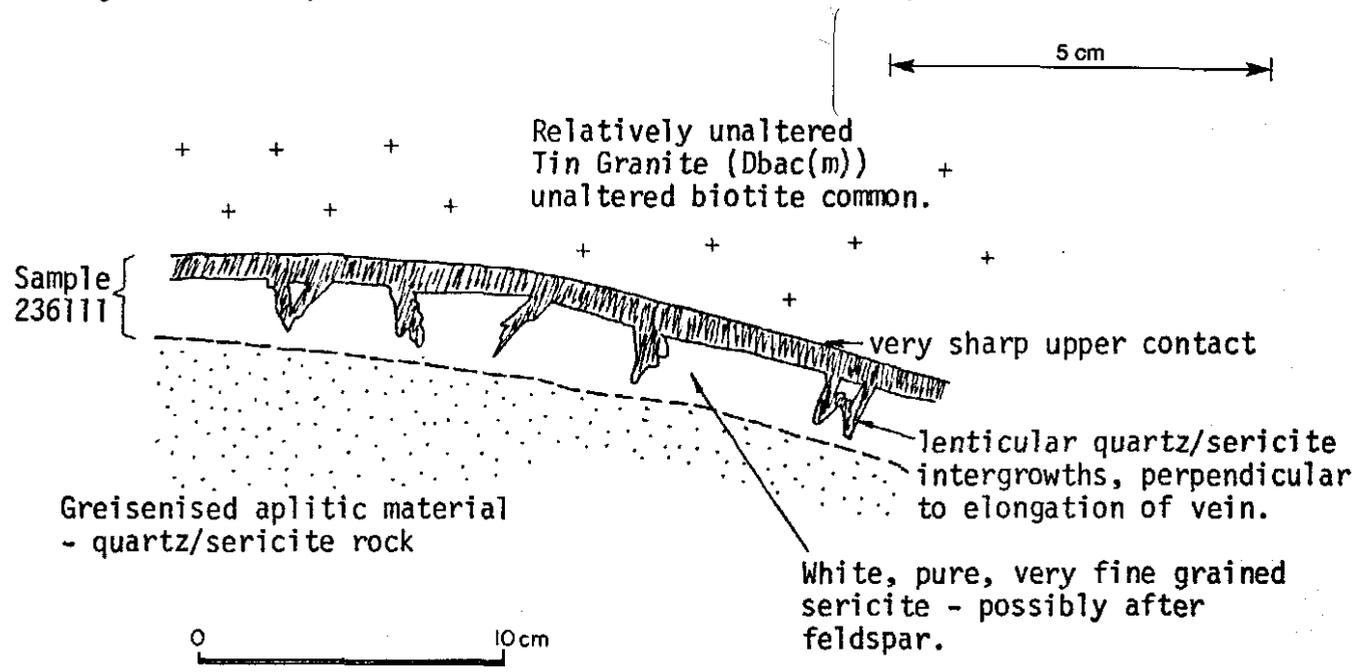


Tin granite (medium grained and aplitic)
Dbae (Dbaem : Dma)

The equigranular tin granite displays both sharp and diffuse internal textural variations. The coarse grained equigranular granite is commonly gradational over tens of metres to the medium grained variety. However the latter exhibits a complex association with the fine grained aplitic end member in the Cream Creek workings. Sharp contacts, often defined by quartz veins, represent major alteration and or textural boundaries. Toward the central portion of the greisen sheet, alteration processes transgress this contact, however on the peripheries the medium grained aplite contact appears to act as a buffer zone across which the alteration terminates (refer to Figure 3). Although the alteration has largely obliterated primary textures, the contact is obviously also gradational in places.

FIGURE 3

Diagrammatic cross section of the sharp, shallowly dipping contact between relatively unaltered tin granite (Dbaem) and thoroughly greisenised aplitic material - refer to Location B, Plate Weld. 4.



The quartz/sericite vein strikes 330° (magnetic) and dips at 20° to the north-east.

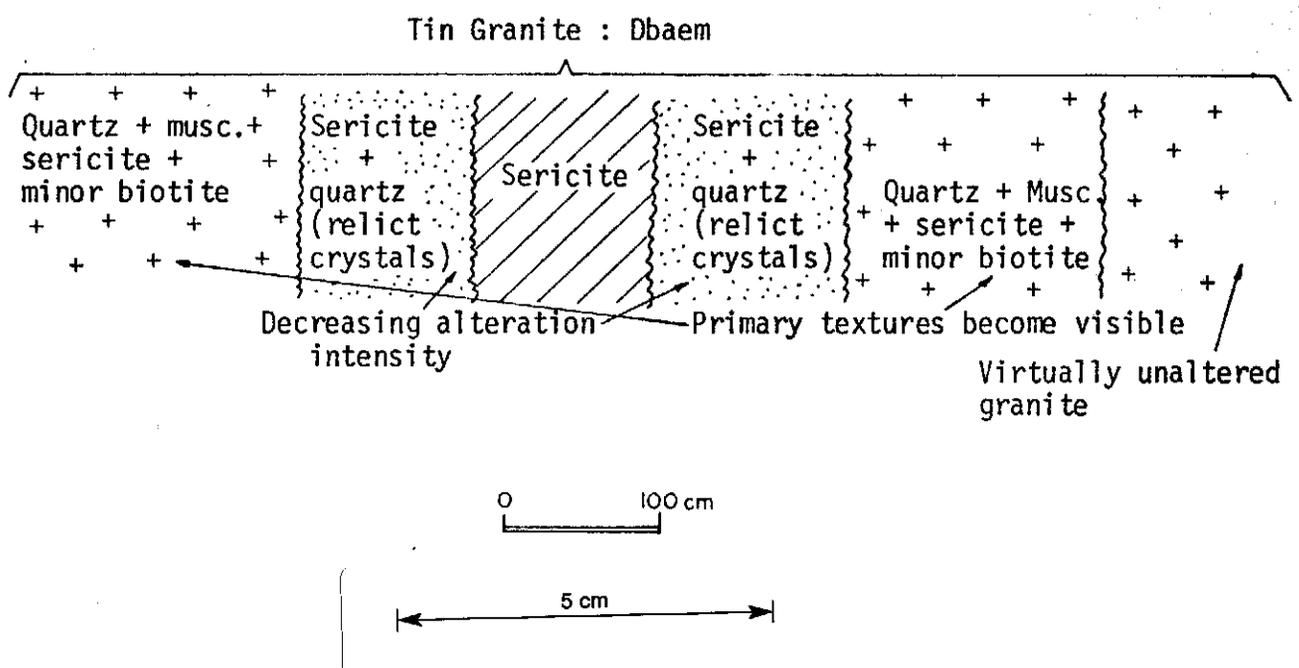
Medium grained tin granite-aplite/greisenised medium grained tin granite-aplite

Dbaem - Dma / Greisenised Dbaem - Dma

Apart from the relatively sharp alteration contacts described in the previous paragraph, the greisenisation acts as a pervasive, non-discriminatory process within the altered tin granite. Despite fluctuations in the intensity of alteration and mineralisation (perhaps controlled by local structural "highs" or irregularities in the tin granite sheet. Refer to Figure 4 and the dips on the medium grained tin granite/aplite contact at Location B), progressions from altered to unaltered tin granite are generally always gradational over several metres.

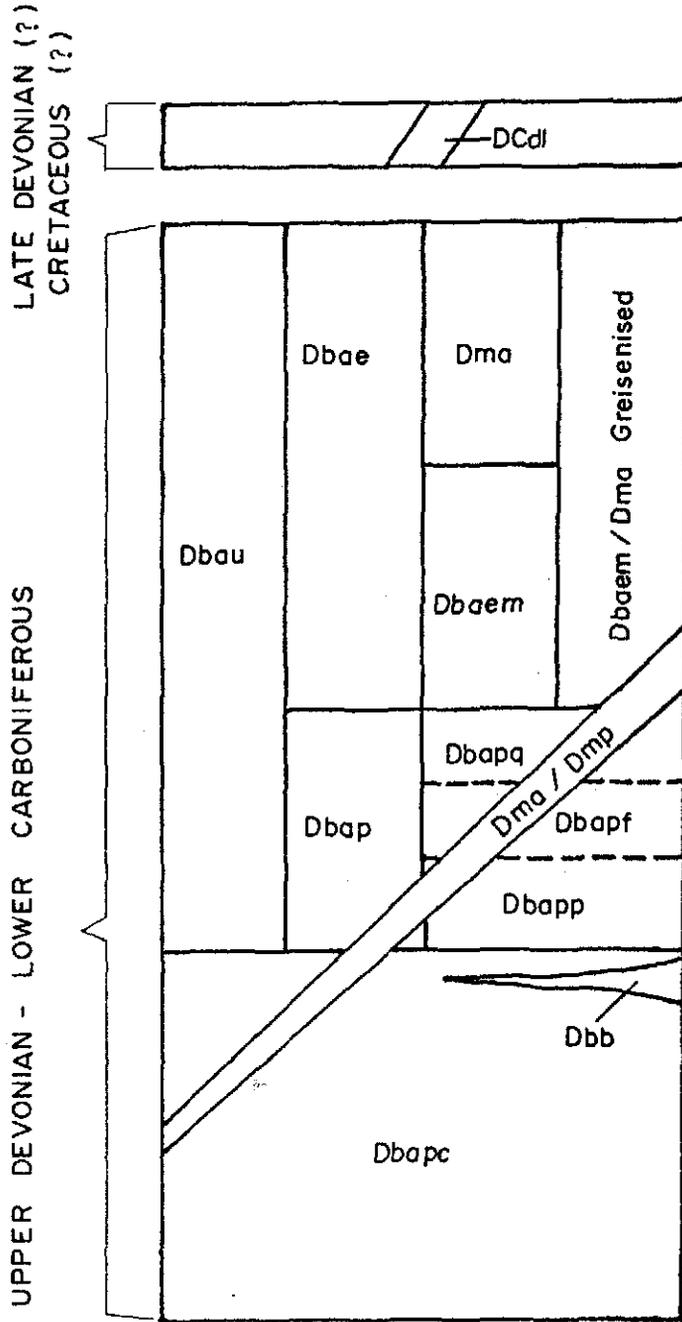
FIGURE 4

Diagrammatic cross section of small scale intense alteration zone within the greisen sheet.



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The chronological order of the various phases established by their contact relationships has given rise to the following 'stratigraphic' column.



'STRATIGRAPHIC' COLUMN

Fig. 5

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MINERALISATION AND ALTERATION

In the Blue Tier Batholith there are three main modes of occurrence of tin mineralisation:

- (i) Steeply dipping greisen veins in tin granite.
- (ii) Flat lying greisen sheets in tin granite.
- (iii) Quartz and quartz greisen veins in porphyritic adamellite.

Of these mineralisation styles only greisen sheets have the tonnage potential to encourage modern exploration.

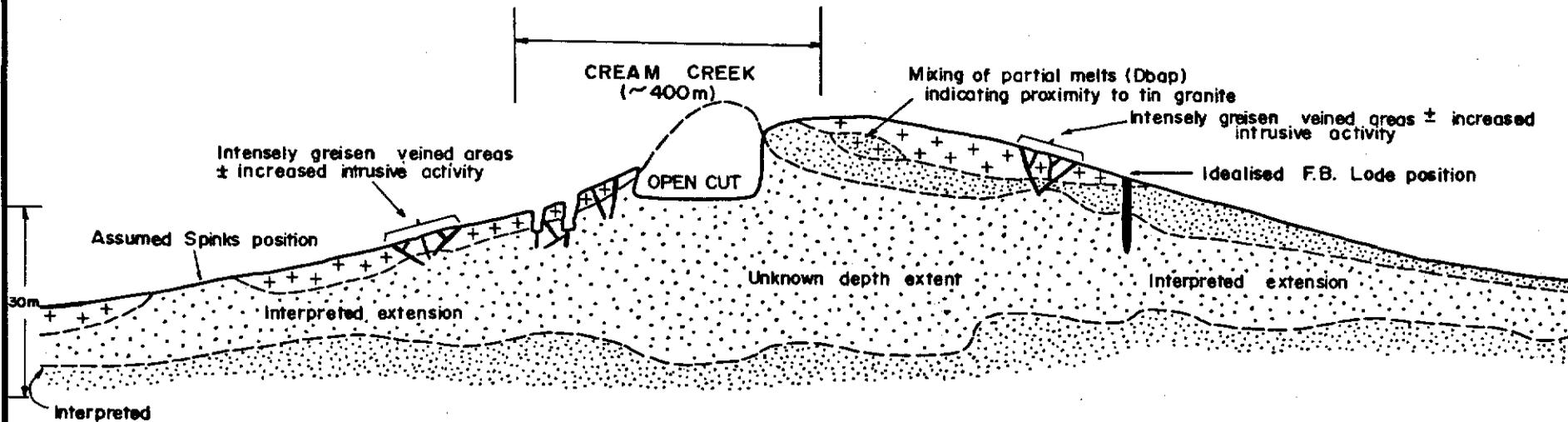
The greisen sheet deposits (e.g. Anchor Mine), consist of flat lying sheet like bodies of greisen and greisenised granite, occurring sub-parallel to the contact between the tin granites (Dbae) and the overlying porphyritic adamellite (Dbapc).

The mode of formation of these greisen sheets has been extensively reported. (Groves and McCarthy 1978, Groves 1972, Groves and Taylor 1973, Gee and Groves 1971). Greisenisation is attributed to the development, through extensive fractionation, of a water saturated melt in which Sn, F and other incompatible elements are concentrated. Greisenisation occurs when this late melt, located near the roof zone of the granite body, loses equilibrium with early formed (higher temperature) minerals. The style of alteration and mineralisation is shown diagrammatically on Figure 6.

Alteration and Mineralization

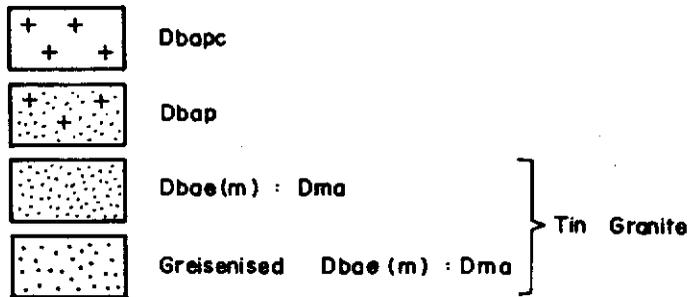
Note: Diagrammatic representation - distorted horizontal scale

- Position of greisen sheet with respect to other granitic phases
- Altitude of Contacts



Diagrammatic representation of the processes involved with the alteration and mineralization. The following factors are considered to represent excellent indicators of unnaturally high late stage crystallization and hence prospective areas for unexposed tin mineralization.

- strongly greisen veined zones
- abundant aplitic and pegmatic intrusions
- abundant late stage phases e.g. muscovite
tourmaline (miarolitic matrix)
topaz etc.



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Aberfoyle Exploration Pty Ltd
NORTH EAST TASMANIA
WELDBOROUGH AREA
Idealised Geological Cross Section

Location code:
Date: July, 1980
Scale: N.T.S.
Plate No FIG. 6

CONCLUSIONS AND RECOMMENDATIONS

Mapping has shown that at Cream Creek, greisenised tin granite is overlain by both unaltered tin granite and porphyritic adamellite. Hence, potential for further greisen tin mineralisation exists;

- (i) Beneath unaltered tin granite cover in the vicinity of the Cream Creek workings.
- (ii) Beneath the unaltered tin granite elsewhere in the district.
- (iii) In unexposed tin granite below a thin cover of porphyritic adamellite.

At Cream Creek the depth extent of the greisen sheet has not been fully explored. Grade and tonnage potential needs to be evaluated. Minor contributions from copper may prove to be economically significant.

It is strongly recommended that active exploration continue on three main fronts.

- (i) Cream Creek
- (ii) Spinks (once located)
- (iii) Regional studies

Cream Creek

- . Establish a grid over the old workings (or relocate the grid surveyed by Geophoto Resources).
- . Sample the greisen sheet utilising the old excavations. (Calculate a greisen vein density in the overlying adamellite to determine their economic viability. Sampling of both vein and adamellite may be warranted).
- . Test drill the greisen sheet to determine its vertical and lateral dimensions.

- . Complete an orientation trace element* survey on the greisen sheet and surrounding tin granite in order to gain an appreciation of the scale of variation likely to be encountered in a regional survey.

- . Complete an orientation trace element survey on the porphyritic adamellite progressing away from the greisenised granite. On a limited scale, trace element geochemistry may be applicable i.e. if boron infiltration (in the form of tourmaline) is observed to occur within the porphyritic adamellite this may indicate proximity to the tin granite.

Spinks

- . Locate and map the Spink's workings.

- . Grid and channel sample if mapping indicates potential.

- . Drilling contingent on the above.

Regional

- . Extend regional mapping to encompass the prospective exposure of tin granite and porphyritic adamellite.

- . Provide sample coverage of this area for the purposes of a trace element geochemical study of the tin granite (Note: regional grid parameters are critical). Similar coverage of the porphyritic adamellite will be contingent on the results of the orientation survey.

* All references to trace element studies are directed to a paper by Groves (1972) entitled, "The Geological Evolution of Tin Bearing Granites in the Blue Tier Batholith, Tasmania".

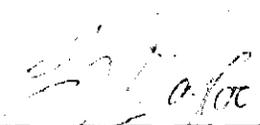
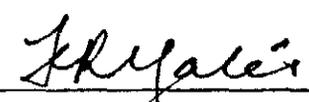
FINANCE

(SEE APPENDIX A)

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McCarthy, T.A.

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APPENDIX AABERFOYLE EXPLORATION PTY, LTD.PROJECT: WELDBOROUGH E.L. 19/78

	12 MONTHS TO 9 AUG. 1980	YEAR TO DATE	PROJECT TOTAL
<u>Salaries & Wages</u>	\$ 1,916	\$ 1,916	\$ 4,066
<u>Contractors</u>			
Drilling			
Geophysics			
Petrology			
Assay, Geochemistry	616	616	1,676
Consultants			
Other			
<u>Materials</u>	-	-	225
<u>Accom & Travel</u>	128	128	396
<u>Vehicles</u>	265	265	665
<u>Communications</u>	126	126	221
<u>Tenure</u>	165	165	268
<u>Equipment Use</u>			
<u>Sundries</u>			58
<u>SUB-TOTAL</u>	\$ 3,216	\$ 3,216	\$ 7,575
<u>ADMINISTRATION</u>	482	482	1,354
<u>TOTALS</u>	\$ 3,698	\$ 3,698	\$ 8,929

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APPENDIX 1

CREAM CREEK ASSAY RESULTS - ROCK CHIP SAMPLES

(for sample locations see Plate WELD ⁴.)

