SHOP 4 ROMA ARCADE
ROSEBERY TASMANIA
7470

EXPLORATION LICENCE NO. E.L.30/92
ANNUAL REPORT
S.LAFFER & F.GRIFFITHS

During this term exploration focussed on determining the extent of tin bearing deep lead tertiary gravels on the northern and eastern licence boundaries. Stream sediment and wash sampling in the vicinity of Healy Creek (345000E : 5370000N) revealed tin bearing gravels persisted on the eastern side of the Tertiary basalt.

As a result of previous stream sediment sampling and a review of exploration conducted by Geopeko 1982 a tin enriched area was highlighted on the northern boundary of the E.L. in the vicinity of Big Rocky Creek and Donnelly's Creek. Historical literature, Waterhouse 1915, indicates an increase in the thickness of the tertiary gravels to the north of the old Heemskirk Tin Syndicate workings.

An E.L. of 15 SQkm was applied extending from the northern boundary of E.L. 30/92 however only 6 SQkm was vacant. This 6 SQkm covers the main axis of the deep lead north of E.L. 30/92. Later an additional 4 SQkm on the eastern side of E.L. application 6/94 was requested to be appended to E.L. 6/94 to cover a total area of 10 SQkm.

During this term Tasman Alluvials (S. Laffer & F. Griffiths) entered into an agreement with Renison Ltd to enable Renison to conduct a geomorphological evaluation of the deep lead. The objective of the review was to determine if an exploration target of suitable interest to Renison existed on the exploration licence. K.C. Morrison Pty Ltd was contracted by Renison to conduct the evaluation. A copy of this evaluation is attached.

The geomorphological evaluation confirmed the interpretation of the work conducted by S. Laffer and F. Griffiths, that the tin bearing fluvial gravels have the potential to support a high tonnage low cost gravel pump / dredge mining operation producing a high grade cassiterite concentrate using gravity separation techniques.

As a result of this favourable evaluation, Tasman Alluvials are conducting further negotiation with Renison Ltd with a view to further development of the deposit.

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Renison Ltd.

Assessment of the Tasman River Alluvial Tin Exploration Target

K.C. Morrison
6 April 1994

INTRODUCTION

1 Background

Alluvial tin was mined at Tasman River, North Heemskirk (Fig 1), by the Heemskirk Tin Syndicate, between 1913 and 1920. The operation involved hydraulic sluicing of gravels, sands and clay to a maximum depth of 10 metres and produced, by gravity separation, cassiterite sand concentrate. By 1915 the mine had produced over 60 tonnes of cassiterite from 52,000 m^3 of gravel (grade of 1.16 kg SnO_2 (70% Sn) per m^3) (Waterhouse, 1915).

It is not clear from the literature if the volumes refer to pit survey or tailings sand/gravel survey, but the grade seems too high for an average, including substantial (approx. 50% of present exposure) near barren clays and sands which would report to the slimes ponds or the river, rather than the sand paddocks.

2 The Prospect

Previous drilling ahead of the mine, together with the general geomorphology of the area, indicates a deepening and widening of the alluvial sediment body towards the north and it is this distal extension of the sediments exposed in old workings which is currently of interest to Renison (Fig 2). Today the site is linked to Zeehan by the sealed HEC Heemskirk Road which passes through the southern edge of the old mine workings (Fig 1).

Mineral Resources Tasmania title is held over the old mine workings and a substantial area of surrounding ground by S. Laffer and F. Griffiths, Exploration Licence 30/92, of 27 km^2. The potential distal extension of the target extends north of E.L. 30/92 into vacant exploration ground.

3 The Brief

K.C. Morrison Pty Ltd was contracted by Renison Ltd in February 1994 to conduct a preliminary examination of the field and literature evidence for the existence of a valid exploration target at Tasman River and to make appropriate recommendations regarding further exploration and evaluation.

The criteria for a valid target are a resource of > 1 million tonnes, a heavy mineral concentrate amenable to a 70% Sn gravity separation product and a combination of sediment depth, sediment type, degree of diagenesis and groundwater conditions suited to low cost mining.

Additional requirements are information on the geological setting, provenance and age of the host sediments and the heavy minerals,

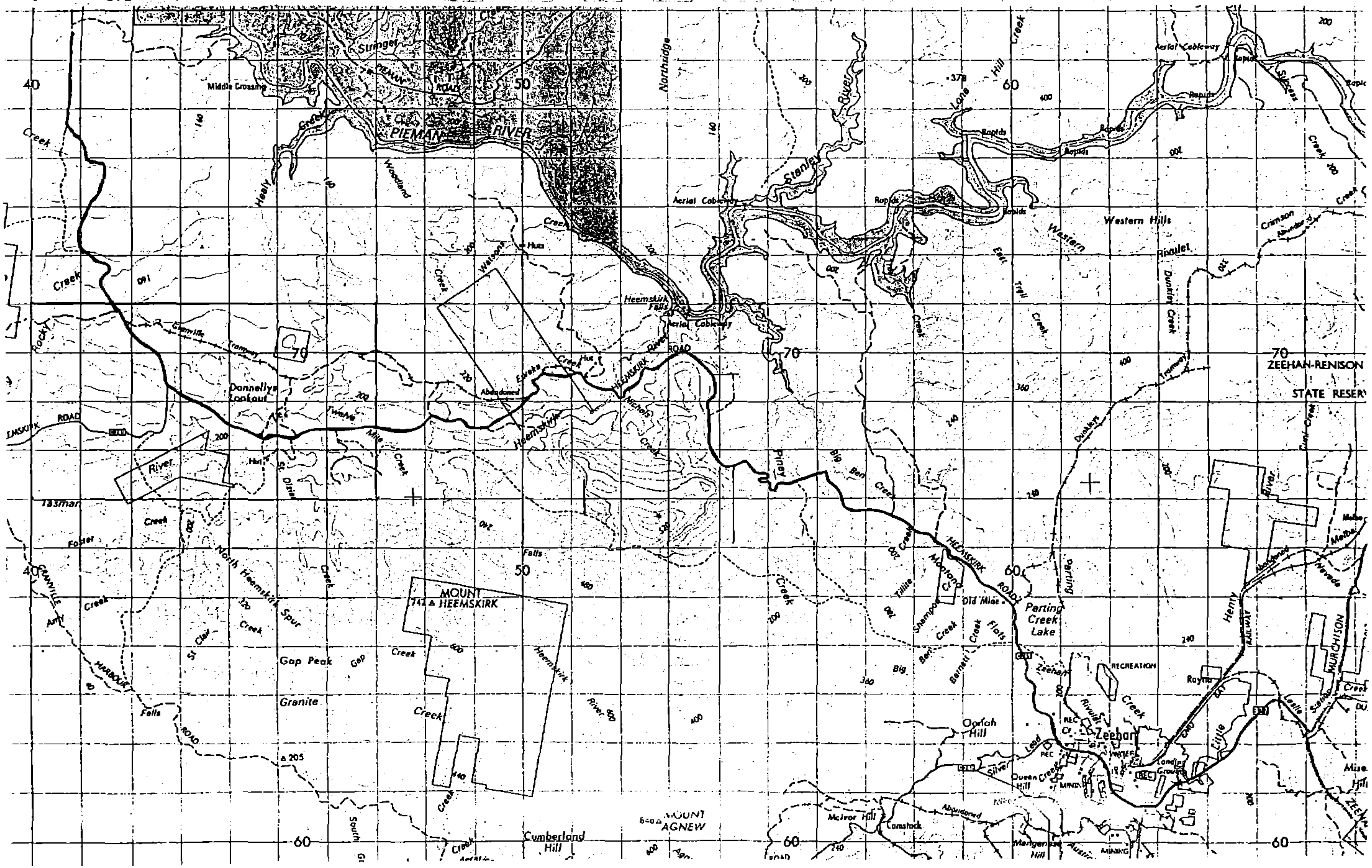

Fig. 1 Location Map - E.L. 30/92 and Abandoned Tasman River Alluvial Tin Worings, 20 km N.W. of Zeehan. 1:100,000 TASMAP PIEMAN SHEET

5 cm

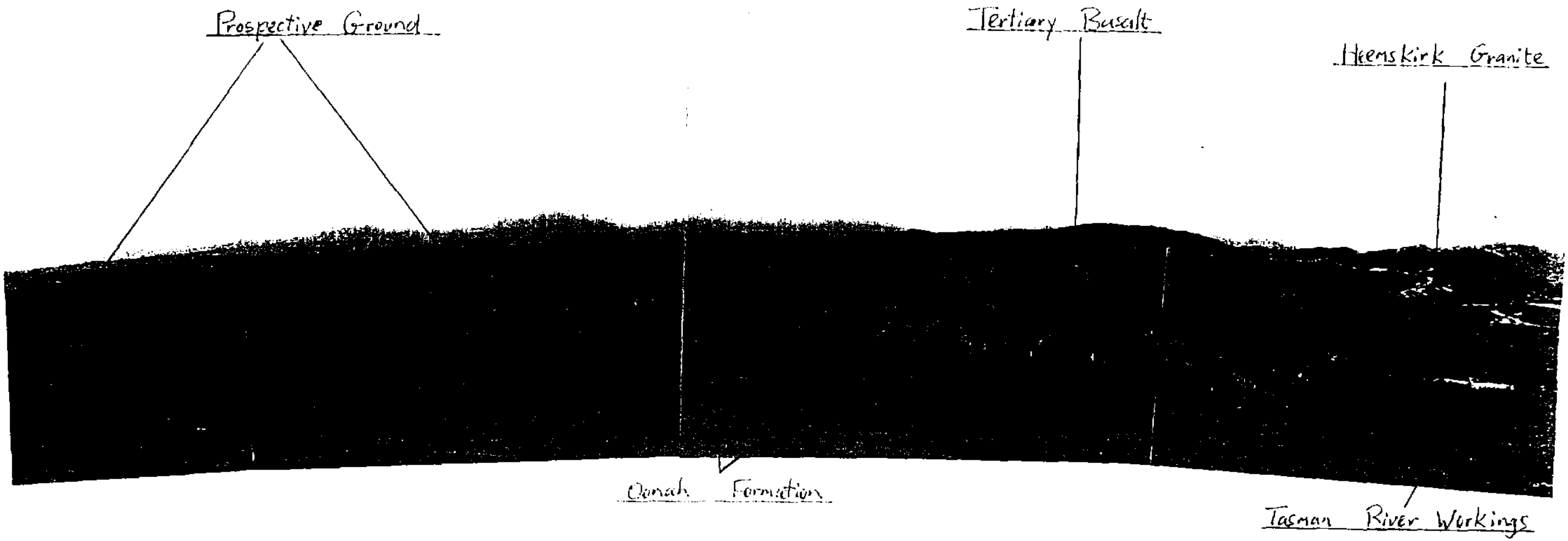

Fig 2 Panoramic view of prospect, from Donnellys Lookout, looking N.E. at centre of view.

plus comment on aspects of the local geology which would impact on exploration and mining.

The project was supervised by Mr Bruce McQuitty, Renison Ltd, who provided all available information, maps and airphotos held at Renison. Mr Stan Laffer, a local mining identity and potential vendor of title to part of the prospect, kindly assisted the writer by providing information on previous mining and by guidance to all field exposures relevant to the project.

GEOLOGY AND GEOMORPHOLOGY OF THE PROSPECT

The general geology and drainage geomorphology of the prospect is shown on Plan 1. Basement to the deep lead sediments consists of the northern outcrop margins of the Heemskirk Granite, along the southern limit of the prospect, and Precambrian Oonah Formation metasediments which outcrop along the N.E and S.W. margins of the prospect and presumably underlie most of the unmined portion of the Cainozoic sediments.

A substantial area of Tertiary basalt outcrops immediatley north of the old Tasman River alluvial workings. The basalt has a WNW - ESE orientation, parallel to the granite - Oonah Formation contact, and clearly exerts a control over drainage. The Tasman River drainage system has been diverted from its northerly course off the Heemskirk Range, by uplift associated with localised crustal sag and basin formation, developing into fracture-controlled extrusion of the basalt. Present day Tasman River drainage takes a sharp diversion immediately south of the basalt and flows, SW to the coast but the pre-basalt Tasman River is likely to have followed a course close to the present day Healy Creek.

The Tasman River basalts are not dated and the closest published Tertiary basalt dates are too distant to be relevant (Sutherland, 1983, Sutherland and Wellman, 1986). Unequivocal field exposure of decomposed basalt/basalt soil overlying correlates of tin bearing gravels were observed during this investigation and the relationship is consistent with mapping on the Zeehan 1:63360 Geological Survey of Tasmania Sheet.

The Tertiary sediments and thin overlying Quaternary cover extend in a NW trending basin form towards the Pieman River, tending to increase in width in the down palaeo slope direction. The distal extent of the sediments and the basement geology is not adequately known but clearly some Cainozoic extends into the area covered by E.L. 56/89 (see Plan 1) and the regional potential for Tertiary tin-bearing sediments may be much larger than the area covered by this investigation. Excavator sampling by Stan and Roy Laffer proves that correlates of the tin-bearing sediments at Tasman River extend at least as far north as the northern boundary of E.L. 30/92 but no reliable data exists on sediment thickness. Clearly there is potential for tin sediments to extend well north of the present Exploration Licence.

SEDIMENTOLOGY OF THE TIN SEDIMENTS

1 The prospect stratigraphy is well exposed in parts of the old Tasman River workings (Fig. 3) and in Stan Laffer's alluvial tin mine, 2 km to the S.E. Two sedimentary sequences are recognised; 1) a lower, relatively thick sequence of trough cross bedded quartz granules and sand lenses, thin sheets of well sorted and thicker beds of poorly sorted, subrounded gravel and lenticular bodies of kaolinitic clay grading to sandy clay. Lignitic sediments and lignitised wood fragments are common, and 2) an upper, relatively thin and uniform blanket of angular vein quartz gravel.

The contrasts in facies style and degree of cementation suggest that the surficial angular gravel (Fig. 4) is probably a ?Quaternary lag deposit, preserved as an erosional remnant after reworking of periglacial or outwash sediments.

The contact of the two sequences is characterised by wedge- or trough-like erosions into the top of the lower sequence, filled with upper sequence gravel (Fig 3). These features are interpreted as thaw cracks formed by the melting of permafrost in Quaternary periglacial conditions (eg. Reineck and Singh, 1975).

Significant placer tin mineralisation and thickness development is confined to the lower sequence which includes the higher grade tin gravels (Fig. 5) and therefore the exploration target.

Fossil wood and organic sediment were sampled from the Tasman River and Laffer workings and submitted to Dr R Hill, palaeobotanist, University of Tasmania. A slide mount of extract from the organic sediment shows a rich, well preserved pollen and spore assemblage which from preliminary work can be dated in the Middle Eocene-Pliocene range (R A Hill, pers. comm., 7/4/94)

This implies a post Middle Eocene age for the overlying basalt. More detailed palynology is currently underway and a more precise Tertiary date for the deposit will follow. This work is being incorporated by the Department of Plant Science into a major research project on Australian Tertiary floras and will involve no cost to Renison.

Examination of the Tasman River mine sediments in outcrop and as panned samples shows that the sands and granules are essentially

Fig 3 Mine stratigraphy exposed in the N.E. corner of the Tasman River workings.

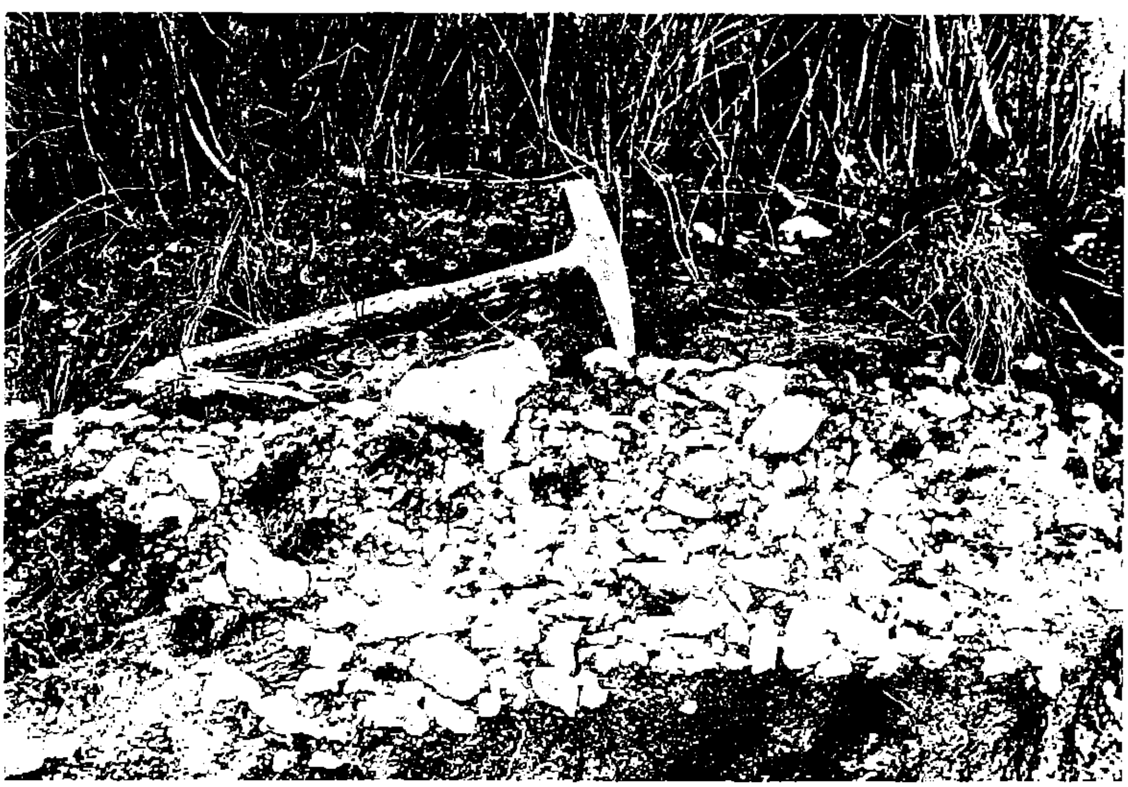

Fig 4 Thin blanket of angular vein quartz gravel overlying the deep lead sequence, Tasman River workings.

Fig 5 Well sorted polymict gravel overlying granite basement, Tasman River workings. This facies hosts the highest tin grades.

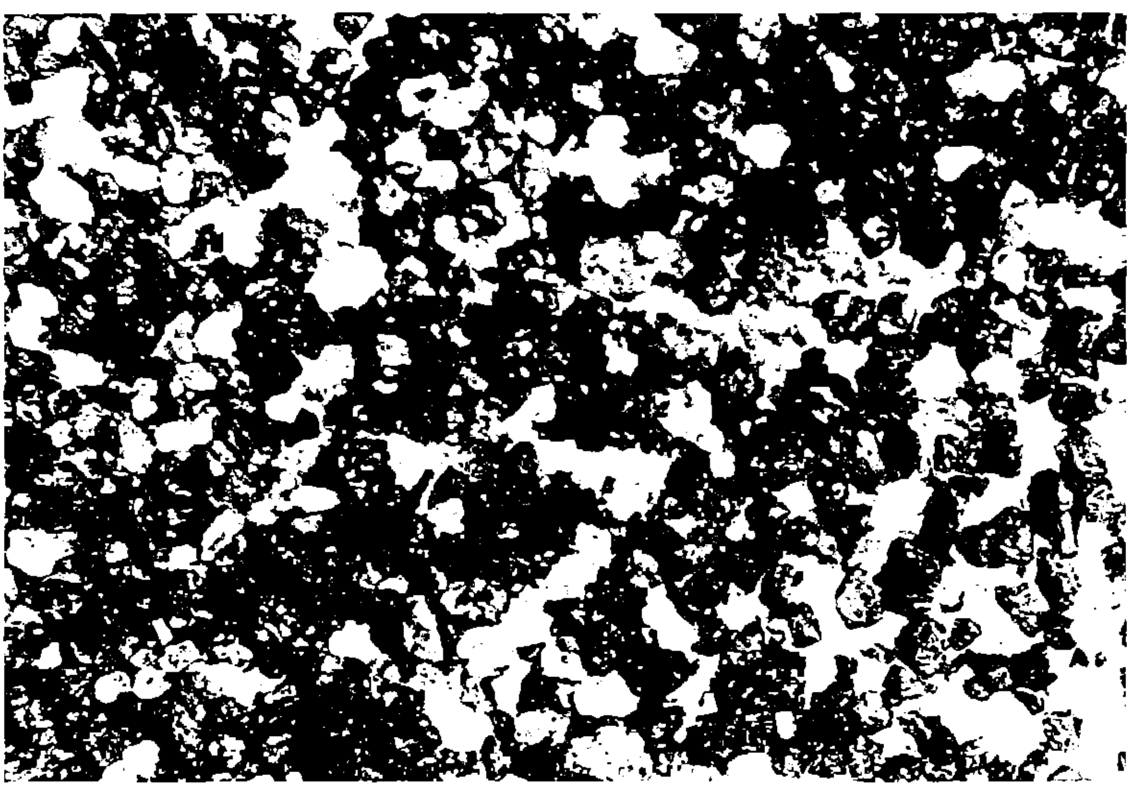

Fig 6 Pan concentrate from basal gravels, dominantly cassiterite and quartz. Note the iron/humic staining. x 12

all monocrystalline granitic quartz and the gravels are composed of mixed lithology pebbles, comprising in order of abundance, granite, Oonah Formation pelites and psammites, and vein quartz. The large majority of the granite clasts (estimated > 95%) are a quartz tourmaline lithology, identical in hand specimen texture and colour to the quartz tourmaline nodules which occur in the White Granite portion of the northern margin of the Heemskirk Granite (Hajitaheri, 1985).

The most likely provenance for the host sediments at Tasman River, considering the clay, sand, granules and pebbles, is the northern Heemskirk Granite during its unroofing in the Middle - Late Tertiary.

The stratigraphic relationship of the sedimentary facies exposed at both the Tasman River and Laffer alluvial workings shows a complex vertical and lateral stratigraphy with multiple erosion surfaces and lenticular beds, often pinching out over a scale of several metres. Extremes in transport and depositional energy and frequent shifts in the loci of deposition and erosion are demonstrated by the juxtaposition of coarse gravels, sands, clays and concentrations of plant fragment debris. The abundance of fossil plant material indicates an onshore freshwater depositional system and when the sedimentary facies provenance and drainage geomorphology are considered, a braided fluvial system is likely.

Gravel, coarse sand/granules, and clay/fine sandy clay bodies are present in approximately equal proportions in the outcrop observed and the main facies recognised are as follows:-

1 Relatively thin, well sorted, horizontal, laterally discontinuous gravel units

2 Relatively thick, less well sorted, horizontally stratified gravel units

3 Trough and planar cross bedded granule and coarse sand units with sandy clay matrix.

4 Lenticular units of clay, sandy clay and fine clayey sand with some pebbly beds. Locally the lutites are lignitic.

Modern fluvial deposits have beed classified on the basis of their facies profiles and the Tasman River tin deposits closely resemble the cyclic deposits of "distal gravelly braided rivers" (Miall, 1978, Rust, 1978). A modern example of this river type is the Donjek River, Canada (Miall, 1978) and the facies profile for this river is analogous to the Tertiary tin deposits of Tasman River and to the deep leads of North East Tasmania (Morrison, 1989).

Braided rivers are multi channel, low sinuosity systems, in contrast to meandering rivers. Braided rivers are confined to valleys and therefore do not have the dispersive morphology of alluvial fans or deltas. They are characterised by; migrating sandy point pars and transverse bars with slip face foreset deposition during periods of increasing flow, frequent flood/low water cycles with high energy transport of bedload gravel into intra channel bars and lag sheets during flooding, and extensive ponding of water laden with fine suspended sediment during the decreasing flow regimes.

Reconnaissance panning of the various sand and gravel facies exposed in the old mine workings shows that the basal well sorted gravels (Fig. 5) are heavily enriched in detrital cassiterite and although no grades were quantified there is clearly potential to achieve ore grades over a mineable thickness, providing the thickness of low grade to barren facies is tolerable. A program of pattern drilling is needed to quantify grades and map out the overburden units.

The cassiterite occurs as a 100-500 micron fine-medium sand (Fig. 6) in a heavy mineral concentrate dominated by cassiterite (visually estimated at approximately 80%, excluding the quartz), with common tourmaline, topaz and composite cassiterite/quartz (Figs. 7 and 8) and traces of zircon, ? monazite and unidentified non-magnetic and magnetic opaques. Variable amounts of authigenic pyrite were observed in pan concentrates but this species is metastable and readily oxidises. Oxidised sulphide staining is common on some basement rocks and basal sediments. The abundance of cassiterite/quartz composite grains, topaz and tourmaline, together with the relativley coarse cassiterite size and the near absence of magnetite is strong evidence for a greisenised granite source rather than a St. Dizier-style (Roberts, 1989) skarn source.

IMPLICATIONS FOR EXPLORATION AND MINING

In addition to the general descriptions above, several observed aspects of the prospect geology need further discussion because of their potential to affect exploration and mining methods and tin product quality.

1 Diagenetic Cement and Hardpan

The sedimentary section is podzolised. Below the dark peaty soil, the upper sediments are bleached white due to the effects of groundwater cation leaching. The variable developemnt of iron hydroxide and humic cement (Figs. 9, 10) is concentrated towards the base of the section and although often these cements merely

Fig 7 Twinned cassiterite (centre), orthorhombic topaz crystals (right) and fragments of dark green and black tourmaline. x 25

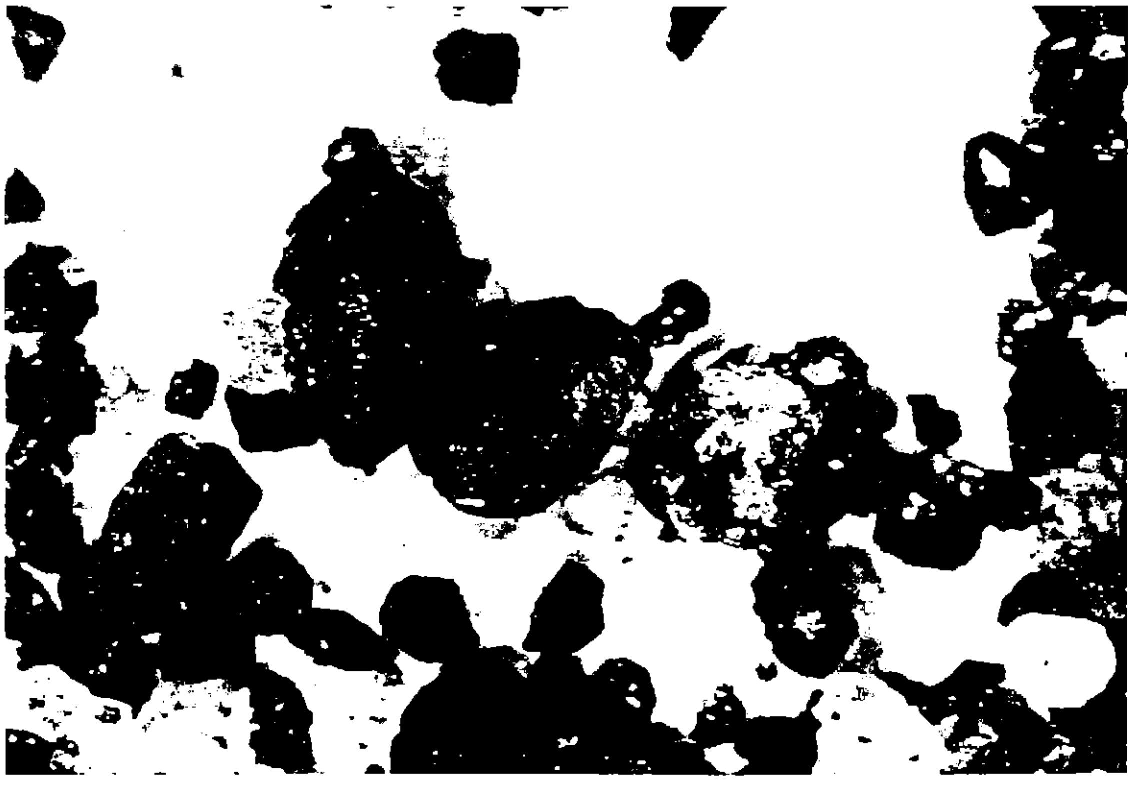

Fig 8 Cassiterite/quartz composite grains. The composites tend to be larger than the pure cassiterite, reflecting hyraulic equivalence during panning. x 25

Fig 9 Intensive iron hydroxide cement in basal sediments at the Laffer mine.

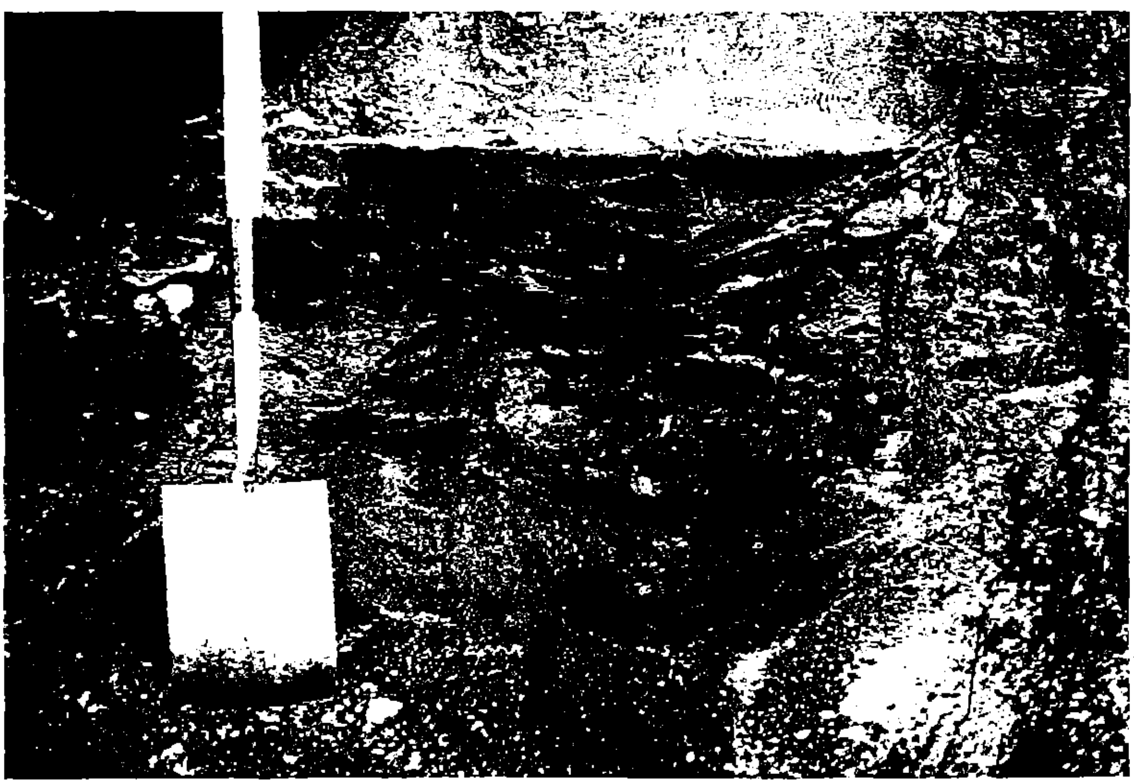

Fig 10 Humic cement in fine sand facies, Tasman River mine. Note lignified wood fragments right of centre.

stain and discolour the sediments, both types (but more often the ferricrete) can develop hard pan layers and irregular shaped bodies which require percussion drilling to penetrate during exploration and pre strip blasting during mining. Irregular blasting of intense ferricrete in the overburden sequence was required in the Pioneer placer tin mine, NE Tasmania, in the early 1980s. These cements also have the potential to sterilise some ore from hydraulic/gravity separation treatment.

The distribution and intensity of these cements in the subsurface cannot be usefully predicted and must be mapped from close spaced drilling data.

Ferruginous and/or humic staining was observed on the surface of unconsolidated "free milling" quartz and cassiterite grains in pan concentrate and this would slightly decrease the tin grade of a final product. In some beach sand mines similar staining on zircon and rutile requires caustic or acid washing to produce high grade products.

The biggest problem in the cement category at Tasman River appears to be silcrete which outcrops as discontinuous bodies on the low elevation terraces adjacent to the youngest generation of drainage incised into the button grass peat country in the main part of the prospect (Fig. 11). The silcrete has formed by the in-situ cementation of the sediments, including the surficial angular quartz lag gravels (Fig. 12) by silica in groundwater and the resultant material is extremely hard, certainly requiring blasting where masses are too large to shift by bulldozer or excavator.

2 Tin Product

As discussed previously, 100-500 micron cassiterite sand is by far the dominant heavy mineral in concentrate and as the next most abundant heavy minerals, tourmaline and topaz, have specific gravities much less than cassiterite (7.0 vs 3.2 and 3.5), concentration by hydraulic and gravity separation, using jigs, spirals and tables, should be effective. Contamination via composite grains and surface staining is present but visually similar cassiterite concentrates consistently returned +70% Sn average product in the Ringarooma Valley placer mines in N.E. Tasmania during the early 1980s.

3 Water Table and Sediment Depth

High winter water tables are characteristic of the button grass peat country which covers most of the untested prospect. Seasonal

Fig 11 Dissected silcrete on drainage terrace surface, west of Healy Creek, near the northern boundary of E.L. 30/92.

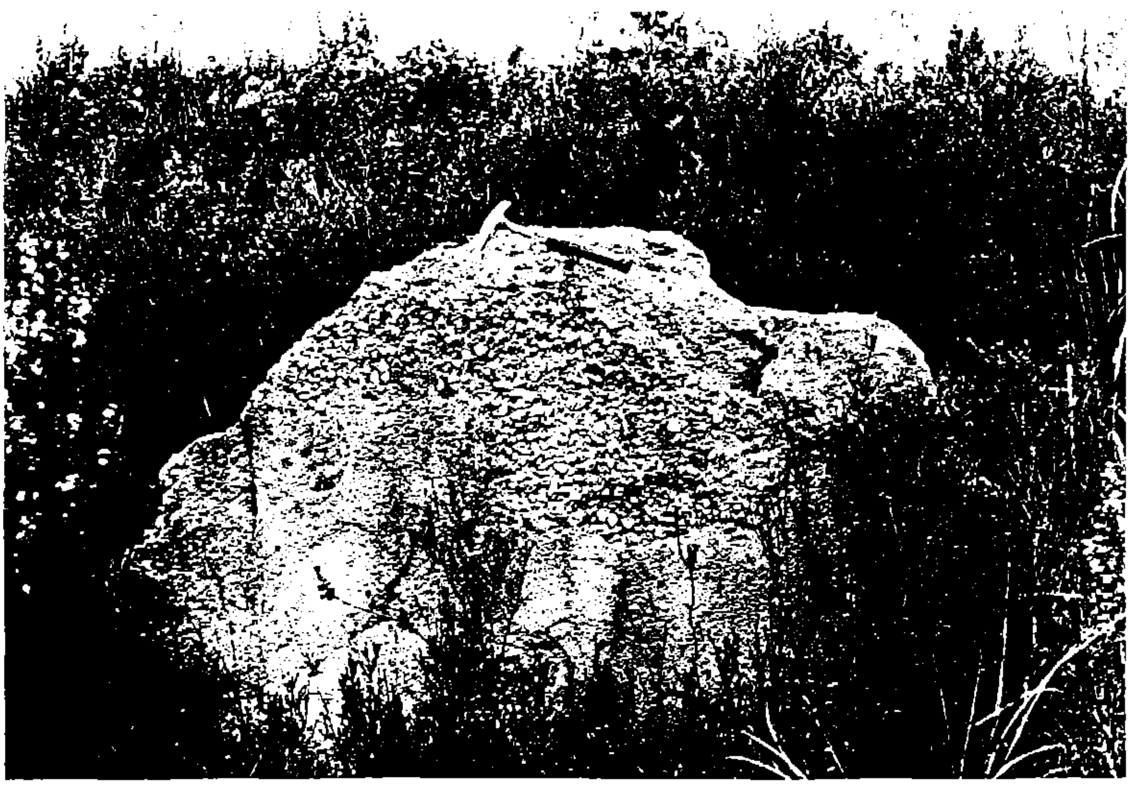

Fig 12 Silcrete boulder showing bedding and pristine fabric in angular quartz gravel.

fluctuation of the water levels, together with sediemnt depth, overburden to ore horizon boundaries and the nature of the silcrete and ferricrete horizons will be the major ground condition factors determining the advantages of dredging versus excavator to truck mining methods.

The button grass peat soil should be well suited to pre-stripping and stockpiling for rehabilitation.

CONCLUSIONS AND RECOMMENDATIONS

1 A valid exploration target with a surface area of at least 8 km^2 is indicated and approximately 2 km^2 of prospective ground exists within E.L. 30/92, excluding the sub basaltic sediments. 2 km^2 at an average sediment depth of 10 metres represents some 30 million tonnes, or 3 million tonnes at an overburden to ore ratio of 10:1 (for example).

The target is a body of Middle-Late Tertiary braided fluvial gravels, sands and clays of predominantly granitic origin containing placer cassiterite of granite origin which is highly enriched in certain basal gravel facies.

2 Extreme ore grade variability is anticipated, and there is some contamination from composite grains and grain surface staining, but a cassiterite sand product grading +70% Sn should be achieved by hydraulic/gravity separation technology.

3 A 12 km^2 Exploration Licence should be secured over the distal extension of the prospect, currently vacant, prior to further field exploration. The following E.L. would cover the vacant ground.

S.E. Corner	346000E 5371000N
to	346000E 5372000N
	345000E 5372000N
N.E. Corner	345000E 5375000N
N.W. corner	343000E 5375000N

4 Future field exploration should be staged, with an initial, relatively quick and low cost stage to test the depth, cross sectional shape and sediment composition of the lead

Two or three profiles of mechanical auger holes, drilled with a rig such as a 2-3 tonne trailer-mounted Gemco, towed by a tracked vehicle, is recommended. A 4 inch diameter auger on such a rig should achieve depths of 30 to 40 metres in un-cemented materials and retrieve sufficient sample to log stratigraphy and basement and to qualitatively assess the tin content of the basal sediments. Valuable information on the water table and the sub surface distribution of heavily cemented materials would also be acquired.

If the outcome of this initial stage was positive, than a program of grid-based grade/tonnage determination drilling (using a method determined partly by the performance of the auger) and/or bulk sample pitting or dredging would be recommended.

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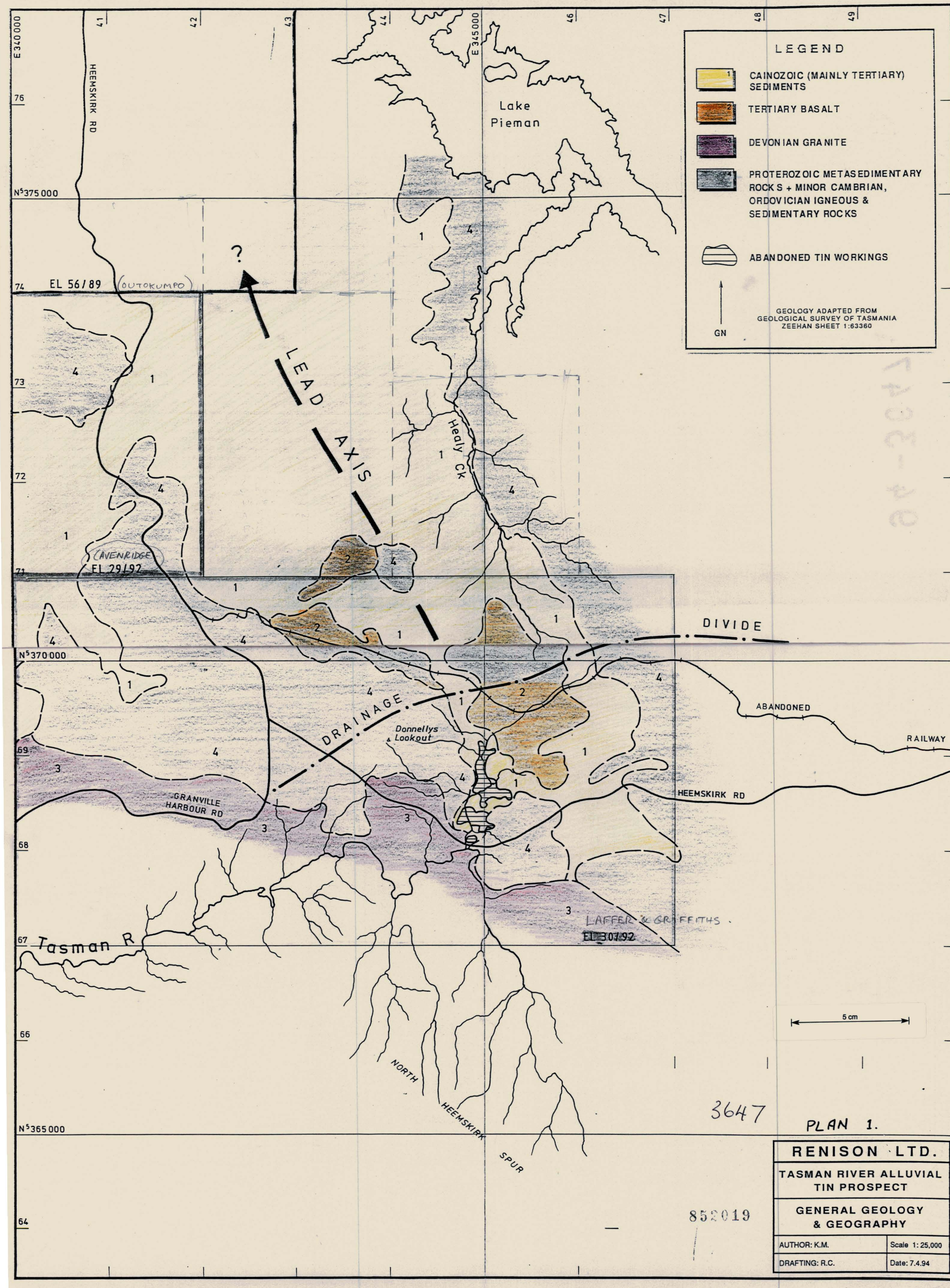

LEGEND
1 CAINOZOIC (MAINLY TERTIARY) SEDIMENTS
2 TERTIARY BASALT
3 DEVONIAN GRANITE
4 PROTEROZOIC METASEDIMENTARY ROCKS + MINOR CAMBRIAN, ORDOVICIAN IGNEOUS & SEDIMENTARY ROCKS
ABANDONED TIN WORKINGS
GN
GEOLOGY ADAPTED FROM GEOLOGICAL SURVEY OF TASMANIA ZEEHAN SHEET 1:63360
E340 000
41
42
43
44
E 345 000
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48
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N⁵375 000
N⁵370 000
N⁵365 000
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74
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69
68
67
66
64
HEEMSKIRK RD
Lake Pieman
EL 56/89 (OUTOKUMPO)
?
LEAD AXIS
Healy Ck
CAVENRIDGE
EL 29/92
DIVIDE
DRAINAGE
Donnellys Lookout
ABANDONED RAILWAY
HEEMSKIRK RD
GRANVILLE HARBOUR RD
LAFFER & GRIFFITHS
EL 30/92
Tasman R
NORTH HEEMSKIRK SPUR
5 cm
3647
PLAN 1.
RENISON LTD.
TASMAN RIVER ALLUVIAL TIN PROSPECT
GENERAL GEOLOGY & GEOGRAPHY
AUTHOR: K.M.
Scale 1: 25,000
DRAFTING: R.C.
Date: 7.4.94
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