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Sn IN TASMANIA

A BRIEF OVERVIEW

Report to

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CONTENTS

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II. EXECUTIVE SUMMARY

Niels Dahl, consulting geologist, was engaged by Green River Resources Ltd, who holds E41/2007 – Mt Paris, to report on the general setting of Sn mineralizations in Tasmania to help it formulate future directions of exploration for Sn within its licence. The study involved literature search, and a compilation of the literature data with a focus on features that can help directly in locating Sn mineralizations. The study concentrated on the following fields of work on Sn-associated granites,

- their compositions,
- trace elements as possible guides in exploration,
- variations in settings of Sn-bearing features in Tasmania
- geophysics as guides to locate prospective areas of a Sn-anomalous intrusion.

III. INTRODUCTION

Seymour et al. (2007) mention Tasmanian Sn deposits occur as Sn-sulphide skarns (e.g. Renison Bell), Sn-silicate skarns (e.g. St Dizier), as vein deposits (e.g. Aberfoyle) and as greisens (e.g. Anchor). They occur in the Western Tasmanian Read Volcanic Belt and in Northeast Tasmania, all are associated with Middle Devonian to lower Caboniferous granitoids (Seymour, op. cit.).

At the time of the emplacement of the Devonian granitoids, Tasmania had suffered multiple deformations and mineralization events. The structural development influenced to the orientations of the granites, which appear steep and following S1 of the enveloping Mathinna Beds in Northeast Tasmania (Goscombe et al., 1994), and the major trend of the Read Volcanic Belt in Western Tasmania. Isobaths suggest that the granitoid bodies are steep and widening with depth (McClenaghan, 2006).

The Sn associated granitoids are more exposed in Northeast Tasmania than in Western Tasmania suggesting they appear at a deeper erosional level which also reflects in the types of Sn deposits that dominate the two districts. Sulphide skarn deposits which are relatively low temperature Sn mineralizations deposited in the surrounding country rock to the granites at relatively higher levels in the crust, are important Sn mineralizations in Western Tasmania, whereas Sn in greisens, which are relatively high temperature Sn mineralizations along the boundaries of the associated granites or in pockets within the granites, is the only important type of Sn mineralization in Northeast Tasmania.

Uranium-lead SHRIMP ages of the granites show the intrusions in Northeast Tasmania (Middle – Upper Devonian) are slightly older than those in Western Tasmania (Upper Devonian to Lower Carboniferous) (McClenaghan, 2006).

IV. Sn GRANITES

Sn mineralizations are associated with a variety of granitoid intrusions. In Eastern Tasmania economic to subeconomic Sn mineralization is associated with the Blue Tier and Scottsdale Batholiths. Which are dominated by granodiorites and adamellites, but other intrusions have the compositions of alkali granites (McClenaghan, 2006). Some of the adamellites/granites have primary cordierite and garnet, tourmaline, xenotime and monazite, topaz and andalusite These minerals are not all necessarily present in the same intrusion. The granodiorites are not associated with Sn mineralization. The two batholiths are considered to be one at depth.

In Western Tasmania granites dominate the exposed granitoid intrusions. At Mt Bischoff Sn-bearing porphyry dykes are suggested to be the upward expression of a granite intrusion at depth

(McClenaghan, 2006). Many of the granites in Western Tasmania are interpreted to connect at depth. Accessory minerals include, amongst others, tourmaline, magnetite, monazite, fluorite and topaz. They may not occur together.

Greisens are present in both Western Tasmania and Eastern Tasmania. A greisen is often external to its associated intrusion in Western Tasmania, whereas greisens are internal in the Blue Tier and Scottsdale batholiths. Greisens formed from the last fluids in solidifying intrusions. They were rich in water and rich in incompatible elements and concentrated economically important elements.

Quartz veins with wolframite, pyrite, cassiterite and rare molybdenite occur within the Birthday Granite near its contact to the enclosing rocks.

V. Sn MINERALS

Sn occurs generally as the oxide cassiterite or as sulfides (sulphosalts). Cassiterite is the most common Sn ore mineral, and Sn-bearing sulphosalts can be a byproduct of mining for another commodity. Sn may occur in other minerals, which will be non-economic accessory minerals of curiosity in a deposit instead of ore minerals, e.g. cylindrite and teallite.

Cassiterite (SnO_2) is tetragonal, most often prismatic and commonly near equidimensional. It is brown, with a hardness of 6-7 and has a poorly developed cleavage similar to the one of quartz, its density is 6.8-7.2 (Ford,1966).

Stannite ($Cu_2SFeSSnS_2$ +/- ZnS) is the most common sulphosalt of Sn. Like cassiterite, it is tetragonal, but sphenoidal instead of prismatic, it is relatively soft with a hardness of 3.5, and it has a relatively low density of 4.3 to 4.52 (Ford, op.cit.). Stannite is brittle with no proper cleavage direction.

VI. TRACE ELEMENTS ASSOCIATED WITH Sn MINERALIZATIONS

As mentioned above, a number of minerals may carry Sn, both sulphides and cassiterite carry trace elements. Trace elements associated with Sn include in alphabetical order:
Ag, As, Au, B, Bi, Cu, F, Fe, Mo, Pb, Sb, Ta, W, Zn and Y (Ford, 1966; McClenaghan, 2006; Sun, 1996).

VII. SETTINGS OF Sn MINERALIZATIONS

Sn mineralizations in Tasmania have formed both in contact aureoles to granite intrusions and within granite intrusions. In contact aureoles skarn deposits of Sn sulphides, e.g. at Renison Bell, where also quartz-arsenopyrite-pyrrhotite-cassiterite-fluorite veins formed in feeder faults that were active during the formation of the skarn deposit (Seymour et al., 2007). At the Cleveland mine Sn occurs with Bi, Mo and W in dykes.

Greisen hosted Sn occurs as aureoles around granites in Western Tasmania, but is found as pockets in granites of the Blue Tier Batholith. The greisen-bearing granites appear to have solidified from all contacts to the country rocks towards the centre of the intrusions.

VIII. GEOPHYSICS OF Sn MINERALIZATIONS

Aeromagnetics of the Scottsdale and Blue Tier batholiths indicate that the Sn-associated alkali granites cannot be distinguished from the intruded adamellites (Figure 5). Gravity and radiometrics have not been studied due to a lack of publicly available data.

IX. EXPLORATION GUIDES FOR Sn MINERALIZATIONS

Geological understanding of an exploration area is important to ascertain whether the target is skarn associated mineralizations or greisen associated mineralizations. Geological mapping will also help ascertain possible settings of Sn mineralizations be it veins or aureoles around granites or pockets of the last solidified fluids of a granite within the intrusion itself. The granodiorites of the Blue Tier and Scottsdale batholiths appear not to be associated with Sn mineralizations.

Apart from Sn, geochemical analyses of Sn samples should include all the elements mentioned in Section VI. Geochemical anomalies of the trace elements may point towards an area of concentration of Sn, even if the samples show grades of Sn below ore grade.

Cassiterite is hard and will withstand harsh treatment by erosional forces. Placer deposits of cassiterite are located on all continents, and by panning for cassiterite in a river system, its source(-s) may be located. Sn-sulphides are too weak to survive erosional transport and will not be a guide to mineralization by panning.

Aeromagnetics appear not to differentiate between Sn-associated igneous activity and igneous activity not associated with the introduction of Sn in Northeast Tasmania.

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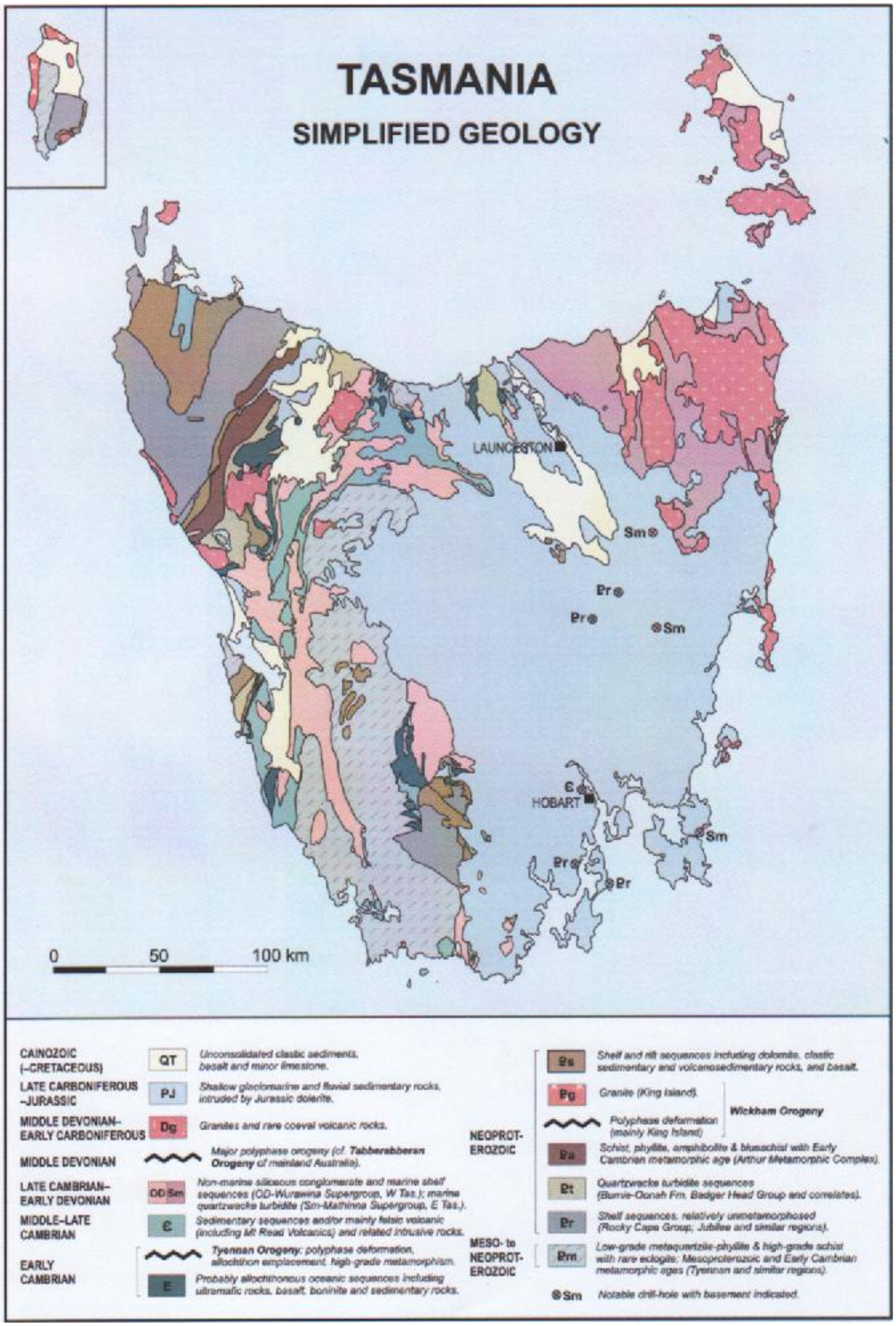

Figure 1. Geology of Tasmania. Bacon et al. (2008)

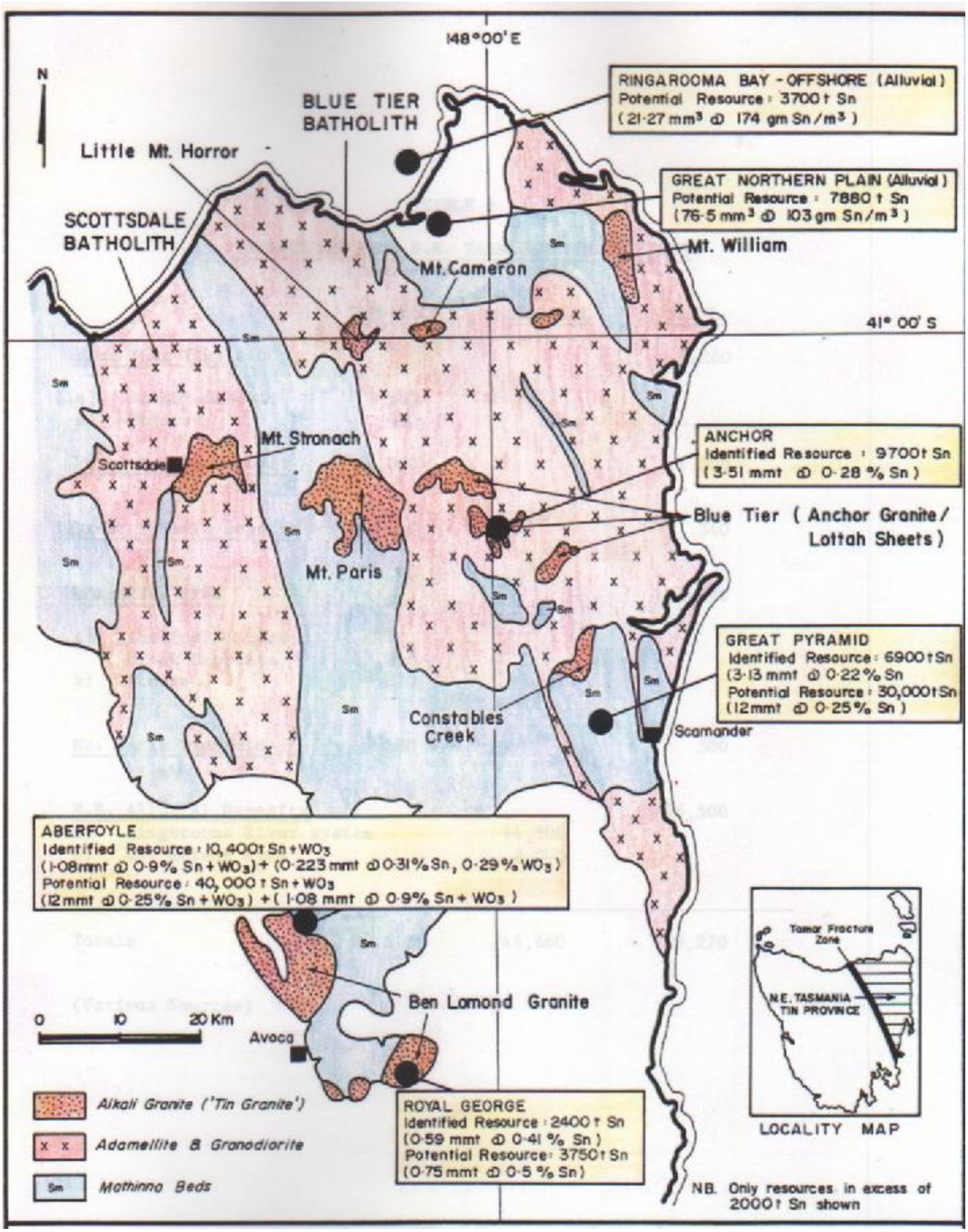

Figure 2. Geology of Northeast Tasmania, Purvis (1988).

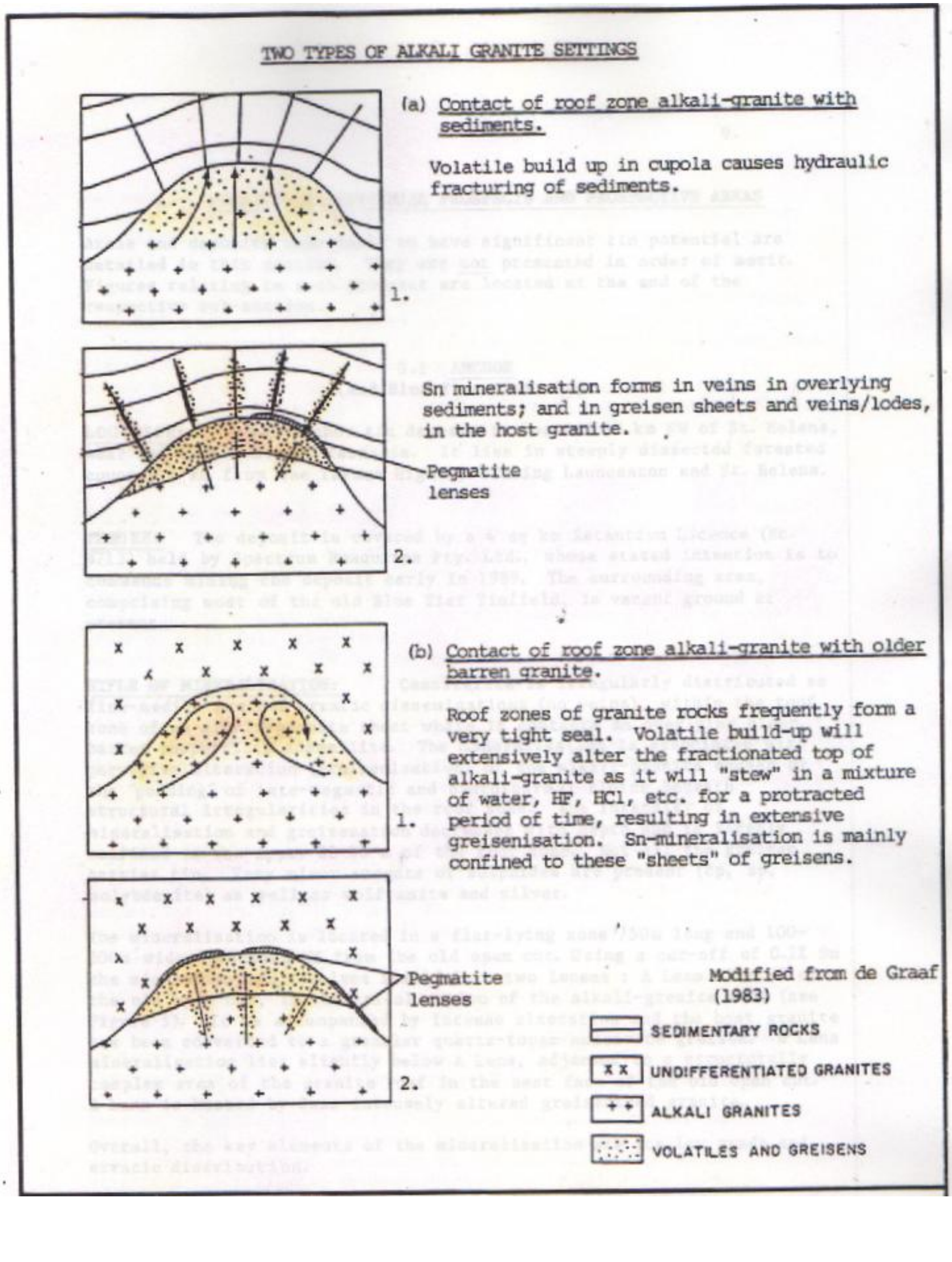

Figure 3. Origin of greisens in Northeast Tasmania. Purvis, 1988.

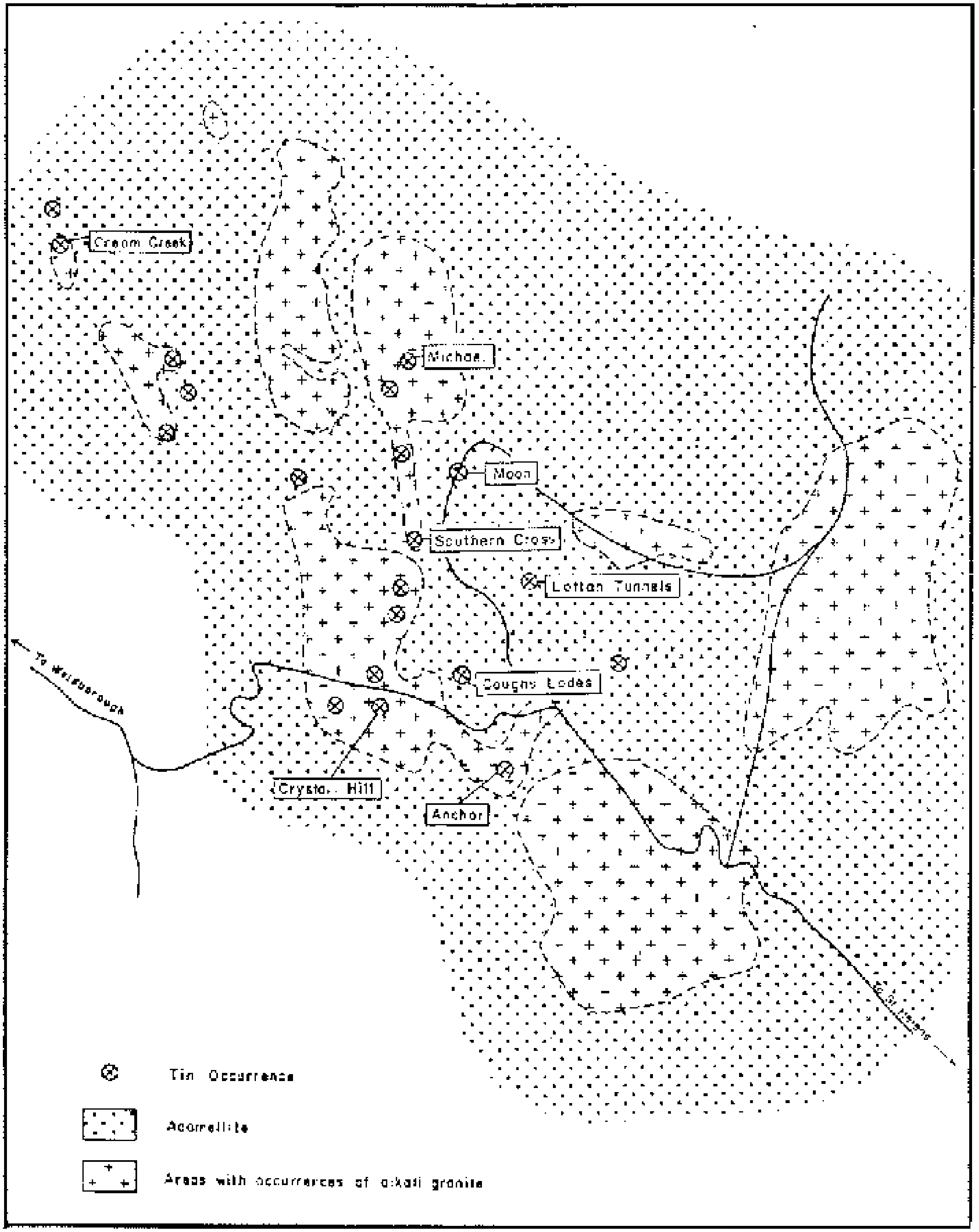

Figure 4. Blue Tier Sn-field showing the relationship of Sn mineralization to alkali granites. Purvis, 1988.

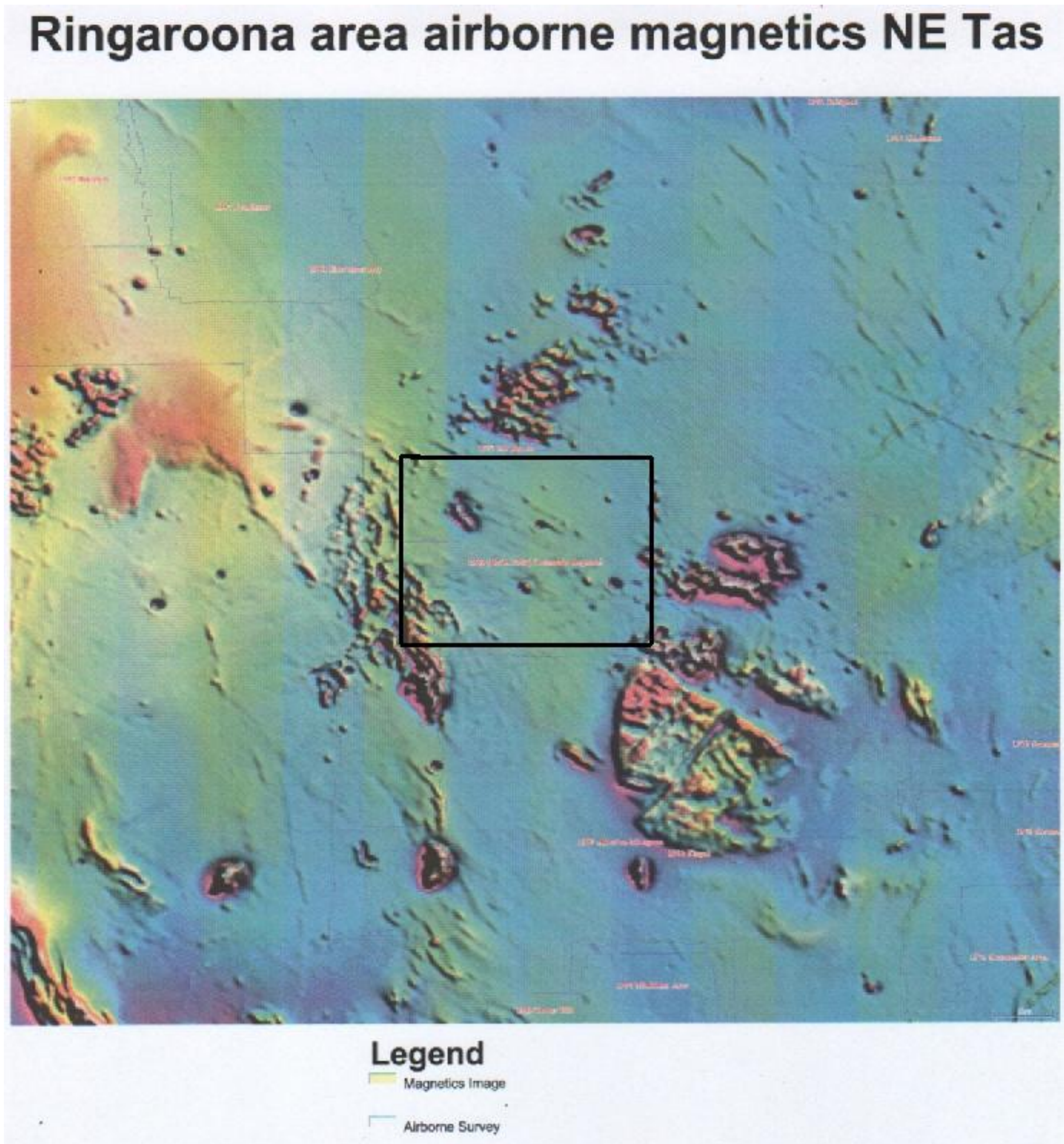

Figure 5. Aeromagnetics over the Scottsdale and Blue Tier batholiths. Publicly available merged data by Geological Survey of Tasmania. The rectangle encloses the Mt Paris area, please refer to Figure 2.