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THE GEOLOGY AND MINERALISATION

OF MT BISCHOFF

by

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1. INTRODUCTION

Early in August 1974 work was undertaken to evaluate the present economic potential of the Mt Bischoff tin mineralisation in the light of the current prices for that metal. The "indicated" and "potential" tin ore tonnage were determined and an investigation carried out on the presence of possible by-products such as fluorite.

An endeavour is made here to present a comprehensive report collating all available geological, mineralogical and structural data gained during the past 10 years.

Consequently this report, is largely based on the results of field work and investigations by D.I. Groves, M. Solomon, R. Fitch, J. F. Lambert, K. G. Chappel and others (see references). In addition to and complementing the above, work was conducted during August-November 1974 which included: costeaning, geological mapping, core logging, thin section and mineragraphic studies.

2. PREVIOUS WORK

Since World War II the tin ores of Mt Bischoff have been intermittently worked on a small scale by tributors, and various surface investigations carried out by a number of mining companies.

In 1964, Mt Costigan Mines Ltd., later joined by Broken Hill South, extensively drilled and prospected the central mine area, (lease No. 3AP/AM), in an effort to prove the ore reserves remaining beneath the old workings. However, this work was largely unsuccessful, mainly through faulty interpretation of geological and structural features.

In September 1964 a joint venture, Comstaff Pty. Ltd., was formed by Mt Costigan, Broken Hill South and AAA. Comstaff undertook to further explore the Mt Bischoff area to test for "the suitability for development for the production of tin metal on a commercial basis."

Between 1964 and 1970, exploration programmes completed included: surveying, geological mapping, rock sampling and diamond drilling.

Drilling was carried out in two stages, during which a total of approximately 30,000 feet was drilled in 68 holes.

Drill holes B1 to B60 (B-series) were completed in stage one, whereas Drill holes AAB1 to AAB8 (AAB-series) were completed in stage two.

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Subsequently, tonnage estimations were made and the project temporarily abandoned. Early in 1974 it was decided to re-evaluate the mine and to determine whether additional drilling could improve the indicated reserves.

3. HISTORICAL NOTES

Blocks of tin ore were first discovered in December 1871 by James Smith in the alluvium of Tinstone Creek on the south-west slope of Mt Bischoff.

In mid 1872, Smith returned to the area to search for the source of the blocks found in the creek bed (Reid 1923), which was found on the mountain, later named Mt Bischoff. In 1873 the Mt Bischoff Tin Mining Company was formed and after some initial difficulties production was started.

Up to 1898 an annual average of 2200 tons of tin oxide was won from the mountain. After 1929 large scale mining operations ceased and the mine was let to tributors until 1943 when the Commonwealth of Australia mined out the readily available ore following the Japanese occupation of South East Asia. In 1947 the tributors again began sporadically working the area. Total production up to 1955 was of 55,000 tons of tin from 5½ million tons of ore, an average of 1.4% SnO₂ (Gillies 1962). The bulk of this production was obtained between 1891 and 1921 as shown in the table below:

TABLE 1 - (data from Reid (1923))

<u>Decade Ending</u>	<u>Ore Production</u>		
	<u>Ore Treated (tons)</u>	<u>%Sn</u>	<u>SnO₂ Recovered</u>
1891	867,000	2.99	37,088
1901	955,000	1.61	22,022
1911	1,342,318	0.56	10,803
1921	1,360,371	0.31	7,066
<u>TOTAL</u>	<u>4,524,689</u>	<u>1.17</u>	<u>76,979</u>

4. GEOGRAPHY

4.1 Location (Inset in Ill No. TAS-2-646)

Mount Bischoff is located in the Waratah district north-west Tasmania. Good sealed roads unite the township with Burnie (sea port) and Wynyard (airport) on the northern coast of the island. Eleven miles east of Waratah is the Guilford junction of the railway line between Zeehan, Roseberry and Burnie. The township of Waratah (inhabitants 125) is about one mile south of the main workings.

4.2 Topography

The dominant topographic feature of the district is a dissected plateau which has an altitude of 2,000 - 2,100 ft above sea level. Rising above the plateau are mountains such as Mt Bischoff (2,596) above sea level and Mt Cleveland, 3,200 ft above sea level. The shape and prominence of Mt Bischoff are due to its backbone of quartz-porphyry dykes.

Two main drainage systems are developed in the area, and are separated by a water shed formed by the Magnet Range. The Pieman river 30 miles south of Waratah has a westerly course. The Arthur river flows to the north-west for 35 miles and then swings to the west. The Waratah river flows along the north and eastern flanks of Mt Bischoff and is a tributary to the Arthur river.

5. GEOLOGY5.1 Regional Geological Setting (Ill. No. TAS-2-675)

The Mt Bischoff-Waratah district is characterised by a south-west trending inlier of upper Pre-Cambrian sediments forming an anticlinorium whose flanks are overlain by a thick sequence of Cambro-Ordovician sediments and Silurian (?) igneous rocks. These are in turn unconformably overlain by Tertiary sediments and lavas. Felsic igneous rocks of Devonian age locally intrude the Pre-Devonian rock sequences. The Mt Bischoff inlier is located between two major Pre-Cambrian structural units: the Rocky Cape geoanticline to the north-west and the Tyennan geoanticline to the south-east. Flanking the Tyennan anticline, towards the Mt Bischoff side, is the Mt Reid volcanic arc with its felsic volcanites and minor intrusives. Upper Cambrian and Ordovician marine sediments overlie the volcanics and occur mostly on large synclinal structures. Cambrian sediments, volcanics and ultramafites occur around and to the north-west of Mt Bischoff and adjacent to the south-east margin of the Rocky Cape geoanticline. About 20 miles to the north-east and 5 - 10 miles to the south-west respectively, are the Husetop and Meredith granite batholiths both of Devonian age.

Tectonic movements in the north-west of Tasmania associated with a Devonian orogeny produced broad NNE trending faults paralleling the NNE margin of the Tyennan geoanticline. (Solomon and Groves 1963). Stress patterns caused the development of east and north-east folding in the Waratah area of which the main structural feature produced is the Mt Bischoff anticlinorium.

5.2 Stratigraphy and Geological History (Ill Nos. TAS2-646, 674, 675)

The basal rocks in the area are the Upper (?) Proterozoic Mt Bischoff beds which were previously referred to as the Mt Bischoff Series (Reid 1923). These sediments were deposited in shallow water environments and consisted of sands, silts and marls. Chemical precipitation of dolomite occurred towards the end of the sedimentary cycle. A period of erosion with minor tectonic activity followed. (Solomon and Groves 1963)

In Cambro-Ordovician times sedimentation occurred again resulting in the deposition of a thick succession of greywacke, mudstone and sandstone. Volcanic activity took place and produced tuffs, breccias and spilites. (Dundas series of Reid (1923)). Ophiolite type rocks of possible Silurian age intrude these early Paleozoic sequences.

A major orogeny occurred between the lower and middle Devonian and resulted in the arcuate NNE trending folds characteristic of NW Tasmania. Following this folding period and marking the

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the end of the Paleozoic geological events, is the intrusion into structural highs of granitic batholiths such as the Meredith and the Husetop granites.

At Mt Bischoff a narrow granitic "cupola" probably protruding from the Meredith batholith, is postulated to have intruded the crest of the Mt Bischoff anticlinorium. Tensional stresses in the sediments, due to the uplift produced by the intrusion, resulted in the familiar Y-shape fracture pattern. Quartz-porphyrines dykes were emplaced along these fractures.

The Tertiary period is heralded by peneplanation and subsequent deposition of conglomerates, gravels, siltstones and ligneous clays. Outpouring of basaltic lavas followed.

Below is a lithostratigraphic sequence adapted after Solomon and Groves (1963), Chappel (1971) and Reid (1923).

<u>ERA</u>	<u>PERIOD</u>	<u>LITHOLOGY</u>
<u>CENOZOIC</u>	<u>Quarternary</u>	Gravels and alluvium
	<u>Tertiary</u>	Basalts and tuffs (50' - 150' thick) Siltstone, gravels, lignite seams, ligneous clays. Basal conglomerate (contains Permian boulders and SnO ₂)
<u>MESOZOIC</u>	<u>Jurassic</u>	Dolerite dykes
	<u>Permo-Carboniferous</u>	? absent or eroded ?
	<u>Devonian</u> (F-Sn and Pb-Zn-Ag mineralising event).	Qtz-feldspar porphyry Granodiorite and adamellite intrusive into both the Bischoff series and Cambrian rocks
	<u>?Silurian?</u>	Ultrabasite and basite intrusives(?)
	<u>?Cambrian?</u> (Ophiolitic Rocks)	?Sandstone, shale, limestones? (Reid 1923) Intrusion of ultrabasites and basites (?)

6.

PALEOZOIC

[?Cambrian?
(Ophiolitic Rocks)

pyroxenite, peridotite,
serpentinite, gabbros-
Magnet dyke (albite-
porphyrite)

[Cambro-Ordovician
(Dunda series)
or
(Waratah River sequence
+ 10,000 ft)

Laminated to massive
sandstone greywacke,
cherts, breccia,
sandstone - lavas and
pyroclastic (basalts)

UNCONFORMITY

PRECAMBRIAN

[Upper(?) Proterozoic
E-W inlier Mt Bischoff
Series or Beds
+ 4,000 ft.

Alternating quartzites
and sheared shales and
siltstone.

Dolomite and dolomitic
shales.

Mt Bischoff area:
Black shale sequence
(+2000' thick)

Dolomite and dolomitic
shale (0-200' thick)

Grey shale sequence
(+2000' thick).

5.3 Sedimentary Rock Sequences

Description of these lithologies will be confined to rocks in the Mt Bischoff mine area only. For full description and discussion of other rock groups, the reader is referred to the works of Solomon and Groves (1963) Reid (1923) and Chapple (1971).

5.3.1 Proterozoic - The Mount Bischoff Beds

Rocks of the Mt Bischoff beds occupy an EW trending zone of about 8 sq. miles between the Magnet Mine to the SW and Deep Creek to the NE, and Waratah township to the south. The beds consist of alternating quartzite, siltstone, shale and argillite. A dolomite horizon is present at roughly mid position in the sequence. This bed was used as a marker horizon to work out the structure of the area. In the mine area the succession is as follows: (Solomon and Groves (1963) and Chapple (1971).

Black Shale Sequence

+2,000 ft

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PALEOZOIC

[?Cambrian?
(Ophiolitic Rocks)

pyroxenite, peridotite, serpentinite, gabbros-Magnet dyke (albite-porphyrite)

[Cambro-Ordovician
(Dunda series)
or
(Waratah River sequence + 10,000 ft)

Laminated to massive sandstone greywacke, cherts, breccia, sandstone - lavas and pyroclastic (basalts)

UNCONFORMITY

PRECAMBRIAN

[Upper(?) Proterozoic
E-W inlier Mt Bischoff
Series or Beds
+ 4,000 ft.

Alternating quartzites and sheared shales and siltstone.

Dolomite and dolomitic shales.

Mt Bischoff area:
Black shale sequence (+2000' thick)

Dolomite and dolomitic shale (0-200' thick)

Grey shale sequence (+2000' thick).

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Black Shale Sequence

+2,000 ft

Black carboniferous shale and argillite, interbedded quartzites and grey shales.

? unconformity ?

Dolomite and Dolomitic Shale Sequence -0-200 ft

Grey Shale Sequence +1,800 ft

Grey shale, argillite, quartzite and minor carbonaceous shale and argillite.

Argillaceous rocks of the Black Shale Sequence are commonly sheared and thinly bedded although some massive units have been observed (Solomon and Groves 1963). These are fine grained (0.03-0.01 mm size grains) and are made up of muscovite, sericite and quartz. Framboydal pyrite has been observed. Carbonaceous material is present and imparts the dark colouring to these rocks.

Quartzite and sandstone of the Black Shale Sequence are thinly bedded to massive. They consist mainly of quartz and muscovite ranging from 0.1 - 0.5 mm in diameter. Disseminated pyrite also occurs. Accessory minerals include zircon, rutile and tourmaline (Chapple 1971).

The dolomite horizon reaches a maximum thickness of 250' at Mt Bischoff and is 100' thick some 2 miles north of the mountain (Solomon and Groves 1963). The dolomite rock is creamy to pale grey when fresh, brown when weathered. Some banding is visible in places and may represent bedding. Two analysis of this dolomite, reported by Solomon and Groves (1963), are given below:

wt%	I	II
CaCO ₃	54.6	53.9
MgCO ₃	43.5	44.1

I = Greisen Face

II = Main tunnel

Rocks of the Grey Shale Sequence, which are shale, argillite, siltstone, are finely laminated with quartz and muscovite as the predominant grains in a matrix made up of sericite and quartz. No carbonaceous matter was noted, although thin and discontinuous lenticular beds of carbonaceous shale may be present in places. Tourmaline is found locally. Muscovite and sericite are much more dominant in the fine shales than in siltstone. This feature produces the fine laminated appearance as described by Groves and Solomon (1963). Graded bedding has also been observed along with flow casts and ripple marks near the summit area, argillite and siltstone show intense flow folding and were termed "rheomorphics" by Lambert (1969). Locally these exhibit features which may be interpreted either as slump breccias or as tectonic breccias. Thin sections seem

to indicate a tectonic origin (Kapelle 1969). However, Chapple (1971) reports that some brecciated samples are of pre-consolidation origin and therefore they are "slump breccias that have undergone later tectonic brecciation and folding."

The present author ascribes this later tectonic brecciation as due to deformation effects produced by the granitic intrusion.

5.3.2 Cambro-Ordovician Sediments:

These are outside the mine area and have not been re-examined in the present report. Generally, the Cambro-Ordovician rocks are reported to be unconformably overlying the Mt Bischoff Beds. The sediments are fine grained and consist of mudstone, greywackes, chert, sandstone.

5.3.3 Tertiary and Quarternary Sediments:

Conglomerates, gravels, siltstones and lenses of lignite form a sequence some 50-100' thick. Some cassiterite was found in the basal beds.

Recent gravel and alluvium are well developed in the Waratah River valley especially at the confluence with Cliff creek.

Detrital cassiterite is locally abundant and is presently being sluiced by tributors.

5.4 Igneous Activity (Ill. Nos. TAS-2-674, 675)

5.4.1 Introduction:

In the Waratah district, five periods of igneous activity are represented. These are:

- | | | |
|---|---|---|
| (i) <u>Proterozoic</u> | - | Felsic pyroclastic rocks |
| (ii) <u>Cambrian (?)</u> | - | (a) Basaltic lavas and tuffs |
| | | (b) Mafic and ultramafic rocks of ophiolitic association |
| (iii) <u>Devonian</u>
(Metallogenic Epoch) | - | Intrusion of Felsic igneous rocks including granodiorite and adamellite batholiths with related quartz-feldspar porphyry dykes. |
| (iv) <u>Jurassic</u> | - | Dolerite dykes |
| (v) <u>Tertiary</u> | - | Plateau basalts and tuffs |

5.4.2 Proterozoic Activity:

Some volcanic activity during the Proterozoic period is testified by the presence of tuffaceous units intercalated within the Mt Bischoff Beds. In DDH's B31, B44 and B66, thin sections from various depths revealed these to be typical volcanic tuffs. Main components are: angular quartz, in one case with characteristic embayment features, and sericite in a Fe-rich ground mass. The Proterozoic activity was probably of explosive and acidic type.

5.4.3 Cambrian Activity:

Volcanic rocks of this age are not represented in the mine area. They are confined to the Magnet Mine and are generally porphyritic spilites and some keratophyres. Detailed description of these rocks were given by Groves (1968). Mafic and ultramafic intrusives occur in a wide belt south west of the Waratah district. These are mostly peridotite, pyroxenite, and serpentinite. A mafic intrusion (Diabase?) along the Mount Bischoff beds and Cambrian rocks contact constitutes the so called Magnet Dyke. These rocks have been recognized as belonging to the same tectonic phase, and they form a typical ophiolite association together with spilites and gabbros.

5.4.4 Devonian Activity: (Ill. No. TAS-2-676).

(a) The Meredith Granite Batholith

The Meredith Granite is a 120 sq. m. batholith which extends from the vicinities of Renison Bell in the south to within two miles of Waratah. The batholith is of adamellitic composition, having approximately equal amounts of K-feldspar and plagioclase. Two varieties are recognized: an even medium grained adamellite and a porphyritic adamellite. The latter apparently intrusive into the former (Reid 1923). The average composition of these rocks is orthoclase, oligoclase (An30), quartz and biotite. Minor components include hornblende, zircon, topaz and tourmaline. A modal analysis published by Solomon and Groves (1963) gave the following:

Total Feldspar	54.5%
Quartz	36.1%
Biotite	9.0%
Accessories	0.5%

The adamellite was dated at 353 ± 7 million years, (Brookes 1966) which places the intrusion at the end of the Devonian. The intrusion of the Meredith batholith resulted in a number of diapiric cupolas, one of which is believed to be emplaced at depth below Mt. Bischoff into the hinge of the Bischoff anticlinorium. The intrusion of the cupolas

produced tension in the overlying rocks causing fractures to develop in planes normal to the maximum stress. As a consequence, sets of fractures formed at angles of 45° to the axis of tension. These fractures were filled with quartz-porphyrines.

(b) The Quartz-Porphyry dykes:

The Mount Bischoff quartz-porphyry dykes are the most prominent feature in the area. The dykes are from 15-100' in width and up to 4,000 feet long, with preferential EW, NW and NE trends, dips are steep to the North and West, or vertical. The porphyries were dated at 349 ± 4 million years. (Brookes 1966).

Local pre-intrusion breccias occur along the walls of the dykes and vary from 2 to 20 feet in thickness. (Solomon and Groves 1963).

Close to the contacts flow banding may be present. Unaltered specimens of porphyry consist of large orthoclase and quartz phenocrysts set in a fine grained groundmass of orthoclase, quartz and minor plagioclase. A modal analysis of a thin section indicated:

25%	quartz phenocrysts
14%	orthoclase phenocrysts
59%	groundmass
2%	muscovite

Within the category of the quartz-porphyry dykes are several varieties which however, depend on the subsequent hydrothermal and pneumatolitic alteration of a primary porphyry rather than variations within the parent magma (Solomon and Groves 1963). This alteration is so extensive in places that the original texture of the rock no longer exists. The altered porphyries consist of a fine grained ground mass of quartz and topaz with sporadic sericite and talc. Fluorite and tourmaline are locally present. Sulphides are generally abundant and occur as fine specs or as lath shaped aggregates which replace feldspars.

(c) Chemical Analysis of Quartz-porphyrines:

Published chemical analysis of 7 samples are given in the Table below. (Solomon and Groves 1963).

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Chemical analyses of porphyries from Mt Bischoff (Solomon and Groves 1963)

	1	2	3	4	5	6	7
SiO ₂	73.78	66.92	70.16	68.98	68.64	72.30	76.69
TiO ₂	0.06	0.06	0.09	0.05	-	trace	+
Al ₂ O ₃	14.35	19.88	21.69	19.96	19.38	17.17	13.49
Fe ₂ O ₃	0.61	trace	0.14	1.05	0.21	trace	0.14
FeO	1.57	0.64	0.35	0.19	0.29	0.58	2.08
MnO	0.09	trace	trace	trace	trace	trace	+
MgO	0.62	0.24	0.22	0.28	0.31	0.29	0.60
CaO	0.44	0.36	0.20	0.20	0.68	0.28	0.46
Na ₂ O	0.40	0.05	trace	trace	trace	trace	0.08
K ₂ O	6.01	0.07	0.07	trace	trace	0.37	2.71
H ₂ O+	2.15	0.98	0.77	0.69	0.96	1.04	+
H ₂ O-	0.12	0.11	trace	0.05	0.24	0.19	+
P ₂ O ₅	trace	trace	trace	trace	trace	trace	+
CO ₂	+	+	+	+	+	+	+
FeS ₂	trace	6.62	2.19	4.86	5.85	3.91	+
Ca	+	0.02	trace	0.01	0.01	0.01	+
SnO ₂	+	0.07	0.13	0.16	0.08	0.16	+
F	+	6.48	6.63	6.86	6.46	6.15	+
<u>TOTAL</u>	100.20	99.77	99.94	100.39	99.86	99.94	99.64

Localities -

- 1, 2, 3 - White Face Dyke
- 4, 5, 6 - Western Dyke
- 7 - White Face Dyke

Analyst for 1-6 - Dept of Mines Assay Laboratories, Tasmania. 1962

Analyst for 7 - A. D. Mackay (in Reid, 1923).

The marginal zones of the dykes usually contain more topaz and other alteration products than the central zones. This suggests, according to Solomon and Groves (1964), that the pneumatolytic vapours were introduced along the brecciated walls of the dyke. Studies of fluid inclusions in fluorite and quartz were conducted by Groves and Solomon (1969). These workers showed that fluorite and quartz from later fissure veins were deposited over a temperature range of 170-380°C at a pressure of 750 atmospheres.

A study of stability fields by Chapple (1971) confirms the above and also indicated that the magma which originated the porphyries had an excess of alkalis which would have led to the early crystallisation of K-feldspar and quartz. Also it is apparent that alkali enrichment (low Na/K values) increases with increasing temperature of alteration. From the results of analysis, Groves (1968) has shown that Al, Fe, F, B, S, Ca, Sn, Cu were introduced by hydrothermal fluids. The effect of localised influxes of pneumatolytic vapours is also discernable in the dolomite horizon and country rocks adjacent or in contact with the porphyries. The dolomite, for instance, was replaced by pyrrhotite, pyrite, talc, quartz and locally cassiterite. Sediments in the mine area suffered re-crystallisation of muscovite and quartz and have had topaz, carbonate and fluorite introduced. Tourmaline is in places abundant within the rheomorphic sediments near the summit.

5.4.5 Jurassic Activity:

This consisted of intrusions of dolerite dykes like that north of the Magnet Mine.

5.4.6 Tertiary Activity:

A sheet of basaltic lavas some 50-150 ft thick occurs over the plateau area between Waratah and Guilford on the Magnet Range. The basalts consist of labradorite, augite and magnetite.

5.5 Structure

5.5.1 Regional:

As mentioned in section 5.1 the Waratah district lies between two stable Proterozoic blocks; the Rocky Cape geanticline in the NW and the Tyennan geanticline in the SE. Emergence of the Rocky Cape block resulted in the formation of a basin and deposition of the Mt Bischoff Beds. Orogenic movements transported the Bischoff Beds to the SE placing them against the Tyennan Block with resultant large folds (Chapple 1971).

The ENE-WSW trending Mt Bischoff anticlinorium constitutes the main structural feature in the area and affects the

Pre-Cambrian rocks only. The anticlinorium has a wavelength of about 5 miles and an amplitude of 2 miles. It has the overall shape of a dome and plunges gently to the west and perhaps to the east too. The overall structure is distorted by numerous superimposed folds.

Devonian faults are of tensional character and have W or NNW trends. An important fault of this age displaces minor westerly folds of the Mt Bischoff anticlinorium. Faults of post-intrusive age are seen to cut the porphyry dykes and are mineralised.

5.5.2 Mine Area: (Ill. No. TAS-2-676)

Small wavelength E-W folds ($\lambda = 100-1000$ ft) were mapped by Solomon and Groves (1963) using the base of the dolomite as a marker horizon. These folds are interpreted as representing plications on the limbs of the Bischoff anticlinorium. Smaller scale folds ($\lambda = 2-100$ ft) with a dominant ENE-NE trend are well developed in some areas. In general small scale structures show a high degree of complexity.

Chapple (1971) in his structural study of Mt Bischoff reached the conclusion that along the south edge of Happy Valley there is the surface of an overthrust fault. It is postulated that this has resulted from an overthrusting of the dolomite and Grey Shale Sequence over the overlying Black Shale Sequence.

The main zone of porphyry dykes is concentrated in the axial surface of the anticlinorium. The stress pattern related to the emplacement of the cupola is responsible for the dominant dyke trends in the district.

The predominant faults in the area are Devonian and have an average strike of 340° with general steep westerly dips. Some of these are seen to cut the porphyry dykes.

Faults which have a subparallel alignment to the limbs of folds are common. These have affected the dolomite and are possibly high angle reverse faults (Chapple 1971). In Brown Face faults of this type have produced "Keel" structures, whereby the dolomite horizon sits like a spoon on top of the Grey Shale Sequence.

Well developed joints, strike consistently at 340° and usually carry quartz and cassiterite. They occur in both Cambrian and Proterozoic sediments and the porphyry themselves.

6. MINERALISATION

6.1 Introduction

"Arc types evolve in parallel with the evolution of continental masses and so particular ores are, as a consequence, concentrated in certain places at certain times," (Stanton 1972). The Mt. Bischoff tin and lead-zinc-silver occurrences belong to the Plutonic vein type deposits as defined by Stanton (1972). These are part of the Tasman Geosyncline Paleozoic tin Province, north-western Tasmanian district.

Tin mineralisation along with Wolfram and Molybdenum is a late event in the orogenic time scale. The event coincides with the emplacement of K-rich granitoids, usually post-tectonic. Thus the late to post-orogenic K-granitoids constitute the tectono-lithological environment of Sn-W-Mo mineralisation. This is well exhibited in the Tasman Geosyncline. Again in the words of Stanton (1974)... "the recognition of the concept of styles of mineralisation and the fact that each style is a characteristic part of a tectono-lithological medium, has important implications for mineral exploration". Thus each style of mineralisation is an intrinsic reflection of the geological environment in which it occurs.

The understanding of these parameters greatly increase the effectiveness of mineral exploration.

6.2 Regional Tectono-lithological environment of tin mineralisation in NW Tasmania

The position of the Mt. Bischoff beds between the Rocky Cape block and the Tyannen nucleus and their being surrounded by Cambrian sediments and volcanics of the Dundas trough, is an important factor.

The Dundas volcanics include rocks which are interpreted as being of ophiolite type and therefore may represent remnants of oceanic crusts. The crust, it is assumed, originally separated the Rocky Cape from the Tyennan block. Therefore the geological framework of this important metallogenic province is: isolated continental Pre-Cambrian blocks separated by oceanic crust, on which Paleozoic sediments and volcanics accumulated. Solomon and Griffiths (1974) suggested that the two Pre-Cambrian blocks started approaching one another during early to late Cambrian. A subduction zone was created in the Dundas trough. The oceanic crust was disrupted and thrust into the younger sediments and volcanics.

The Tabberrabbean orogeny commenced in Late Ordovician to Devonian times with characteristics of an Andes Cordilleran type margin. Typical of this situation is greywacke-shale sedimentation, calc-alkaline volcanism and syn to post-tectonic granitic intrusions. These events are a direct consequence of the subduction zone created in the Dundas trough.

The calc-alkaline magmas originated above the zone are exemplified by the Mount Reid volcanics which are dominantly rhyolites, dacites, andesites and minor basalts. In late stages of the Tabberrabbean orogenic event and during its aftermath, an intensive period of granitic activity took place. The tectonic plutons, now exemplified by the Meridith and Husetop batholiths, produced a Sn-F-Pb-Zn-Ag mineralogenic district.

6.3 Tin Mineralisation at Mt. Bischoff Ore Mineralogy

6.3.1 Introduction

The Mt. Bischoff tin mineralisation is limited to an area of roughly 2000 feet radius (Ill.No.TAS-2-675) with its centre situated in the Brown Face open cut. This mineralisation is contained in three distinct lithological units; these are:

- (i) dolomite (dolomite-ore)
- (ii) quartz-porphyry (porphyry-ore)
- (iii) rheomorphic sediments

6.3.2 Mineralisation in dolomite (dolomite-ore)

This is a replacement of the dolomite bed at Mt. Bischoff. This bed, probably folded before the mineralising event, was locally replaced by pyrite, pyrrhotite, sphalerite, talc, tremolite and quartz. Distribution of mineralisation within the body is irregular, some portions having massive sulphides while others are sulphide free (Groves and Solomon 1963). However, sulphides show a rough zonal arrangement whereby in sulphide-rich zones, pyrrhotite occurs in the centre with pyrite and sphalerite at the periphery. Replacement mineralisation of the dolomite bed was confined to a small area pervaded by a fracture system.

Stilwell (1943) divided the dolomite-ore into three dominant types.

- (i) The carbonate-sulphide ore consisting of carbonates with veinlets of pyrrhotite, pyrite and arsenopyrite. Cassiterite occurs in coarse carbonate and

is locally coated with stannite.

- (ii) Massive pyrrhotite-pyrite ore. This is made up of masses of pyrrhotite, pyrite, marcasite with traces of stannite and chalcopyrite.
- (iii) The talc ore shows pyrrhotite bands with rare cassiterite crystals.

A study of 7 polished sections from mineralised dolomite showed that the most common ore minerals are represented by pyrite, pyrrhotite, marcasite and sphalerite. Variable amounts of cassiterite and stannite are associated with these sulphides. Chalcopyrite occurs locally. Fluorite and sellaite are common.

Pyrite occurs as subhedral to euhedral grains or polygonal aggregates. Grain size ranges from 40 to 500 μ and its relative abundance by volume is in the range of 20% to 85%.

Pyrrhotite may occur as inclusion in pyrite or elsewhere as anhedral aggregates up to 750 μ in size. It is usually replaced by marcasite and its relative abundance is between 5% and 40%.

Marcasite occurs as alteration product of both pyrite and pyrrhotite, more commonly the latter. In places it is colloform whereas in others it shows its typical twinning. Its percentage by volume is in the order of 5 to 40.

Sphalerite is seen in relative abundances of between traces to 10%. It is either enclosed in non-opaques or as marginal to pyrite-pyrrhotite aggregates. It may contain inclusion of stannite, pyrite or pyrrhotite.

Cassiterite has a relative abundance of between traces to 4% of the total volume. It usually occurs as trains of discrete grains or as patches marginal to pyrite-pyrrhotite aggregates.

Stannite occurs as traces, or locally up to 1% of the total volume. It is usually either in isolated grains or marginal to sulphides. It may occur as small aggregates in gangue.

Chalcopyrite, tremolite and arsenopyrite occur in small traces or locally as inclusions in sphalerite.

Fluorite (CaF_2) and sellaite (MgF_2) were detected by XRD in two specimens. These minerals may account for the high F values (up to 11%) in the mineralised dolomite.

6.3.3 Mineralisation in Quartz-Porphyrries (Porphyry-Ore):

Mineralisation in the quartz-porphyry dykes includes topaz, tourmaline, fluorite, pyrite, pyrrhotite, cassiterite, stannite, sphalerite and wolframite. These minerals generally pseudomorph, feldspar and/or quartz. Cassiterite crystals associated with quartz and tourmaline also occur along joint planes within the porphyry. A study of 12 polished sections from mineralised porphyry revealed the following:

Pyrite forms between 5% and 90% of the total volume of ore minerals. It occurs as euhedral to anhedral aggregates, locally replaced by marcasite. There are two distinct generations of pyrite. One is after pyrrhotite and can be distinguished by its lamellar structure. The other is older, is skeletal and replaces silicates.

Pyrrhotite makes up from 1% to 80% of the ore minerals volume. This sulphide is often replaced by marcasite. It occurs as discrete grains or aggregates locally marginal to pyrite.

Marcasite occurs always associated to and is in fact derived from pyrite and pyrrhotite. It may be colloform, and its relative abundance ranges from 1% to 10% of the total.

Stannite occurs as irregular patches or grains marginal to pyrite or pyrrhotite. Stannite is usually present from traces up to 3% of the total ore minerals volume. In places it rims equant grains of cassiterite.

Cassiterite makes up from traces up to, in one case, 90% of the total ore minerals content. It occurs as very fine grains aggregates, isolated crystals or as irregular patches.

Sphalerite is found in traces and it forms small isolated grains or as inclusions in pyrite or pyrrhotite.

Wolframite occurs as rare isolated crystals.

Fluorite, topaz and tourmaline are locally abundant and form part of the greisenization process of the quartz-porphyrries. Topaz is evident as acicular crystals and replaces feldspar or lines cavities. Fluorite and tourmaline occur as small crystals or veinlets. Groves and Solomon (1963) found that the marginal zones of the dykes contain more topaz and other alteration products than the inner zones.

6.3.4 Mineralisation in Rheomorphic Sediments:

Near and around the summit are heavily contorted and

and siltstones which in the vicinity of porphyry dykes have quartz-cassiterite veins filling tension fractures. The intensity of fractures as well as mineralisation decreases away from the dykes. At one stage an attempt was made to gain additional reserves by investigating the potential of the "rheomorphics". At an estimated grade of 0.2% Sn this would have presented an attractive low grade/high tonnage proposition. Surface exploration however, gave discouraging results and thus this possibility was abandoned.

6.3.5 Vein-type mineralisation:

A fourth category is the vein type tin mineralisation which fills fractures through both porphyries and country rocks and is considered a later mineralising event. The veins have NNW to WNW trends and strike lengths of up to 2500 ft with pinch and swell structures, and an average width of 2-3 feet. They were traced downdip for a little over 1000 feet. Minerals comprise cassiterite, pyrite, pyrrhotite, sphalerite, chalcopyrite, galena, stannite, wolframite, fluorite and topaz.

6.4 W, Pb-Zn Mineralization in Surrounding Areas. Primary Metal Zoning (Ill. Nos. TAS-2-675, 676)

Primary metal zoning is present in the Mt. Bischoff area and Waratah district. In plan view, and taking into account the erosion level, a central Sn-F zone passes outward into a W zone which is exposed some 1000 feet below the Mt. Bischoff summit in the Waratah river valley. This zone consists of large wolframite crystals in quartz-feldspar veins cutting sedimentary rocks. The W - zone passes into a large outer Pb-Zn-Ag zone, represented by sphalerite-galena with minor chalcopyrite mineralization. Deposits of Pb-Zn-Ag occur at Magnet Mine as a vein 10-15 feet in width at the contact with a porphyrite rock. Small pockets of Pb-Zn-Ag mineralization are also common throughout the Waratah district, usually in the form of small uneconomic veins.

Determinations of temperatures, using pyrrhotite and sphalerite (Arnold and Reichen 1962), indicate a local high at Mt. Bischoff with lower temperature zones outwards from the central Sn-F zone.

7. ESTIMATION OF ORE RESERVES (Ill. Nos. TAS-2-646, TAS-2-656 to 670)

7.1 Shape of Mineralised Zones

The mineralised zones shown on the sections have assay boundaries. Zones within the quartz-porphyry follow the shape of the dykes themselves, although most of this mineralisation seems to be confined to the central portion of the dyke rock. Mineralisation in the dolomite rock is marked by irregular rich pockets which seem to be governed by fracture zones, or in places, preferentially located near the contacts with the porphyry dykes.

In the rheomorphic sediments, tin mineralisation is confined to a large scale stress pattern area in the vicinity of the dykes. In detail this mineralisation occupies narrow zones.

7.2 Metal Values

Tin values in mineralised porphyry have a fairly restricted range of between 0.2% to 0.8%. Rarely values of 1% or more are attained and then only over small areas. The largest mineralised intersection is that obtained in DDH B9, where an average value of 0.4% Sn x 300' was obtained. The fluorite content is largely dependent on the presence of topaz and fluorite, but the influence of each is not known. Fluorine values range from 4% to 6%.

Wolfram has values of between 30 to 385 ppm, Bismuth ranges from 12 to 148 ppm. Molybdenum does not exceed 4 ppm. Zinc reaches concentration of up to 0.7%.

Mineralisation in dolomite is generally richer than that in the porphyry. Here tin values reach levels of up to 2%, fluorine from 5.6% to 11% and is due to fluorite and sellaite. Zinc ranges from 0.17% to 0.45%. Concentrations of Molybdenum, bismuth and wolfram were not determined.

7.3 Specific Gravity

Specific gravity determinations were carried out by AMDEL laboratories on three batches of ore samples. Results are given in Table 3.

TABLE III

<u>DDH No. 1</u>	<u>Sample No.</u>	<u>Depth in feet</u>	<u>Specific Gravity</u>	<u>Average</u>	<u>Type of ore</u>
B26	TE 615	256'	2.77	3.01	po-ore
	TE 617	266'	3.21		
	TE 619	276'	2.86		
	TE 621	286'	2.80		
	TE 623	296'	2.64		
	TE 625	306'	3.01		
	TE 627	316'	2.81		
	TE 629	326'	3.10		
	TE 631	336'	3.30		
	TE 633	346'	3.08		
	TE 635	356'	3.05		
	TE 637	366'	3.06		
	TE 639	376'	3.07		
	TE 641	386'	3.11		
	TE 643	396'	3.26		
	TE 645	406'	2.97		
TE 647	416'	3.10			
AAB3	TE 784	70'	2.86	2.89	do-ore
	TE 790	100'	2.85		
	TE 796	130'	3.04		
	TE 802	160'	2.86		
	TE 808	190'	2.86		
	TE 814	220'	2.88		
	TE 820	250'	2.88		
	TE 826	280'	2.87		
	TE 832	210'	3.00		
	TE 837	340'	2.82		
B19	TE 838	185'	3.01	2.98	po-ore
	TE 846	225'	2.84		
	TE 850	245'	3.18		
	TE 856	275'	2.95		
B48	TE 857	330'	2.96	2.96	po-ore
	TE 860	425'	2.95		
	TE 863	440'	2.91		
	TE 865	450'	3.00		
	TE 867	460'	2.91		

7.4 Previous calculations of ore reserves

Ore tonnage calculations were carried out by R. Fitch (A.A.A. Ltd) in March, 1970. Results are shown below:

Dolomite Ore	2.5	x	10 ⁶ t	@	0.77% Sn
Low Grade porphyry ore	2.8	x	10 ⁶ t	@	0.48% Sn
High Grade porphyry ore	0.125	x	10 ⁶ t	@	1.05% Sn
*included in low grade type					

These values were classified as "inferred tonnage". A second lot of calculations were made by H. Robinson in November, 1970.

His results were:

Dolomitic ore (West orebody)	0.238	x	10 ⁶ t	@	0.89% Sn
Dolomitic ore (East orebody)	0.047	x	10 ⁶ t	@	0.66% Sn
Total	0.33	x	10 ⁶ t	@	0.86% Sn
Porphyry Ore	0.888	x	10 ⁶ t	@	0.59% Sn
Grand total	1.168	x	10 ⁶ t	@	0.67% Sn

C. Codner (A.A.A. Ltd) in May 1974 in a brief re-appraisal of the Mt Bischoff mine calculated total ore reserves at 2.7 x 10⁶t @ 0.51% Sn.

7.5 Present estimation

Ore reserves were estimated using existing data from 76 drillholes. Calculations were done by cross-sectional method (profiles B₁ to I₁ and EWD-EWA, EW1 to EW6 on a 0.1% Sn cut off).

Results are tabulated:

Total indicated ore:

Porphyry-ore	2.8	x	10 ⁶ t	@	0.34%Sn
Dolomite-ore	0.83	x	10 ⁶ t	@	0.69%Sn
Total	3.6	x	10 ⁶ t	@	0.43%Sn

Indicated tonnage recoverable by best-fit open cut mining:

Porphyry-ore	1.56 x 10 ⁶ t	@	0.38% Sn
Dolomite-ore	0.72 x 10 ⁶ t	@	0.66% Sn
<hr/>			
Total	2.28 x 10 ⁶ t	@	0.46% Sn
<hr/> <hr/>			

N.B. Best-fit open cut would give a stripping ratio of 3:1.

Total potential ore to a vertical depth of 500'

Porphyry-ore	4.4 x 10 ⁶ t		
Dolomite-ore	1.23 x 10 ⁶ t		
<hr/>			
Total	5.63 x 10 ⁶ t	@	0.4% Sn
<hr/> <hr/>			

7.6 Discussion

The apparent discrepancies between the various calculations are readily explained by the different approaches and availability of data used by the authors. Calculations by R. Fitch were under the heading of "inferred" and as such the results agree fairly well with the present "Total potential ore." Calculations by Robinson were done using limited information, hence the low values. C. Codner's calculations do not differ greatly from the "indicated ore" of this report.

8. ORE GENESIS

Sn - F-W mineralisation and Ag-Pb-Zn mineralisation is thought to have occurred during the following stages:

- Stage 1 = Tensional fractures filled by pneumatolytic vapours produce greisen of quartz-porphyry with topaz, tourmaline and cassiterite.
- Stage 2a = Hydrothermal solutions rise along dykes to introduce Fe, Sn, F, S and forming pyrite, pyrrhotite, cassiterite, and fluorite in porphyries.
- Stage 2b = Selective replacement of dolomite bed by pyrrhotite, cassiterite, talc, quartz etc.
- Stage 3 = Quartz-cassiterite vein in NNW joints and Pb-Zn-Ag mineralisation.

Tin minerals are generally considered to be derived by pneumatolytic action originating from felsic magmatic reservoirs. It is widely accepted that tin is transported as fluoride and/or chloride which upon reaction with water form cassiterite liberating HCL and/or HF. A granitic cupola is postulated to exist beneath the Mt Bischoff area. From this cupola originated the quartz-porphyry dykes. The existence of a cupola is supported by the fact that these structures are usually centres of mineralising fluids as these tend to accumulate at the top of cupolas or domes. From here the fluids travel upward into the roof rocks through fractures which are created in response to both the intrusion and the pressure of the gases. Thus the form of the intrusion (cupola) controls the orientation of the fracture system (Y-shaped in the case of Mt Bischoff) which in turn acts as loci of ore deposition.

Pneumatolytic vapours gave rise to the formation of topaz, tourmaline and cassiterite in these porphyries. Late hydrothermal fluids rose along the dykes to start the second stage in the mineralising process. During this stage pyrrhotite, pyrite, cassiterite and fluorite were deposited.

A third stage included the formation of NNW trending joints which then acted as channel ways for subsequent mineralising solutions. These resulted in cassiterite-quartz veins and Pb-Ag-Zn mineralisation over the remainder of the district. (Solomon and Groves 1963).

9. CONCLUSIONS

In a memo dated 23.5.74 from the Consulting Engineer to the Exploration Manager, it was stated that the tonnage and grade required to justify an open cut mining operation would have to be of the order of $8-10^6$ tons at 0.8 - 0.9% Sn within 300 metres of surface. Later on, it was considered that a large tonnage/low grade (25×10^6 tons at 0.3% Sn) tin ore body in the rheomorphic sediments added to the existing reserves could represent an attractive economic proposition.

Results of the present investigations showed that:

- (a) Approximately 7000 feet of additional drilling may increase the present "indicated ore reserves" of some 2×10^6 tons, within 200 m of surface.
- (b) A best-fit open cut with a stripping ratio of 3:1 would allow the mining of roughly 2/3 of the "indicated" ore reserves.
- (c) Tin mineralisation in the rheomorphic sediments is erratic, low in tenors (0.1-0.2% Sn), and is mostly confined to restricted areas in the vicinity of the quartz-porphyry dykes.
- (d) The fluorine content of porphyry and dolomite ore is on the average, 4-6% to 5-11% respectively. At this stage, it is doubtful if the extraction of fluorite could render mining operations at Mt Bischoff economic.
- (e) Following discussions with the Research Geologist and the Divisional Geologist in Tasmania, it is considered possible that W-Mo mineralisation exists at depth at or near the top of the granitic cupola (3000' below Mt Bischoff summit?). This could be investigated by the sinking of one inclined diamond drill hole to be sited down in the Waratah river valley 1000' below the summit.

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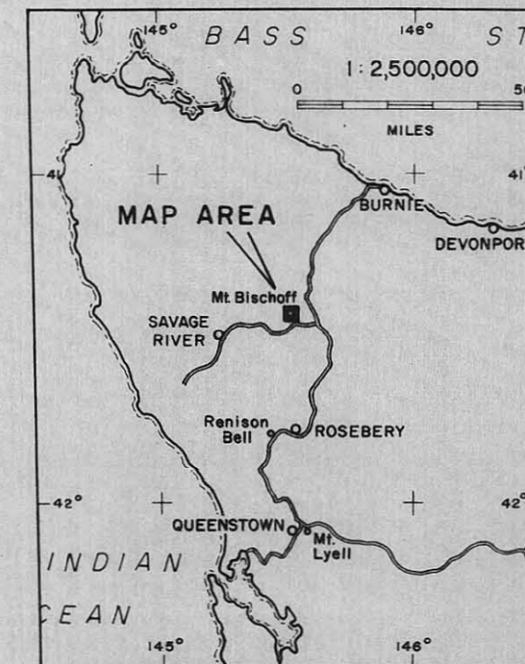
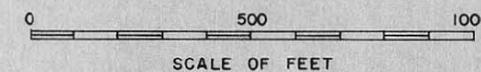
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LEGEND

- IGN.  Quartz porphyries
- SED.  Shale, siltstone and quartzite
-  Dolomite and dolomitic argillite
-  Rheomorphic zone, possible limit
-  Fracture
-  AAB2 Aust. Anglo American diamond drill hole
-  B36 Prior license holders diamond drill hole
(underground d.d.h's B30, B31, B47 to B55,
B57 and B59 not shown on map)
-  Disused mine shaft
-  -1700- 100 feet topographic contour

1 : 4,800

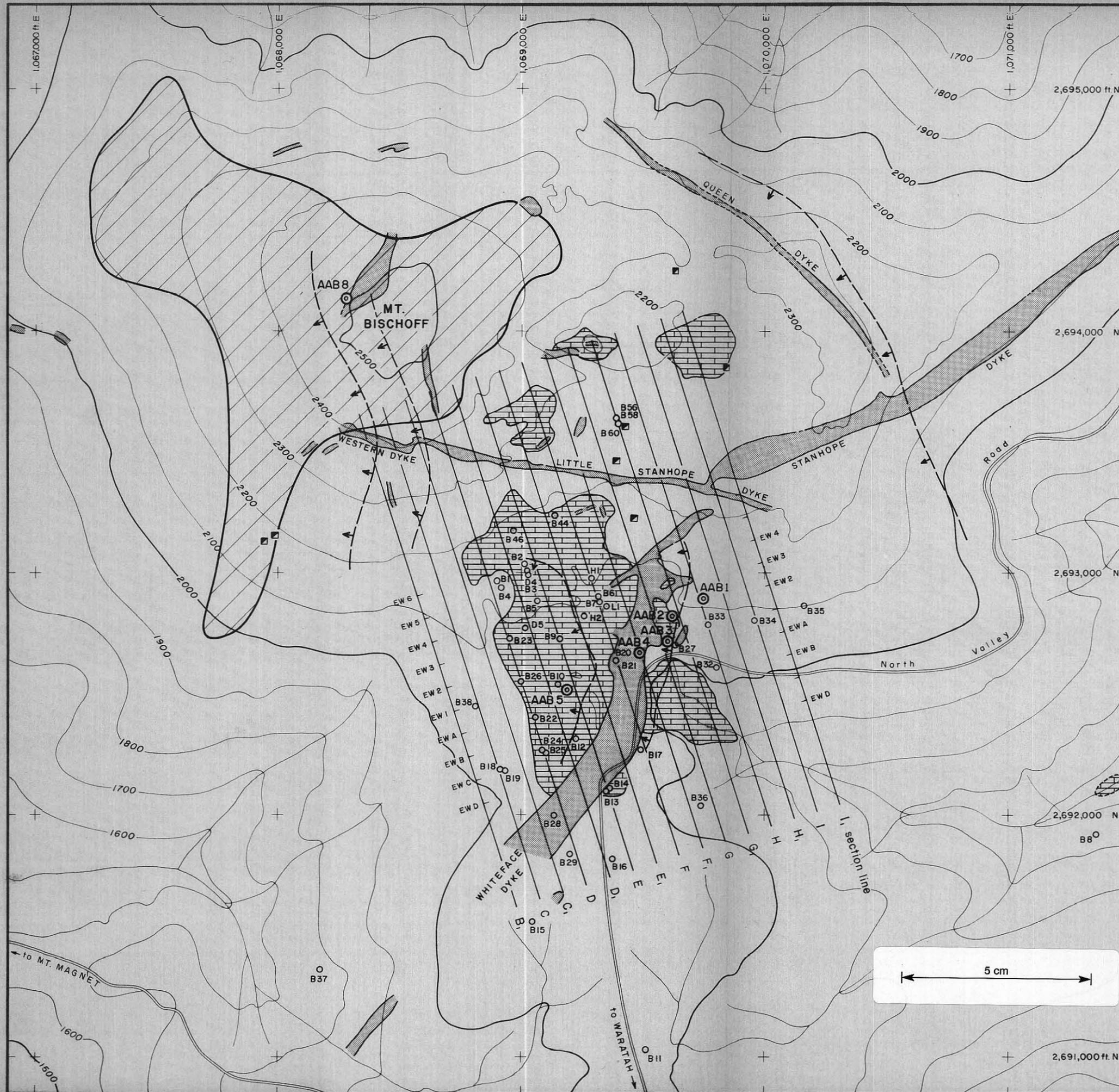


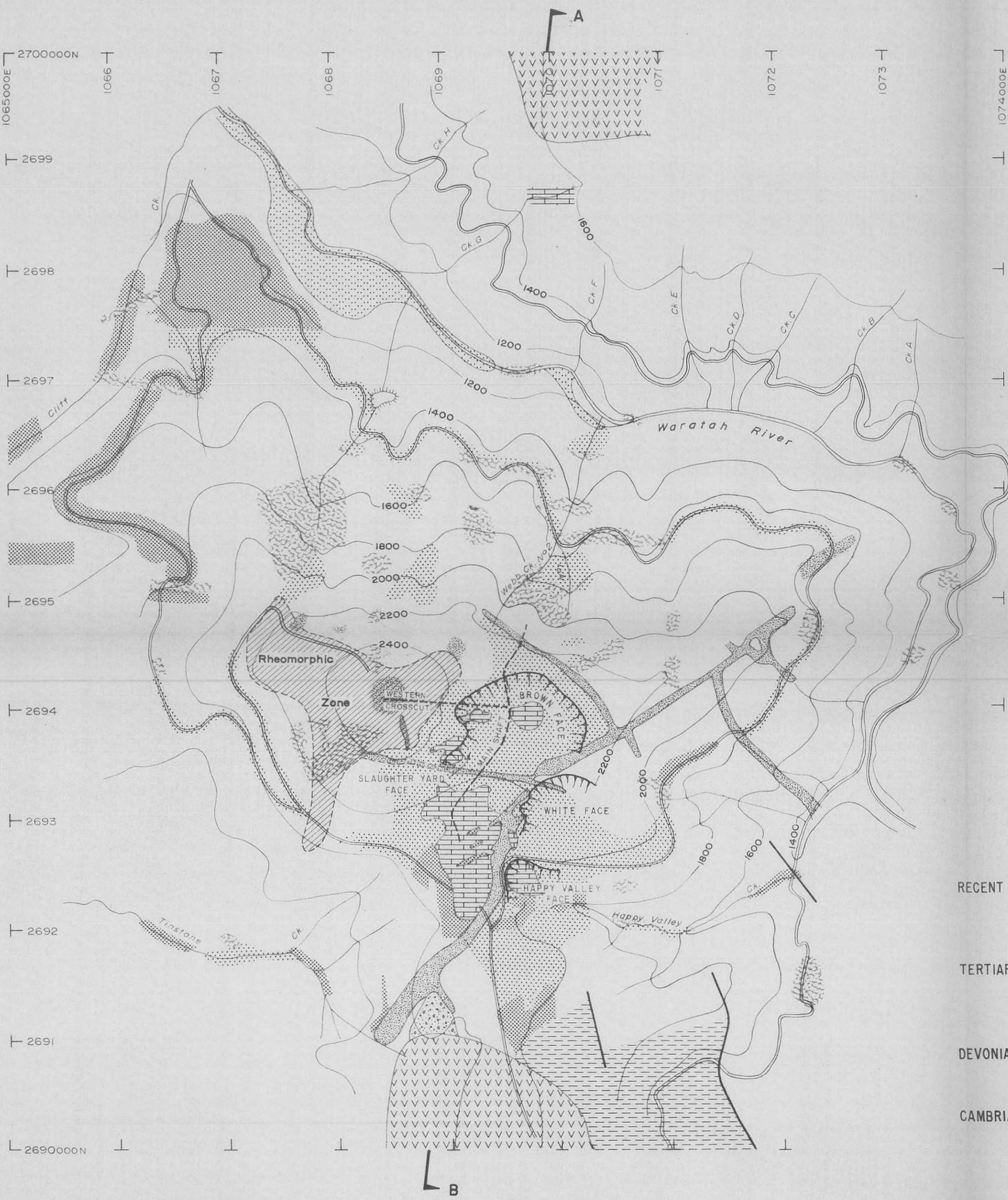
NORTH-WEST TASMANIA

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF MINE AREA
SURFACE GEOLOGY 001
TOPOGRAPHY & D.D.H. LOCATIONS

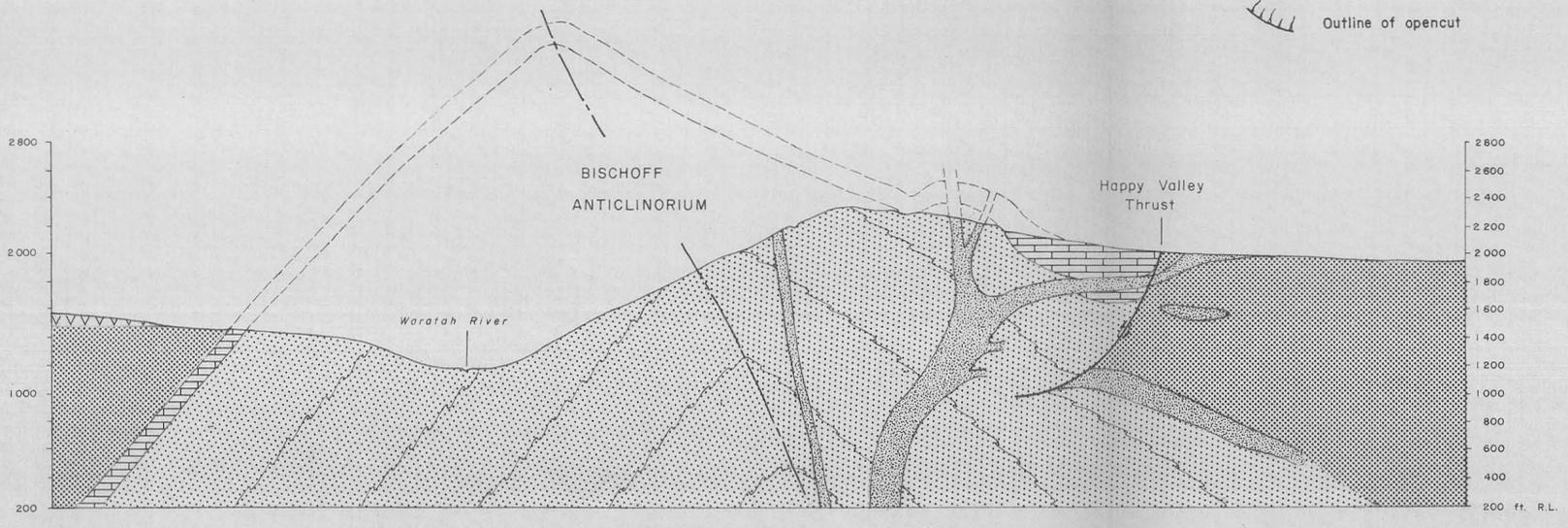
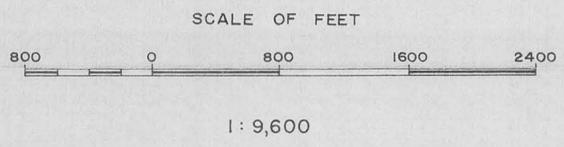
DRAWN 9-74 R. Botterley COMPILED F.P. SCALE 1: 4,800 TAS-2-646



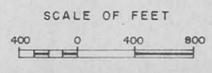


LEGEND

- RECENT
 - Alluvium
- TERTIARY
 - Basalt
 - Gravel, sand, silt and clay
- DEVONIAN
 - Quartz porphyry
- CAMBRIAN
 - Greywackes and mudstones
- PROTEROZOIC
 - Rheomorphic argillites, shales and quartzites
 - Black argillites and shales
 - Dolomite
 - Grey argillites and shales
 - Quartzites
 - Fault
 - Outline of open cut

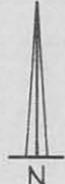
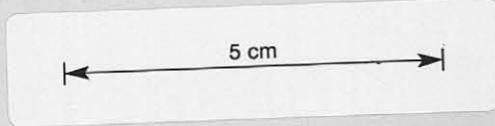
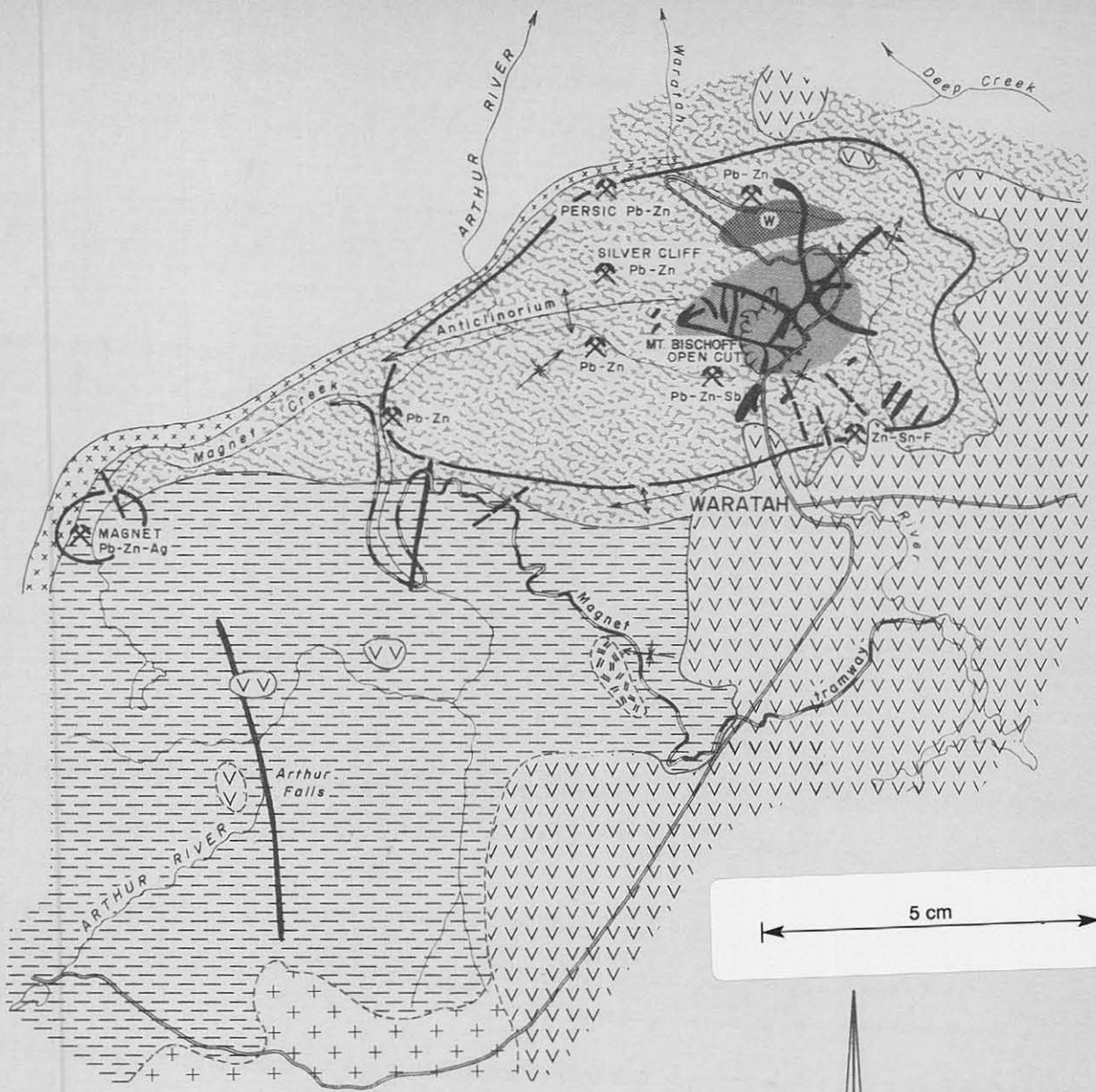


SECTION A-B
(looking east)



COMSTAFF PROPRIETARY LIMITED
 560034
MT. BISCHOFF MINE AREA
 DETAILED OUTCROP GEOLOGY
 002
 DRAWN A.D. J. COMPILED F.P. SCALE As noted TAS-2-674

032



1 : 30,000
(approx.)



LEGEND

- TERTIARY Basalt and sub-basaltic gravels
- JURASSIC Dolerite
- DEVONIAN Quartz porphyries
 Granodiorite
- CAMBRIAN Basic dyke
 Mudstone, greywackes, pyroclastics
- PRECAMBRIAN Quartzites, shale, siltstone, dolomite.

METAL ZONING

- Sn - F - Po - Py and minor Gl - Sp
- W
- Pb - Zn - Ag and minor Sn - F

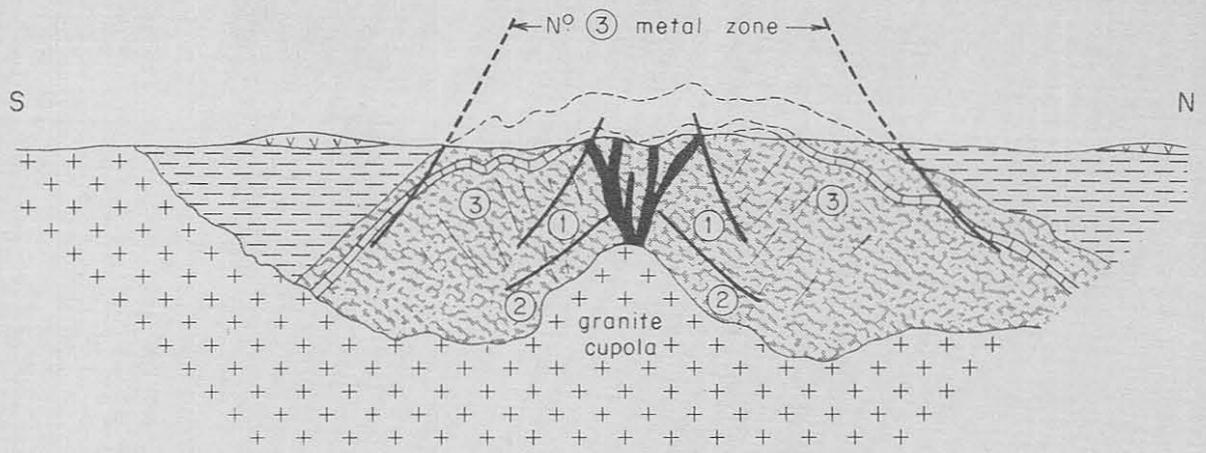
NOTE : After D.I. Groves & M. Solomon, 1964

560035

COMSTAFF PROPRIETARY LIMITED

WARATAH DISTRICT
GEOLOGY & METAL ZONING

033



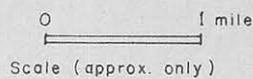
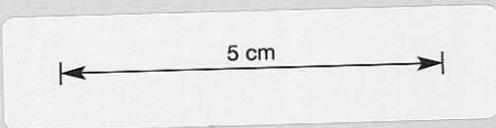
GENERALIZED CROSS - SECTION THROUGH MT. BISCHOFF
(looking west)

LEGEND

- TERTIARY  Basalt
- DEVONIAN  Quartz porphyry
-  Granite
- CAMBRIAN  Sedimentary beds
- PRECAMBRIAN  Dolomite horizon
-  Sedimentary beds.
-  Quartz-feldspar filled fractures with wolframite

METAL ZONING

-  Metal zone boundary
- ① Sn - F
- ② W - Mo ? - Bi ?
- ③ Pb - Zn



NOTE : Modified after M. Soloman and
D.I. Groves, 1964

560036

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF MINE AREA

CROSS - SECTION SKETCH

METAL ZONING AT DEPTH

DRAWN 1-75 	COMPILED F.P. (see note)	SCALE As shown	TAS-2-676
---	-----------------------------	-------------------	-----------

2693000 N

SE

NW

R.L. 2500'

R.L. 2500'

EWD

EWC

EWB

EWA

EWI

EW2

EW3

EW4

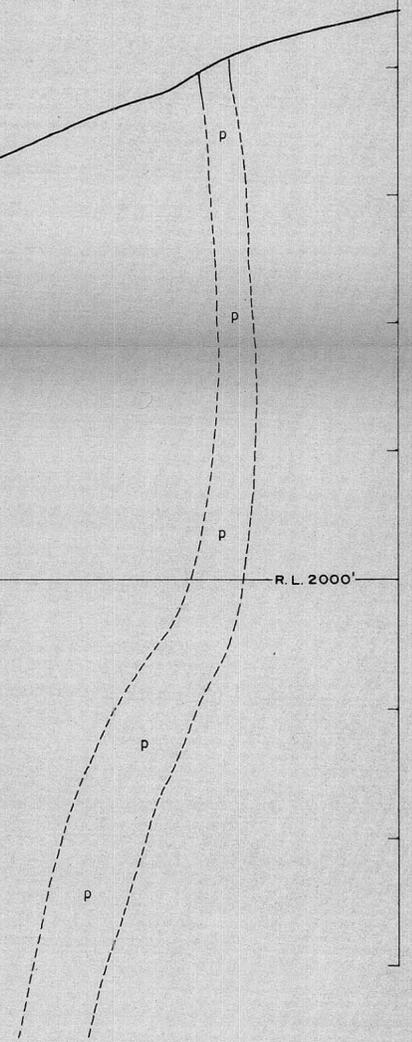
EW5

EW6

R.L. 2000'

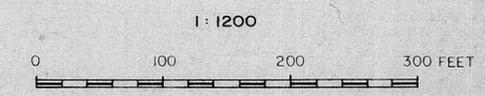
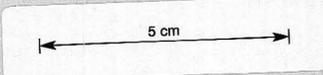
R.L. 2000'

R.L. 1500'



LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rheomorphic ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn% over intersected width in feet



560037

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION B1 003

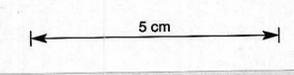
DRAWN	COMPILED	SCALE	TAS/2/656
11/74	FP	1:1200	

2693000 N

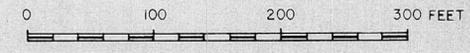


LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rheomorphic ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  0.35% x 10 Sn % over intersected width in feet



1:1200



560038

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION C1 004

DRAWN 11/76 W.A.P.	COMPILED F.P.	SCALE 1:1200	TAS/2/657
-----------------------	------------------	-----------------	-----------

2693000 N

SE

NW

R.L. 2500'

R.L. 2500'

EWD

EWC

EWB

EWA

EWI

EW2

EW3

EW4

EW5

EW6

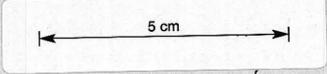
R.L. 2000'

R.L. 2000'

R.L. 1500'

LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rheamorphics ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn% over intersected width in feet



1:1200



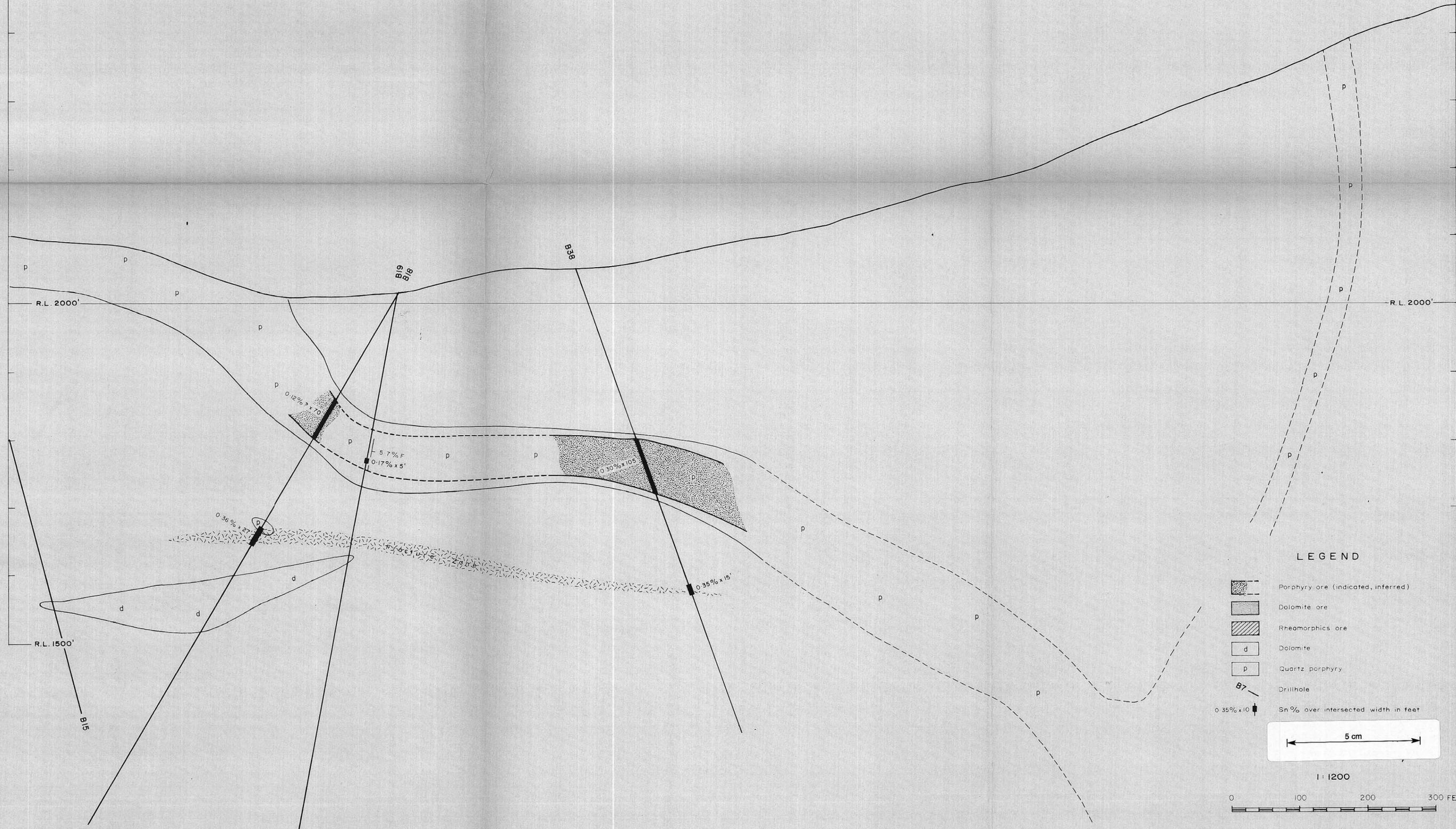
560039

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION C 005

DRAWN	COMPILED	SCALE	TAS/2/658
11/74	F.P.	1:1200	



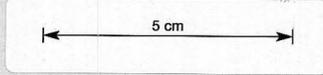
2693000 N



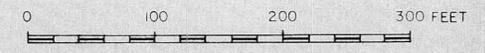
1842
 PYRITE 85%
 MARCASITE 3%
 PYRRHOTITE 5%
 SPHALERITE TRACES
 CHALCOPYRITE 1%
 STANNITE 1%

LEGEND

- Porphyry ore (indicated, inferred)
- Dolomite ore
- Rheomorphic ore
- Dolomite
- Quartz porphyry
- Drillhole
- Sn% over intersected width in feet



1:1200



560040

COMSTAFF PROPRIETARY LIMITED

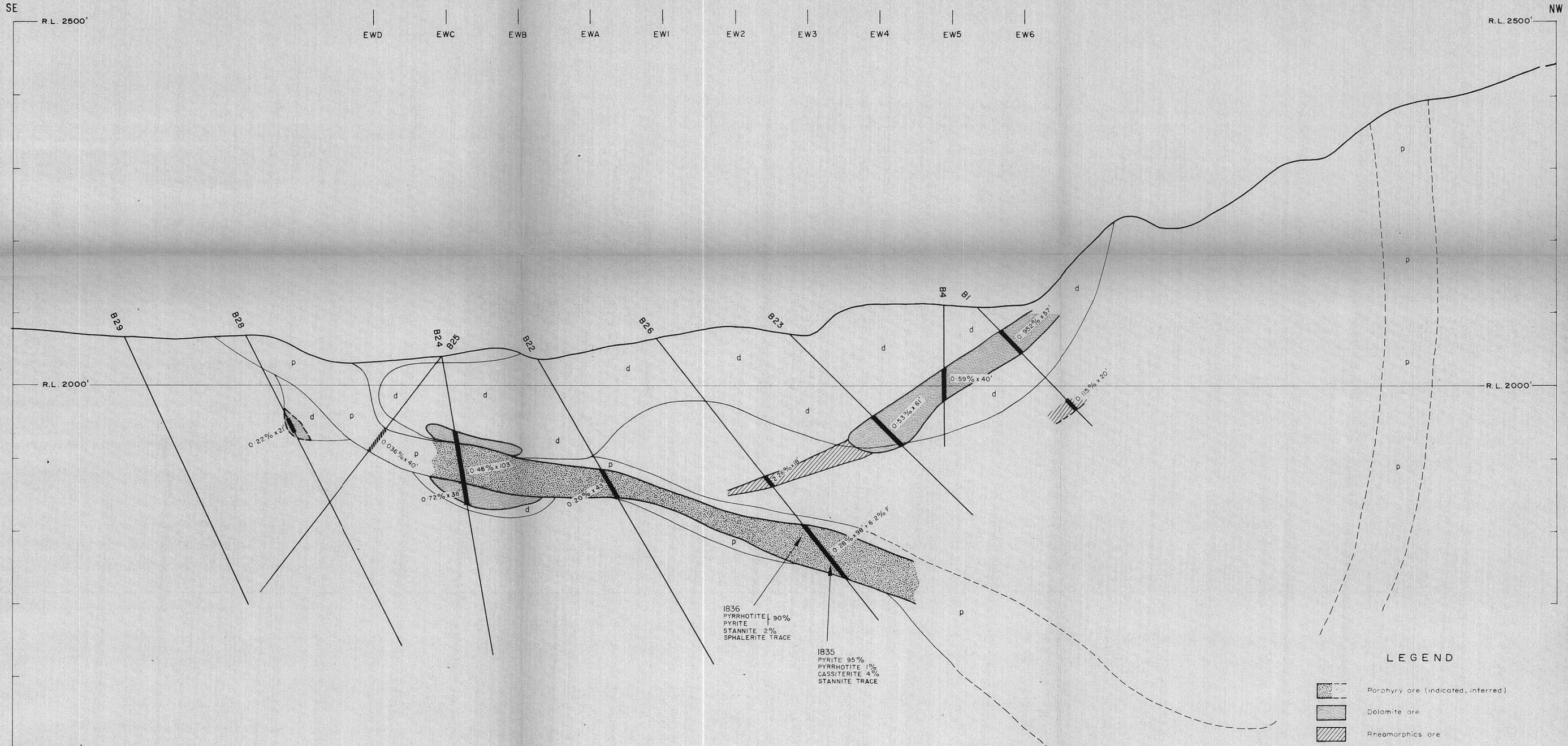
MT. BISCHOFF PROJECT

SECTION D1

006

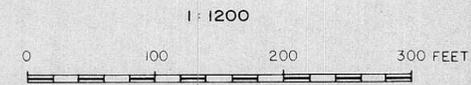
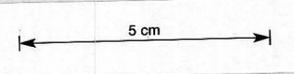
DRAWN 11/74 J. van der Merwe COMPILED F.P. SCALE 1:1200 TAS/2/660

2693000 N



LEGEND

- Porphyry ore (indicated, inferred)
- Dolomite ore
- Rheomorphic ore
- Dolomite
- Quartz porphyry
- Drillhole
- Sn % over intersected width in feet



560041

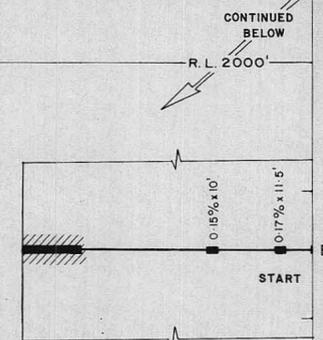
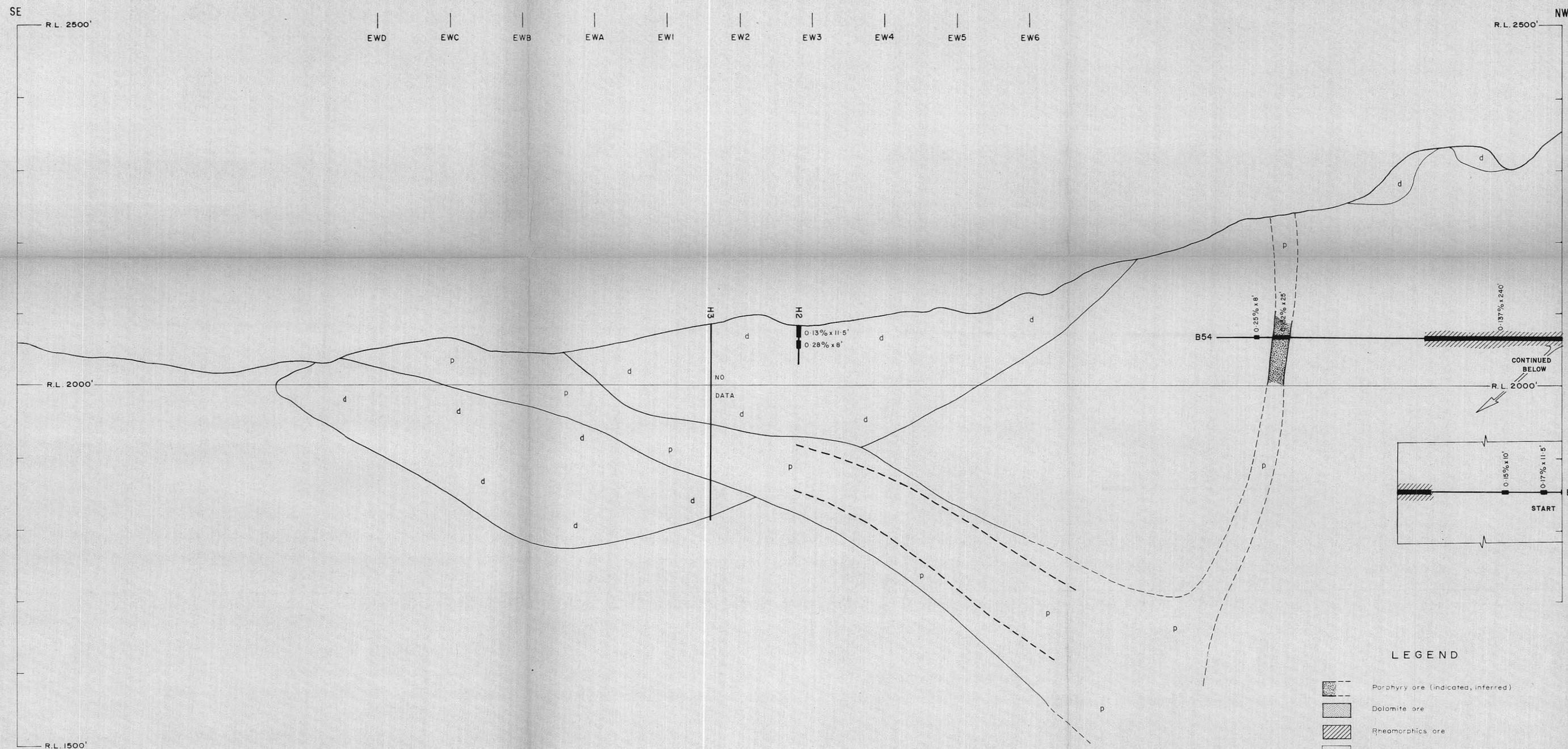
COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION D 007

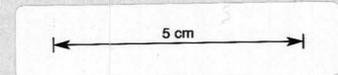
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11/74	F.P.	1:1200	

2693000 N

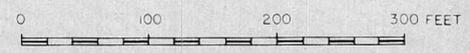


LEGEND

- Porphyry ore (indicated, inferred)
- Dolomite ore
- Rheomorphic ore
- Dolomite
- Quartz porphyry
- Drillhole
- Sn% over intersected width in feet



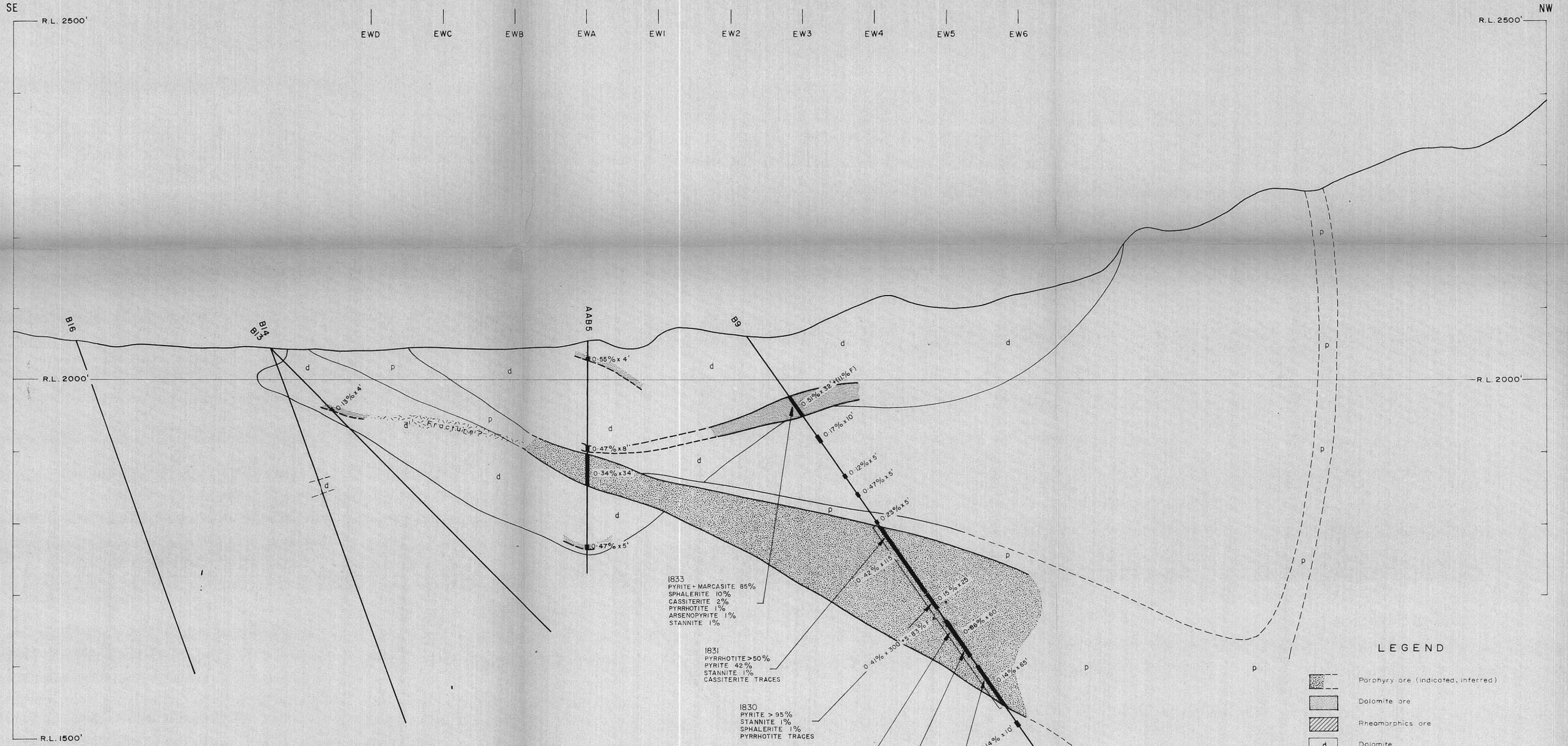
1:1200



560042

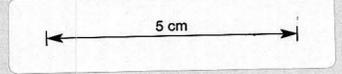
COMSTAFF PROPRIETARY LIMITED
 MT. BISCHOFF PROJECT
 SECTION E1 008

2693000 N



LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rheomorphic ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn % over intersected width in feet



560043

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION E 003

DRAWN	COMPILED	F.P.	SCALE	TAS/2/661
			1:1200	

2693000 N

SE

NW

R.L. 2500'

R.L. 2500'

EWD

EWC

EWB

EWA

EWI

EW2

EW3

EW4

EW5

EW6

R.L. 2000'

R.L. 2000'

R.L. 1500'

B36

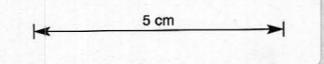
AAB 4

0.32% x 3.25'

0.35% x 10'

LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rneomorphics ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn % over intersected width in feet



1 : 1200



560044

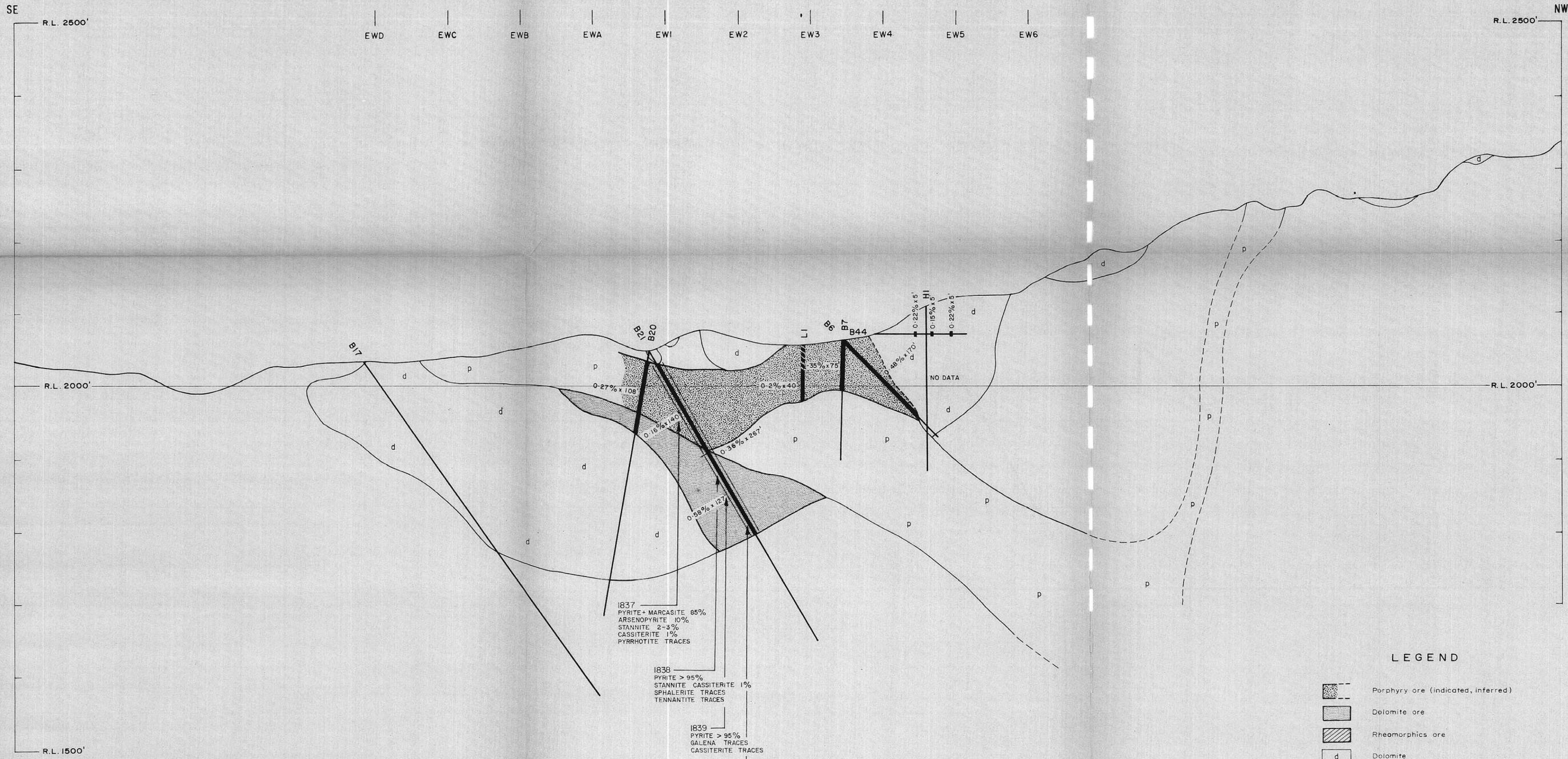
COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION F1 010

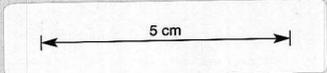
DRAWN	COMPILED	SCALE	TAS/2/664
11/74	E.P.	1:1200	

2693000 N

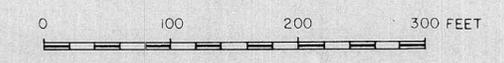


LEGEND

- Porphyry ore (indicated, inferred)
- Dolomite ore
- Rheomorphic ore
- Dolomite
- Quartz porphyry
- Drillhole
- Sn% over intersected width in feet



1:1200



560045

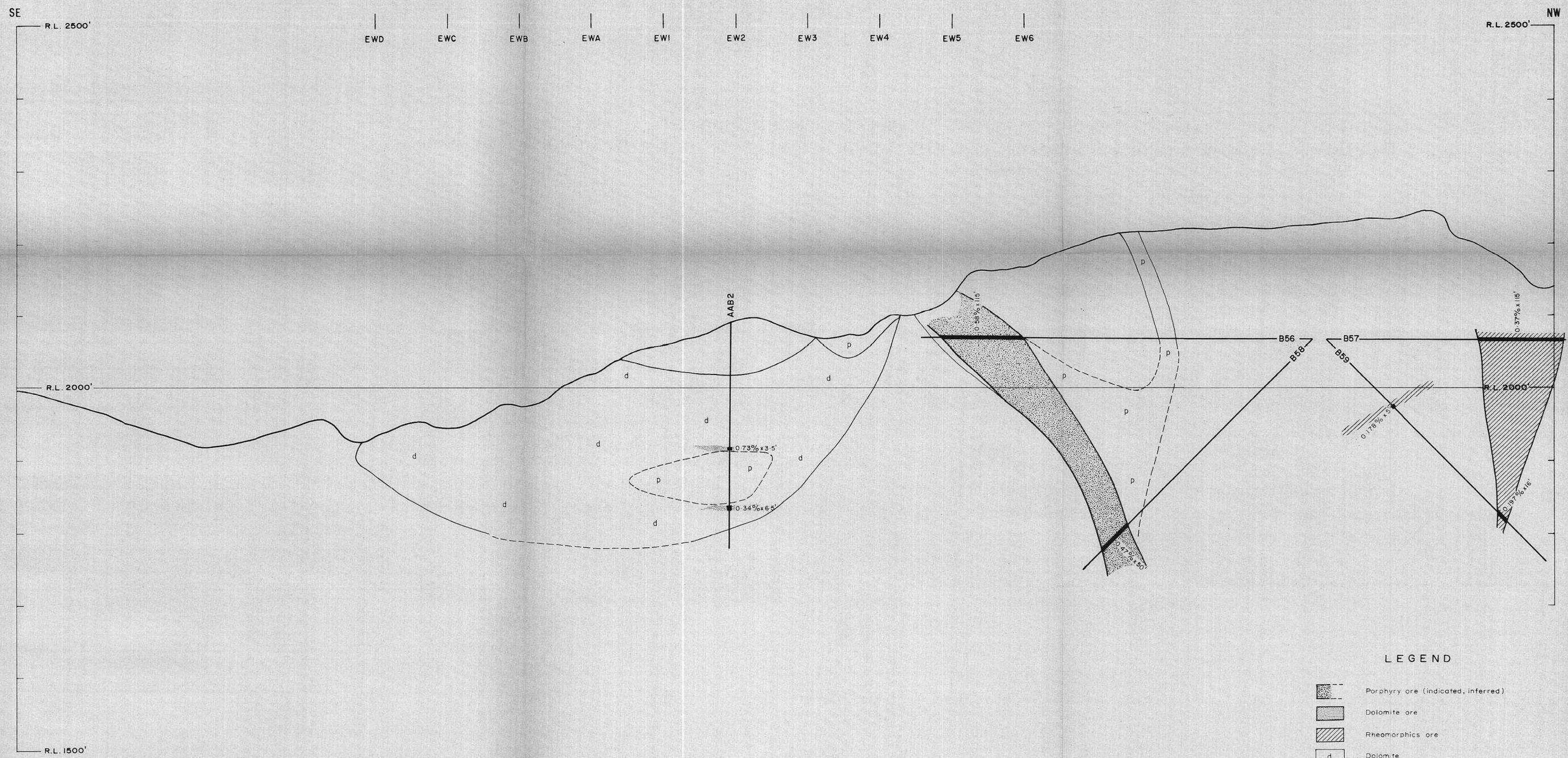
COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION F 011

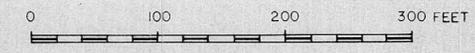
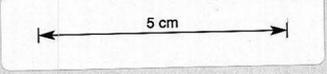
DRAWN 11/74	COMPILED F.P.	SCALE 1:1200	TAS/2/663
----------------	------------------	-----------------	-----------

2693000 N



LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rhenomorphic ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn % over intersected width in feet



560046

COMSTAFF PROPRIETARY LIMITED
 MT. BISCHOFF PROJECT
 SECTION G1 012

2693000 N

SE

NW

R.L. 2500'

R.L. 2500'

EWD

EWC

EWB

EWA

EWI

EW2

EW3

EW4

EW5

EW6

R.L. 2000'

R.L. 2000'

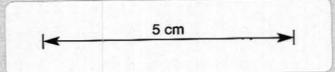
R.L. 1500'

B27
AAB3

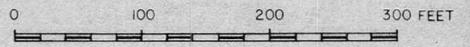
0.1% ± 124

LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rheamorphics ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn % over intersected width in feet



1 : 1200



560047

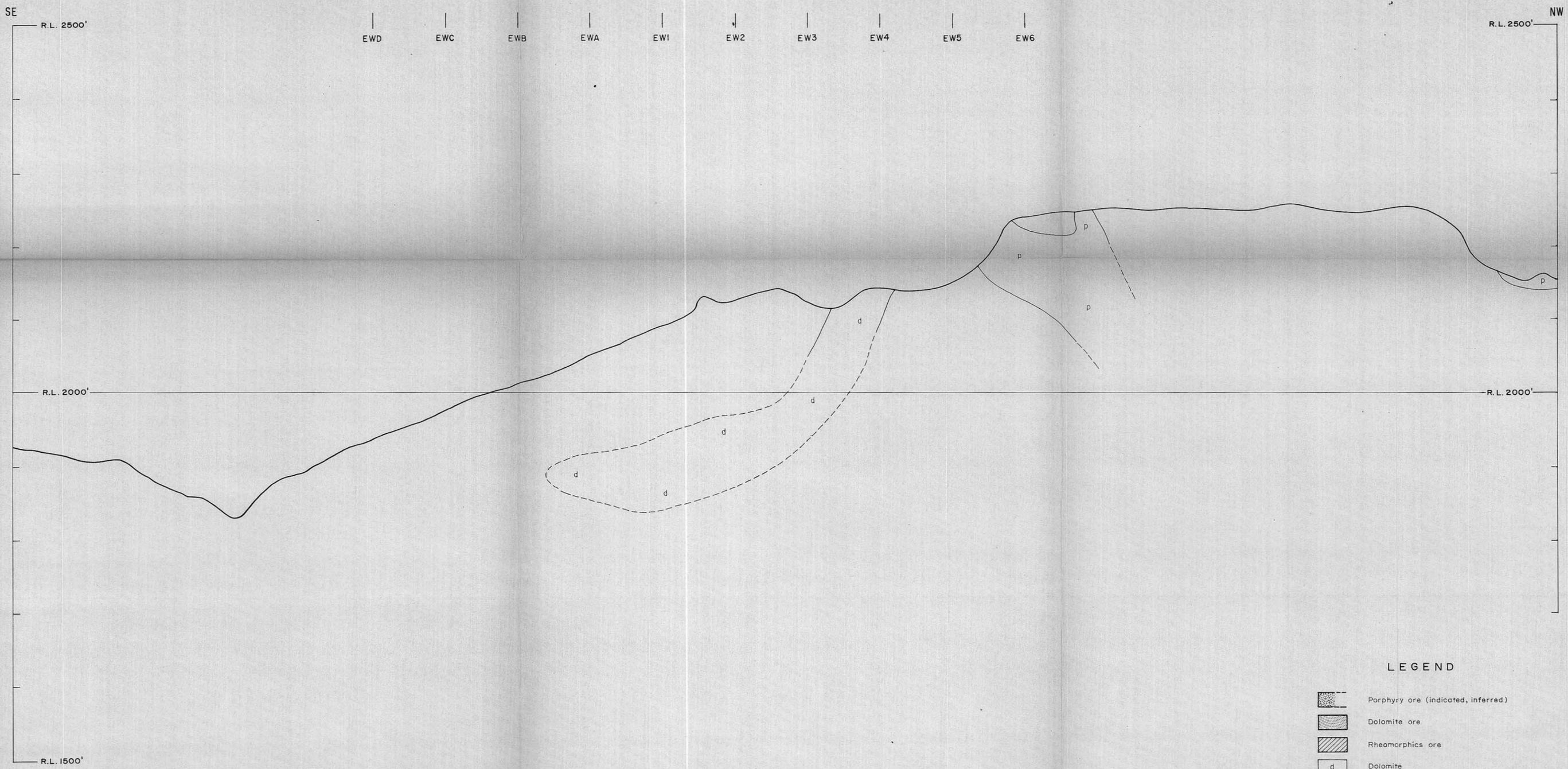
COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION G 013

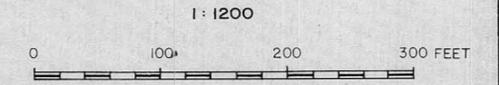
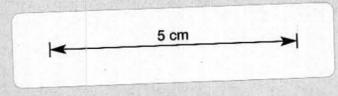
DRAWN 11/74	COMPILED F.P.	SCALE 1 : 1200	TAS/2/665
----------------	------------------	-------------------	-----------

2693000 N



LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rheomorphic ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn% over intersected width in feet



560048

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION H1 014

DRAWN	COMPILED	SCALE	TAS/2/668
1/7/68	E.P.	1:1200	

2693000 N

SE

NW

R.L. 2500'

R.L. 2500'

EWD

EWC

EWB

EWA

EWI

EW2

EW3

EW4

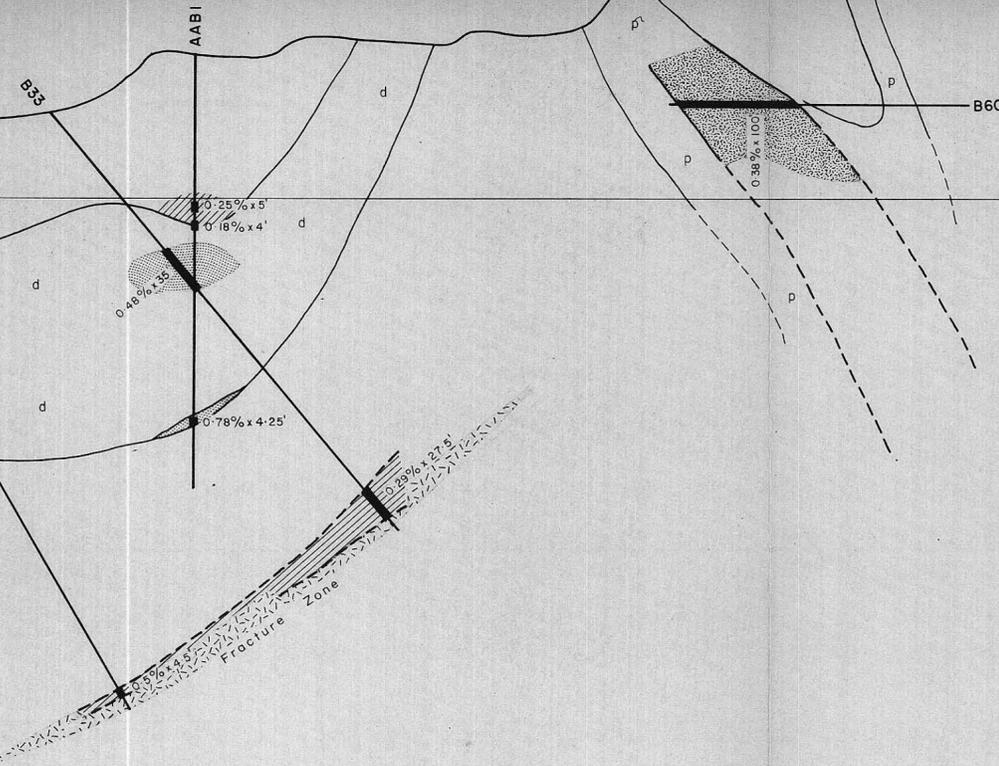
EW5

EW6

R.L. 2000'

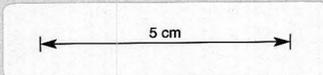
R.L. 2000'

R.L. 1500'

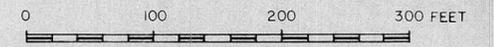


LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rheomorphics ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn % over intersected width in feet



1 : 1200



560049

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION H 015

DRAWN 11/74	COMPILED F.P.	SCALE 1 : 1200	TAS/2/667
----------------	------------------	-------------------	-----------

2693000 N

SE

NW

R.L. 2500'

R.L. 2500'

EWD

EWC

EWB

EWA

EWI

EW2

EW3

EW4

EW5

EW6

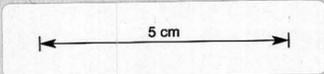
R.L. 2000'

R.L. 2000'

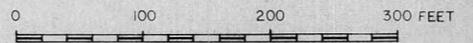
R.L. 1500'

LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rheomorphic ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn % over intersected width in feet



1 : 1200



560050

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION II 016

DRAWN	COMPILED	E.P.	SCALE	1 : 1200	TAS/2/670
11/74					

2693000 N

SE

NW

R.L. 2500'

R.L. 2500'

EWD

EWC

EWB

EWA

EWI

EW2

EW3

EW4

EW5

EW6

R.L. 2000'

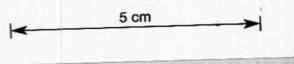
R.L. 2000'

R.L. 1500'

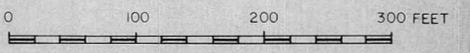
B34

LEGEND

-  Porphyry ore (indicated, inferred)
-  Dolomite ore
-  Rheamorphics ore
-  Dolomite
-  Quartz porphyry
-  Drillhole
-  Sn% over intersected width in feet



1: 1200



560051

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF PROJECT

SECTION I

017

DRAWN	COMPILED	SCALE	TAS/2/669
11/76	FP	1: 1200	

560052

aac

PROJECT NAME:

APPENDIX 1
GEOLOGY AND MINERALISATION OF

TITLE:

MT. BISCHOFF
VOLUME II
DIAMOND DRILL HOLE LOGS AND ASSAYS.

AREA NAME/S, STATE 1:250,000 SHEET NO/S & COORDINATES:

145°30'E, 41°25'S D55-3 Burnie Sheet

COMMODITY/IES:

Sn

TEXT PAGES NO:

PLAN NOS:

TAS-2-646

TABLE NOS:

APPENDICES:

AUTHOR/S:

DATE:

October, 1974.

OPEN FILE

AUSTRALIAN ANGLO AMERICAN LIMITED

Incorporated in the State of Victoria

002

560053

CONTENTS

Surface Geology, Topography
and DDH Location

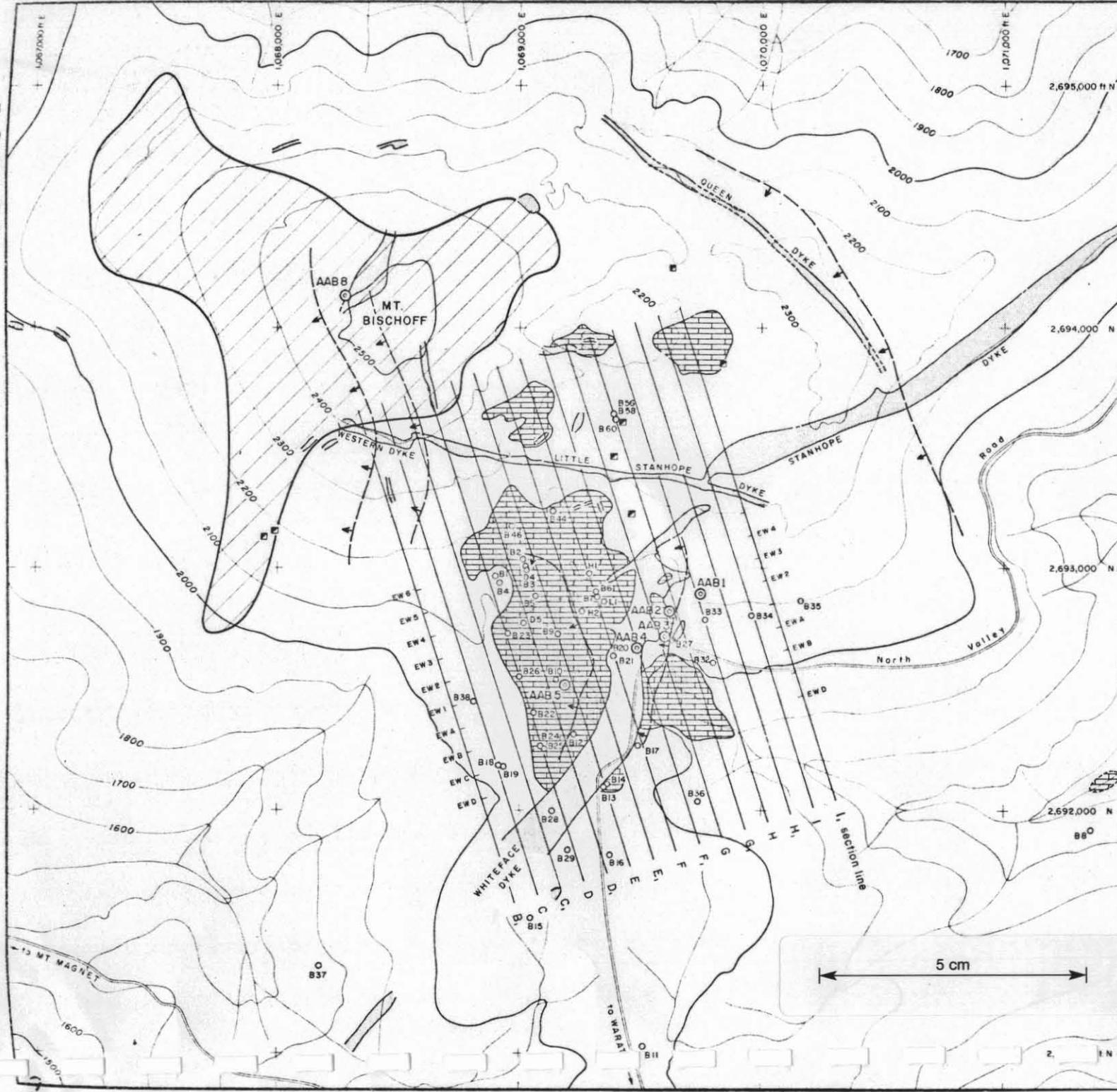
TAS-2-646

Summary of Drill Hole
Mineralised Intersections

Drill Hole Logs, Assays and
Petrographic Descriptions

- B1 - B38, B44
- B44 - B60
- AAB1- AAB5, AAB8
- D4, D5
- FL 1
- H1, H2
- L1

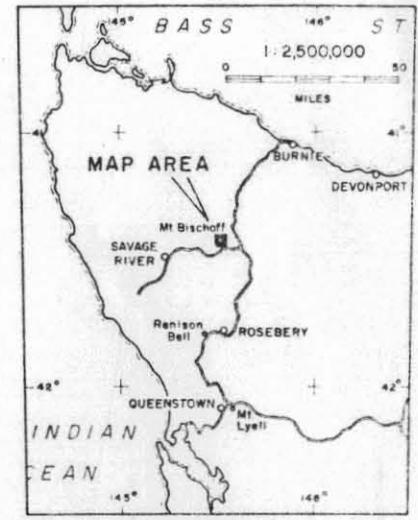
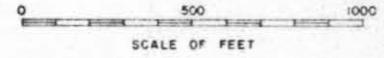
560054



LEGEND

- IGN. Quartz porphyries
- SED. Shale, siltstone and quartzite
- Dolomite and dolomitic argillite
- Rheomorphic zone, possible limit
- Fracture
- ⊙ AAB2 Aust. Anglo American diamond drill hole
- B36 Prior license holders diamond drill hole
(underground d.d.h! B32, B31, B47 to B55,
B57 and B59 not shown on map)
- Disused mine shaft
- 1700- 100 feet topographic contour

1 : 4,800

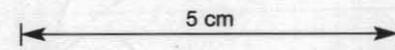


NORTH-WEST TASMANIA

COMSTAFF PROPRIETARY LIMITED

MT. BISCHOFF MINE AREA
SURFACE GEOLOGY

DRAWN 5-74 BY COMPILED FP. SCALE 1:4,800 TAS-2-646



004

560055

MT. BISCLOFFSUMMARY OF DRILL HOLE MINERALISED INTERSECTIONS(MODIFIED AFTER CODNER (1974))

<u>Hole No.</u>	<u>Section</u>	<u>Intersection</u>	<u>Length</u>	<u>%Sn</u>	<u>Lithology</u>
B1	D	60'-117'	57'	0.94	dolomite/massive po ore
B2	D ₁	45'->105'	60'	0.74	dolomite
B3	D ₁	125'-130'	5'	0.29	talc
		175'-180'	5'	1.97	talc
B4	D	90'-100'	10'	0.35	talc
		115'-130'	15'	1.31	talc
B5	D ₁	95'-110'	15'	0.38	dolomite
		135'-150'	15'	0.74	dolomite
B6	F	0'-77.5'	77.5'	0.47	dolomite
		100'-170'	70'	0.57	dolomite
B7	F	0'-75'	75'	0.35	porphyry
B8	not plotted	Mineralised zone	not intersected		
B9	E	100.5'-132.25'	31.75'	0.51	dolomite
		315'-615'	300'	0.41	porphyry
B10	D ₁	138.5'-302.5'	164'	0.83	(9.5' not assayed)
		138.5'-220.5'	82'	1.40	dolomite
		230-302.5'	72.5'	0.30	porphyry
B11	*	1358'-1362'	4'	1.11	quartzite/argillite
B12	D ₁	132'-140.5'	8.5'	0.51	dolomite
		326'-331'	5'	0.53	talc
B13	E	116.75'-120'	3.75'	0.23	dolomite
B14	E	Mineralised zone	not intersected		
B15	C	Mineralised zone	not intersected		
B16	E	No assay results			
B17	F	No assay results			
B18	C	180'-190'	10'	0.43	porphyry
		398'-425'	27'	0.36	argillite
B19	C	215'-220'	5'	0.14	porphyry
		245'-250'	5'	0.18	porphyry
B20	F	25'->108'	>83'	0.37	
		0-85'	85'	0.24	porphyry
		85-108'	15'	0.48	dolomite

File No.	Section	Intersection	Length	%Sn	Lithology
B21	F	66'-221'	155'	0.22	porphyry
		51'-166'	114'	0.16	dolomite
		251'-291'	40'	1.47	talc
B22	D	174'->217'	>43'	0.21	porphyry
B23	D	<168'-213'	>45'	0.64	dolomite
		223'->229'	>5'	0.52	porphyry
B24	D	<106'-116'	>10'	1.83	Py-Po-Cp vein
		171'-209'	>38'	0.73	dolomite
B25	D	Unmineralised		<.08	
B26	D	<256'->274'	>18'	2.37	argillite
		<322'>420'	>98'	0.35	porphyry
B27	G	130'-150'	20'	0.25	dolomite
B28	D	125'->146'	>21'	0.22	dolomite
B29	D	153'-154'	1'	0.21	massive py-carb min
B30	**	11.5'-40'	28.5'	0.17	talc/carbonate lode
B31	**	Unmineralised	>0.1'	<.05	
B32	H	462'	4.5'	0.49	quartzite
B33	H	115'.6"-123'	7'6"	0.39	carbonate lode
		146'-181'	35'	0.48	dolomite
		384'-411'6"	27'6"	0.29	quartzite
B34	I	no results available			
B35	not plotted	476'-481'	5'	<0.10	porphyry
B36	F1	Unmineralised		<0.06	
B37	not plotted	Unmineralised		<0.01	
B38	C	251'-356'	105'	0.30	porphyry
		291'-341'	50'	0.50	porphyry
		492'-507'	15'	0.35	porphyry
B44	F	140'-145'	5'	0.22	talc
		170'-175'	5'	0.15	dolomite
		190'-195'	5'	0.22	dolomite
B46	D1	5'-15'	10'	0.22	dolomite/argillite
		319'-325'	6'	0.12	porphyry
B47	**	10'-15'	5'	0.64	talc po ore

File NO.	Section	Intersection	Length	%Sn	Lithology
B48	I ₁	433'-462'	29'	0.15	porphyry
B49	*	15'-23'	8'	1.66	massive po-py vein "Thompson lode"
B50	*	130'-140'	10'	0.16	porphyry
		239'-293'	54'	1.32	quartz -po-py vein
B51	*	6'-16'	>10'	0.61	qtz-po-py vein " Thompson lode "
		203'-208'	5'	0.11	quartzite/argillite
B52	*	125'-135'	10'	0.11	quartzite/argillite
		160'-175'	15'	0.14	quartzite/argillite
		220'-245'	15'	0.19	quartzite/argillite
		315'-340'	25'	0.22	quartzite
B53	*	216'-220'	4'	1.15	qtz-po-py vein
B54	E ₁	13'-24.5'	11.5'	0.71	qtz - py vein
		205'-245'	40'	0.50	argillite
		603'-613'	10'	0.22	porphyry
		642'-650'	>8'	0.25	porphyry
B55	j *	No results			
B56	G ₁	>408'-523'	>115'	0.58	porphyry
B57	G ₁	>208'-273'	>65'	0.61	quartzitic/argillite
B58	G ₁	359'-409'	>50'	0.47	porphyry
B59	G ₁	335'-351'	16'	0.20	quartzitic/argillite
B60	H	233'-253'	20'	0.06	porphyry
		311'-341'	30'	0.21	argillite
		341'-426'	85'	0.40	porphyry
B61	H	110'-115'	5'	0.25	dolomite/shales
		135'-139'	4'	0.18	dolomite
		278'-281'	4'	0.75	dolomite
AAB2	G ₁	174.5'-178'	3.5'	0.68	porphyry
		253'-259.5'	6.5'	0.34	porphyry
AAB3	G	30'-33'	3'	0.32	argillite
		35'-45'	10'	0.28	argillite
AAB4	F ₁	202.25'-205.5	3.25	0.32	dolomite
B65	E	146.5'-154'	33.5'	0.48	serpentinite
		171'10"-179'10"	8'	0.34	serpentinite
		281'- >286.5'	>5.5'	0.49	massive qtz-py-po vein
AAB6	*	5'-25'	20'	0.14	porphyry

007

<u>Hole No.</u>	<u>Section</u>	<u>Intersection</u>	<u>Length</u>	<u>%Sn</u>	<u>Lithology</u>
D4	D ₁	111'-115'	4'	0.22	talc
		130.6'-132.6'	2'	0.20	talc
D5	D ₁	113'-130'	17'	0.14	dolomite
		139'4"-149'	9'8"	0.10	dolomite
FL1	***	367.5'-377.5'	10'	0.72	mudstone
2	***	No results			
H1	F	No results available			
	E ₁	0-11'6"	11'6"	0.13	dolomite
		11'6"-20'6"	9'0"	0.04	dolomite
		20'6"-28'4"	7'10"	0.28	dolomite
H3	E ₁	No results available			
	F	40.6'-80.5'	40'	0.21	porphyry

* Off Grid

** Approximately 90° to section - Underground holes

*** Position unknown

B39 - B43 and B45 :- No information available

STATE TASMANIA
 COMPANY TIN MINING CO.
 AREA MT. BISCHOFF

HOLE NUMBER B.1
 BEARINGS (N)
 CO-ORDS 1000N, 1195W
 DIP 45°

560059

FROM	TO	CORE DESCRIPTION	C. to D. Angles
0	4	No core.recovery	
4	29	Soft, highly oxidised material, in places resembling weathered dolomite, but mostly resembling a marl, with some lignitic material. Only 6' recovered.	
29	46'6"	Barren greyish-white <u>dolomite</u> .	
46'6"	65	<u>Dolomite</u> with talc developments thro'out, latter occuring as irregular crystalline growths in dolomite. 2" py vein at 55' and becoming very wkly sulphidic in last 2' of section.	Few angles of 50°-70°
65	91	<u>Massive Pyrrhotite Ore</u> with only minor talc gangue.	
91	107	<u>Moderate Pyrrhotite Ore</u> with much light greyish talc gangue (variable from massive Po Ore to talcy gangue).	
107	110	<u>Dolomite</u> , with fair Po-Py mineralisation (talc absent, sulphides disseminated and weaker).	
110	130	<u>Fair Pyrrhotite Ore</u> with black talcy gangue.	
130	133	Light yellowish-green <u>talcy lode</u> with only minor Po Min.	
133	142	<u>Fair Pyrrhotite Ore</u> with black talcy gangue.	
142	158	<u>Talcy lode</u> with with weak-fair Po Min, tending in part to fair Pc ore. Talc mostly light coloured.	
158	203	<u>Siliceous argillite</u> , in part wkly quartzitic below about 192'. Numerous Py-Sph-Gn veins to ¼" width at start, becoming very sparse after 180'.	
203	205	Well silicified <u>tuff</u> . Lower contact at 30°	
205	217	<u>Siliceous argillite</u> , with only occasional traces of sulphides.	

009

STATE
COMPANY
AREAHOLE NUMBER B.1.
BEARINGS (M)
CO-ORDS
DIP

2.

560060

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
217	224	<u>Tuff</u> , with fragments about 0.5" in size. Occasional traces of f.g. Py.	
224	229	<u>Siliceous argillite</u> with minor interbanded quartzite. Only occasional traces of Py.	
229	238	Mainly <u>quartzite</u> , with minor interbanded siliceous argillite. Only traces of Py.	
238	241	<u>Siliceous argillite</u> .	
241	245	<u>Quartzite</u> with minor interbanded siliceous argillite.	
<u>End of Hole</u>			

ASSAY SHEET

560061

HOLE NUMBER B1

FROM	TO	WIDTH	% Zn			
10	35		.47			
29	35	6	-			
35	39	4	-			
39	44	5	-			
44	50	6	-			
50	55' 3"	5' 3"	-			
55' 3"	60	4' 9"	-			
60	67	7	.15			
67	72	5	.32			
72	77	5	-			
77	82	5	1.88			
82	87	5	1.30			
87	92	5	.86			
92	97	5	.58			
97	102	5	.31			
102	107	5	2.06			
107	112	5	.82			
112	117	5	2.10			
	120	3	tr			
120	125	5	-			
125	130	5	tr			
130	135	5	tr			
135	140	5	-			
140	145	5	-			
145	150	5	-			
150	155	5	-			
155	160	5	tr			
165	170	5	tr			
160	165	5	tr			
170	175	5	tr			
175	180	5	-			
180	185	5	.12			
185	190	5	.17			
190	195	5	tr			
195	200	5	.17			
	205	5	tr			
205	210	5	-			
	215	5	-			
215	220	5	tr			
220	225	5	-			
225	230	5	-			
230	235	5	tr			
235	240	5	tr			
240	245	5	-			
77	117	40'	1.24			

011

STATE TASMANIA
 COMPANY
 AREA MT BISCHOFF

HOLE NUMBER B2
 BEARINGS (M) 333°
 CO-ORDS 1085N, 1075W
 DTP 55°

560062

FROM	TO	RECOVERY	CORE DESCRIPTION
0	29		<u>Creamy dolomite</u> with scattered talcy lode developments throughout. Occasional fine grained Po present in latter to minor extent
29	32		<u>Grey slate</u> (foliation = 40°) with lesser interbedded dolomite, and very minor talcy lode.
32	40		<u>Cherty argillite</u> , with very weak fine grained Po Min. Occasional talc coated narrow joints.
40	104		<u>Grey dolomite</u> , with weak Po Min from 40'-43', moderate to strong from 43'-89' (tending to weak Po ore) and weak Po-Py Min from 89'-104'. Very strongly oxidised and decomposed from 43'-85' (with only 5' recovery), indicating strong fault zone or old U/G workings.
104	124		Light grey <u>cherty argillite</u> , with traces of fine grained sulphides in first several feet only. Upper contact = 60°. Bedding angles of 50°-60° in latter half of section.
124	138		<u>Siliceous argillite</u> , with some interbedded quartzite. Angles 40°-60° but deformed.
138	144		<u>Massive quartzite</u> .
144	183		Weekly banded <u>siliceous argillite</u> , with minor interbedded quartzite near beginning and end of section. Angles 55°-65°, with a local steepening to 80° at 167'. ½" Py vein at 182'
183'	196'		<u>Quartzite</u> , with minor interbedded siliceous argillite. Angles of 65°.

END OF HOLE

012

ASSAY SHEET

560063

HOLE NUMBER

B2

FROM	TO	WIDTH	%Sn				
10	15	5	tr				
15	20	5	tr				
20	25	5	tr				
25	30	5	tr				
30	35	5	tr				
35	40	5	tr				
40	45	5	tr				
45	50	5	.64				
50	55	5	tr				
55	60	5	.11				
60	65	5	.20				
65	70	5	1.10				
70	75	5	.26				
75	80	5	1.94				
80	85	5	3.50				
85	90	5	tr				
90	95	5	.16				
95	100	5	.69				
100	105	5	.26				
45	105	60	.74				
65	85	20	1.70				

013

STATE INDUSTRY
 COMPANY MT. BISCHOFF T.M.Co.
 AREA MT. BISCHOFF

BEARINGS (M)
 CO-ORDS
 DIP

560064
 1040N, 1055W
 Vertical

FROM	TO	RECOVERY	CORE DESCRIPTION
0	60		<u>Dolomite</u> Creamy coloured to 30' then grey, fin grained and siliceous from 30'-60'. Traces of fine grained Py-Po Min from 42'-60'.
60	79		<u>Green talcy lode</u> with lesser light grey dolomite. Very sparse fine grained Py-Po min throughout.
79	93		<u>Creamy crystalline dolomite</u> , with only very minor talc developments. Weak Py-Po min, increasing to end of section.
93	124		<u>Massive Po Ore</u> . Minor dolomite and talc gangue from 93' - 95'. Weakly oxidised from 113' - 119'.
124	136		<u>Talcy lode</u> with moderately strong Po Min.
136	167		<u>Massive Po Ore</u> , with some talc gangue from 155' - 167'
167	175		<u>Fair Po Ore</u> , with appreciable talc and minor dolomite gangue.
175	184		Dark-grey <u>talcy lode</u> . Weak Po Min to 178' then only traces to end of section.
184	203		Grey-brown <u>cherty argillite</u> . ¼" Py veins at 190' and in last 6" of hole. Angles: 85° at 186' 45° from 193' - 199' 20° from 199' - 203'
			<u>End of Hole</u>

01A

ASSAY SHEET

560065

HOLE NUMBER

B3

FROM	TO	WIDTH	% Sn				
0	20	20	.19	(core +	sludge)		
20	25	5	-				
25	30	5	-				
30	35	5	-				
35	40	5	-				
40	45	5	-				
45	50	5	-				
50	55	5	-				
55	60	5	-				
60	65	5	-				
65	70	5	tr				
70	75	5	-				
75	80	5	tr				
80	85	5	-				
85	90	5	-				
90	95	5	tr				
95	100	5	-				
100	105	5	-				
105	110	5	-				
110	115	5	-				
115	120	5	tr				
120	125	5	-				
125	130	5	.29				
130	135	5	-				
135	140	5	tr				
140	145	5	-				
145	150	5	tr				
175	180	5	1.97				
180	185	5	tr				

015

STATE TASMANIA
 COMPANY MINES EX. PTY LTD
 AREA MT BISCHOFF

HOLE NUMBER B4
 DEPT. (M) -
 CO-ORDS 970N, 1180W
 DIP vertical

560066

FROM	TO	RECOVERY	CORE DESCRIPTION
0	19		Sludge recovery only (2').
19	80		Barren creamy dolomite. 1" Py-Fluorite vein at 43'6", then occasional Py-Po veinlets from 66'-80'. Occasional suggestion of banding at 45°-55°.
80	92		Light-grey dolomite with talc developments thro' out. Only traces of fine grained Py-Po Min.
92	134		Talcy lode, with fair Po Min from 109'-114' and 124'6"-125'6". Occasional weak fine grained Po Min elsewhere. Angles at 30°.
134	172		Fairly massive Po Ore, with dark-green talc gangue. Po content decreasing below 161', becoming a very strong talcy lode in last few feet of section.
172	182		Yellowish talcy lode, with fair Po-Py Min thro' out. Lower contact = 45°.
182	198		Grey-brown siliceous argillite. ½" Py-Sl vein at 189'6", but elsewhere only very minor Py Min. especially in first 1' of section. Angles 30°-40°.

END OF HOLE

016

ASSAY SHEET

560067

HOLE NUMBER B4

AVERAGE ASSAYS

FROM	TO	WIDTH	% Sn	FROM	TO	WIDTH	% Sn
0	10	10	Tr	115	130	15	1.31
70	75	5	Tr	90	100	10	.39
75	80	5	Tr				
80	85	5	Tr				
85	90	5	Tr				
90	95	5	0.19				
95	100	5	0.59				
100	105	5	Tr				
105	110	5	-				
110	115	5	Tr				
115	120	5	1.20				
120	125	5	2.44				
125	130	5	0.28				
130	135	5	Tr				
135	140	5	-				
140	145	5	-				
145	150	5	-				
150	155	5	-				
155	160	5	-				
160	165	5	-				
165	170	5	Tr				
170	175	5	-				
175	180	5	-				
180	185	5	Tr				

017

STATE TARRANT

HOLE NO. 560068

COMPANY MT. BISCHOFF T.M.CO. BEARINGS (M) -

AREA MT. BISCHOFF

CO-ORDS

945N, 1000W

560068

DIP

VERTICAL

FROM	TO	RECOVERY	CORE DESCRIPTION
0	95	68'	<p><u>Massive barren dolomite</u> Some talc, fluorite 18' - 19'6". Altered and in part recrystallised 40' - 50' (approx) with some talc, Sl, Py. Probable 'contorted' type 55' - 67' with talc, recrystallised Py. Some talc, fluorite, Py, Sl, recrystallised carbonates 93' - 95'.</p>
95	109		<p><u>Green 'contorted' dolomite</u> with abundant Po, some recrystallised Py, lesser Sl.</p>
109	145'6"		<p><u>Massive dolomite</u> Narrow 'contorted' sections at 109'6", 110', 122'9" - 123'9". Medium-grained (recrystallised) dolomite, from 133'6" - 136', 137'6" - 140'6", 144'6" - 145'6", in part silicified and with some Po. Py, talc.</p>
145'6"	152		<p><u>Strongly talcose rock</u> with some sections of abundant Po. minor Py.</p>
152	224		<p>Fine-grained <u>quartzite</u>, (?) dolomitic at upper limits, with narrow shaley sections and occasional narrow veins containing Po, Py, Sl, carbonates often along bedding. Shaley sections become more frequent towards bottom of hole.</p>
			<p>END OF HOLE</p>

018

ASSAY SHEET

560069

HOLE NUMBER B5

FROM	TO	WIDTH				
0	5	Tr				
90	95	Nil				
95	100	0.24				
100	105	0.55				
105	110	0.34				
110	115	Tr				
115	120	Tr				
120	125	Tr				
125	130	Nil				
130	135	Nil				
135	140	0.13				
140	145	0.43				
145	150	1.67				
150	155	Tr				
95	110	0.38				
135	150	0.74				

019

STATE TASMANIA

HOLE NUMBER B6

COMPANY MT BISCHOFF TIN M. Co

DIARINGS (M) 333°

560070

AREA MT BISCHOFF

CO-ORDS

1025N, 765W

DIP

45°

FROM	TO	RECOVERY	CORE DESCRIPTION
0	-29'3"		<u>Friable pyritic lode</u> , of the type usually associated with the quartz-porphry dykes, some Sl.
29'3"	44'		<u>Dolomite lode</u> , altered and silicified in part, with recrystallised Py, carbonates, some Sl. Massive Po 40'6"-43'.
44'	50'		CORE MISSING
50'	57'6"		' <u>Contorted</u> ' dolomite lode with Po.
57'6"	74'9"		<u>Strongly talcose rock</u> , with recrystallised Py, some Sl.
74'9"	77'3"		<u>Dolomite lode</u> , altered and silicified in part, with recrystallised carbonates and abundant Po. Intensely altered over last 8".
77'3"	103'6"		<u>Quartz-porphry dyke</u> , with disseminated sulphide grains, throughout - Py except from 87'-88', where Po predominant. Very altered and pitted from:- 80'-80'6", 85'6"-86'9", 92'9"-93'9", 101'4"-102'. Brown cherty-like rock with abundant fine-grained Py 91'6"-92'9". Intensely altered contact zone 102'-103'6", in part chert-like rock as above.
103'6"	150'6"		<u>Dolomite lode</u> , with abundant Po, rare Py and fluorite, some silification; massive Po 103'6"-112', 153'6"-154'6". Strongly talcose after 148'.
150'6"	182'		<u>Dark grey talcose rock</u> . Narrow veins and blebs of Py, Po after 159'6". Altered zone 164'9"-167'6" with recrystallised Py, some Sl. Medium-grained talc 169'6"-170'3". Fine-grained dolomite 171'-172' then coarsely crystalline dolomite with Py, Sl to 172'9". Becomes shaley towards end of section.
182'	189'		<u>Shales and shaley quartzites</u> with some talcose bands.

END OF HOLE

520

560071

ASSAY SHEET

HOLE NUMBER B6

FROM	TO	WIDTH	% Sn				
0	5		0.75				
5	10		1.26				
10	15		0.29				
15	20		1.00				
20	25		0.17				
25	30		Tr				
30	35		0.32				
35	40		Tr				
40	45		0.22				
45	50		0.49				
50	55		0.77				
55	60		0.14				
60	65		0.17				
65	70		Tr				
70	75		0.27				
75	77'6"		2.73				
77'6"	80		Tr				
80	85		Tr				
85	90		Tr				
90	95		Nil				
95	100		Nil				
100	104		0.96				
104	105		Tr				
105	110		0.54				
110	115		0.67				
115	120		1.87				
120	125		Tr				
125	130		0.11				
130	135		0.23				
135	140		0.48				
140	150		1.49				
150	155		0.42				
155	160		0.13				
160	165		0.21				
165	170		0.12				
170	175		Tr				

021

STATE MICHIGAN

ACQUISITION NO.

COMPANY MT BISCHOFF T.M.Co.

BEARINGS (M) -

560072

AREA MT BISCHOFF

CO-ORDS

1025N, 765W

DIP

Vertical

FROM	TO	RECOVERY	CORE DESCRIPTION
0	20		Friable pyritic lode of the type usually assoc. with the quartz-porphry dykes.
20	111		<p>Quartz-porphry dyke with disseminated sulphide grains - recrystallised Py throughout. Occasional grains of unidentified metallic mineral, rare fluorite. Core severely altered as follows:-</p> <p>(S) = silicification (D) = devitrification</p> <p>21'6"-22' (S) 24'-24'6" (S) 28'6"-29' (S)</p> <p>29'6"-43' (D) 43'-46'6" (S) 56'-71' (S)</p> <p>72'9"-76'6" (S) 76'6"-87' (D)</p> <p>98'3"-103'3" (S) 103'3"-111' (D)</p>
111	159'6"		Clay Pug with small pebbles of various rock types. Possibly a fault zone.
159'6"	160'		Quartz-porphry dyke with Po, minor recrystallise Py.
			END OF HOLE

022
ASSAY SHEET

560073

HOLE NUMBER B7

AVERAGE ASSAYS

FROM	TO	WIDTH	% Sn	FROM	TO	WIDTH	% Sn
0'	5'	5'	.33	20'	75'	55'	.20
5'	10'	5'	.62				
10'	15'	5'	.97				
15'	20'	5'	1.21				
20'	25'	"	Tr.				
25'	30'	"	.14				
30'	35'	"	Tr.				
35'	40'	"	.17				
40'	45'	"	.24				
45'	50'	"	.24				
50'	55'	"	Tr.				
55'	60'	"	Tr.				
60'	65'	"	.47				
65'	70'	"	.80				
70'	75'	"	.10				
75'	80'	"	Tr.				
80'	85'	"	Tr.				
85'	90'	"	Tr.				
90'	95'	"	Nil				
95'	100'	"	Tr.				
100'	105'	"	Tr.				
105'	110'	"	Tr.				

N.B. Core recoveries were poor

023

COMPANY AAA
 AREA MT. BISCHOFF

BEARINGS (M)
 CO-ORDS
 DIP

360°
 23E, 14.5N
 72.5°

560074

FROM	TO	CORE DESCRIPTION	C. to D. Angles
0	468	<p>Grey and black shales, with some siliceous sections generally well-banded but with occasional sedimentary breccia zones. Numerous veins of Py observed on fractures etc. More siliceous overall (some quartzite)</p> <p>169'-225' 333'-357' 409'-468'</p> <p>Abundant Py veining 384'-391'</p> <p>Core very carbonaceous as follows:-</p> <p>51'-53'6" 100'6" - 113' 126'9" - 145'6"</p> <p>146'-150'6" 153'6" - 162'3" 194' - 195'</p> <p>200'3" - 220'6" 224'6" - 333' 454'6" - 462'</p>	<p>20-25 35-25 60-40 80-45 100-45 120-30 140-35 160-50 180-50 200-40 220-50 240-40 260-10 280-50 300-40 320-70 330-10 340-80 365-70 380-75 400-70 420-45 440-35 460-45</p>

024

SAMPLE TAG/MARKING

COMPANY MT. BISCHOFF T.M.CO. BEANIECS (M)

333°

AREA MT. BISCHOFF

CO-ORDS

800N, 875W

560075

DIP

55°

FROM	TO	RECOVERY	CORE DESCRIPTION	
0'	70'		<u>Loose boulder fill</u>	
70'	100'6"		<u>Massive dolomite, very broken; occasional thin pyrite veins up to 1/16".</u>	75'-55' 95'-45'
100'6"	113'6"	100% here after	<u>Mineralized 'contorted' dolomite with major Po minor Py, some talc.</u>	
113'6"	117'		<u>Talcosed dolomite with minor Py some Po</u>	
117'	126'3"		<u>Mineralized 'contorted' dolomite with major Py minor Po. abundant disseminated Sl grains up to 1/8". Barren dolomite: 117'3"-117'9" 118'8"-119'5" 123'9"-125'6"</u>	
126'3"	132'3"		<u>Mineralized 'contorted' dolomite with major Po minor Py. Some coarse fluorite, Sl.</u>	
132'3"	138'6"		<u>Massive barren dolomite, some very narrow veins containing one or more of Py, Po, Sl, fluorite, carbonates.</u>	
138'6"	160'6"		<u>Grey shaley quartzite, generally poorly banded and in part brecciated (apparently preconsolidated breccia). Some very narrow veins containing one or more of Po, Py, Sl, fluorite.</u>	142'-45' 152'-50' 159'-55'
160'6"	164'		<u>Grey-brown sandy shale, more gritty than previous horizon. Dips variable 0-30°</u>	
164'	250'		<u>Grey shaley quartzite. Some narrow fractures filled with one or more of Po. Py, Sl, fluorite. Narrow bands of shale throughout. Strongly fractured 174'-181', filled with Py, fluorite 6" of shattered rock at 210' filled with Po, Py. More shaley 227'-250'</u>	170'-50' 183'-20' 188'-45' 214'-45' 225'-60' 235'-30' 250'-50' 280'-35' 290'-40'
250'	306'		<u>Quartzite, some narrow shaley sections. May narrow veins of Py, some Po, at 262'. Minor fractures throughout, filled with Py, fluorite. Some apparently pre-consolidation breccia of 267' and occasionally thereafter.</u>	260'-50' 270'-45'
306'	401'		<u>Quartz-porphry dyke 10" fine grained contact zone, then porphyritic and with abundant (10%) disseminated Py grains up to 1/8". Increase in Py content (20%) 320'-321'6", the Py grains being larger and usually having a core of</u>	

025

STATE, TASMANIA

INDUSTRIAL

ED

COMPANY MT. BISCHOFF T.M.CO. BEARINGS (M)

3330

560076

AREA MT. BISCHOFF

CO-ORDE

800N, 875W

DIP

55°

FROM	TO	RECOVERY	CORE DESCRIPTION
			<p>fluorite. Core in severely altered and pitted 321'6"-401' with fine-grained recrystallised Py and partial kaolinisation of the felspars. Less-altered sections :</p> <p style="padding-left: 100px;">336' - 342'</p> <p style="padding-left: 100px;">378' - 385'</p> <p style="padding-left: 100px;">398' - 401'</p> <p>END OF HOLE</p>
B9 (Extended) 401'6"	626'		<p>Massive <u>Porphyry</u> with strong evenly distributed Pyrite Mineralization through-out (barren sections are few and generally of about 6" duration). Massive pyrite-sphalerite mineralization from 588'6" - 589'. Pyrite grains average approximately 0.1" across.</p>
626'	634'		<p>Massive Siliceous (cherty?) Rock - very hard, light greyish colour. Various jointing directions with up to 1" wide pyrite veins. Fine-grained disseminated pyrite throughout. Specimen taken at 626'6" for AMDL examination.</p>
634'	637'		<p>Massive <u>Quartzite</u> with sulphide veining.</p>
637'	675'		<p>Banded siliceous argillite, bands varying from light to mid-grey in colour. Very minor interbedded quartzite near start of section. Irregular Py veining up to ¼" wide throughout with larger veins at 647' (¾"), 658' (2") and 664' (3" vein with much fluorite). Appreciable fine grained Py, and occasional narrow and irregular calcite veins. Although fair banding, structures are extremely deformed. Angles generally in range 50° - 80°.</p>
675'	678'		<p>Massive porphyry with strong evenly distributed pyrite mineralisation through-out. Upper and lower contacts both 50° with some brecciation in wall rock.</p>

026

STATE TASMANIA

HOLE NUMBER B9

COMPANY MT. BISCHOFF T.M.CO. BEARINGS (M) 3330

560077

AREA MT. BISCHOFF

CO-ORDS 800N, 875W

DIP 55°

FROM	TO	RECO- VERY	CORE DESCRIPTION
678'	721'		Weakly banded siliceous <u>argillite</u> , with minor interbanded quartzite. Scattered pyrite veining, generally narrow, as with section above porphyry. Angles: folded 0°-30° from 678'-680', then mostly 35° to 701', where steepen to 80°. Then vague to 719', and finally 35° - 45° from 719'-721'.
721'	731'		Massive <u>pyrrhotite ore</u> (with only minor calcite gangue) to 729', then pyrite-pyrrhotite-calcite-sphalerite ore from 729'-731'. Upper and lower vein contacts flat at about 10° - 20°.
731'	772'		Very weakly banded siliceous <u>argillite</u> as previously. Pyrite veining also as previously. Angles: 35°-45° to 753', then flattening to 0° at 758', and finally 30° to end of section.
772'	800'		Light grey slate-rock basically as above, but lacking bedding and with definite slaty cleavage. Occasional narrow pyrite veinlets, and 3" calcite-fluorite-pyrite vein at 788'. Overall sulphide content much lower than previously.
800'	803'		Massive <u>porphyry</u> with strong evenly distributed pyrite mineralisation throughout. Wallrock contacts obscure.
803'	850'		Siliceous <u>argillite</u> , weakly banded and with lesser interbanded quartzite. Scattered pyrite veinlets, but sulphides not highly abundant. Angles: 45°-50° at first, decreasing to 35°-40° by 813', then 35°-40° from 813'-832', 30°-35° from 832'-846' and 45°-50° from 846' - 850'.
850'	868'		Massive <u>quartzite</u> with minor interbedded argillite. Sulphides generally very sparse. Angles: 30° at start then not apparent.
868'	884'		<u>Argillite</u> Scattered weak pyrite veinlets, and ½" pyrite vein at 872'.

027

STATE TASMANIA

HOLE NUMBER

B9

COMPANY MT. BISCHOFF T.M.CO BEARINGS (M)

333°

560078

AREA MT. BISCHOFF

CO-ORDS

800N, 875W

DIP

55°

FROM	TO	RECOVERY	CORE DESCRIPTION
			Angles not distinct but appear to be steep at 80° at start, and flattening to 40° at 884'.
884	887		Massive porphyry with strong evenly distributed Py Min thro'out. Upper contact 45°, lower 30° but irregular.
887	932		Light grey siliceous argillite, with occasional narrow fine grained quartzite bands. ¼" wide siliceous vein with strong Sl Min at 906', and scatt'd narrow irregular Py veins. Angles : 30° to 915' 0°-5° from 915'-922' 30° from 922'-932'
932	936		Massive porphyry with strong Py Min thro'out. Upper contact 70°, lower 60°
936	1046		Interbedded light-grey siliceous argillite and fine grained quartzite. Scattered Py veins as previously, with ½" veins at 989'6" and 1016'. Angles : 0°-5° from 936'-953' variable 40°-80° from 953'-960' 25° from 960'-986' 0°-10° from 986'-1014' 15° from 1014'-1022' 0° - 10° from 1022'-1039' variable 0°-35° from 1039'-1040'
1046'	1112'		Banded mid-grey siliceous argillite, with lesser interbedded fine grained light-grey quartzite. Very occasional narrow Py veinlets as previously. Angles variable 0°-60° from 1046'-1053' 20°-30° from 1053'-1073' 60° from 1073'-1077' 45°-50° from 1077'-1089' 30° from 1089'-1106' 40° from 1106'-1112'.
1112'	1127'		Light-grey siliceous argillite. Sulphide veining stronger than previously with abundant narrow Py-Po veinlets and 2" Py vein at 1121'6". Angles variable but generally steeper at 55°-80°.
1127'	1156'		Massive porphyry. Very strong fine grained sulphides thro'out, with Po very greatly predominating over Py. Upper

028

STATE TASMANIA HOLD NUMBER B9
 COMPANY MT. BISCHOFF T.M.CO. BEARINGS (M) 333°
 AREA MT. BISCHOFF CO-ORDS 800N, 875W
 DIP 55°

560079

FROM	TO	RECOVERY	CORE DESCRIPTION	
1156'	1275'		<p>Variable light to mid-grey siliceous argillite, with scattered narrow quartzitic bands thro-out. Scattered sulphide veinlets thro-out, with moderate Po Min from 1175'-1182', 1234'-1240' and Py-Po Min from 1240'-1275'. Strong Py Min with fluorite and Co in diffuse siliceous vein from 1251'-1254'.</p> <p>Angles: faint 20°-30° from 1156'-1186' folded 0° from 1186'-1195' faint 5° from 1195'-1198' faint 30° from 1198'-1226' faint 0°-20° from 1226'-1237' variable 10°-40° from 1237'-1251' (10° at 1248') indistinct 30-50° from 1254' faint 50° increasing to 80° from 1271'-1275'</p>	0 1260'
1275'	1281'		<p>Mainly fine grained quartzite with little interbedded siliceous argillite. Angles of 20° flattening to 35° at end of section</p>	
1281'	1307'		<p>Mainly light-grey siliceous argillite with lesser interbedded quartzite. Sulphides sparse, except for 8" Py vein at 1306'.</p> <p>Angles: faint 55°-80° from 1284'-1294' fold from 1294'-1296'; upper limb at 45°, lower at 30° 45° from 1296'-1303' 60° from 1303'-1305' 39°-40° from 1305'-1307'.</p>	
1307'	1340'		<p>Mainly very fine grained quartzite with some interbedded light-grey siliceous argillite. Minor Po-Py Min as thin and irregular veinlets.</p> <p>Angles: 35°-40° from 1307'-1314' 30° from 1330'-1335' 40° from 1335'-1338'</p>	
1340'	1570'		<p>Weakly banded light grey siliceous argillite with very minor interbedded f.g. quartzite. Fair zone of oyrhotite mineralisation as veinlets parallel to bedding from 1340'-1375' (with 3" Po-Py vein at 1362' and ½" Py-Po vein at 1392') and weak zone of Po Min from 1405'-1440', and 1" Py vein at 1445'.</p>	

029

STATE TASMANIA

HOLE NUMBER

B9

COMPANY MT. BISCHOFF T.M.CO. BEARINGS (M)

333°

560080

AREA MT. BISCHOFF

CO-ORDS

800N, 875W

DIP

55°

FROM	TO	RECOVERY	CORE DESCRIPTION
			<p>Several Carbonate-Py-Sl veins to ½" from 1473'-1478', elsewhere only very minor Py Min.</p> <p>Angles: 30° from 1340'-1343' 50°-70° from 1343'-1420' 80° from 1420'-1437' 45°-50° from 1437'-1452' 50°-60° from 1452'-1460' 65°-75° from 1560'-1474' 50° from 1474'-1476' 30°-50° from 1476'-1490' 70°-80° from 1490'-1496' 50°-60° from 1496'-1501' 30°-45° from 1501'-1510' 60° from 1510'-1517' 40° from 1517'-1521' 50° from 1521'-1525' 35° at 1528' 45°-60° from 1540'-1543' 50°-60° from 1550'-1565' 60° from 1565'-1570'</p>
1570'	1587'		<p>Very strongly banded dark and light grey siliceous argillite. Only traces of Py Min in scattered narrow and irregular veinlets.</p> <p>Angles: mainly 30° from 1570'-1573' mainly 60°-70° from 1573'-1587'</p>
1587'	1626'		<p>Weakly banded mid-grey siliceous argillite with lesser interbanded very f.g. quartzite. Several ¼" Py veins at 1590' and scattered narrow Py-Po-Sl-Carb veinlets from 1590'-1611'.</p> <p>Angles: from 1587'-1598' var. 50-80° 45°-30° from 1598'-1601' 30°-60° at 1603' var. Up to 70° from 1610'-1616' folded Var. 60° from 1616'-1618'.</p>
1626'	1637'		<p>Mainly very f.g. quartzite with a little interbedded mid-grey siliceous argillite</p>
1637'	1648'		<p>Well banded mid-grey siliceous argillite with little interbanded very f.g. quartzite. Minor Py veining from 1641'-1644'</p>

69°-1633

70°-1630

gen 65-75°

Var. 60°

62°-1646

030

STATE	TASMANIA	HOLE NUMBER	B9	560081
COMPANY	MT. BISCHOFF T.M.C.	BEARINGS (M)	333°	
AREA	MT. BISCHOFF	CO-ORDS	800 N, 875 W	
		DIP	55°	

FROM	TO	RECOVERY	CORE DESCRIPTION	
1648'	1680'		Mainly very f.g. <u>quartzite</u> with little interbedded mid-grey banded argillite. Only 10' recovery from 1647'-1675'. Buckled partly.	50°-60° Var. up to 75
1680'	1754'		Laterbedded mid-grey and generally well banded <u>siliceous argillite</u> and very f.g. <u>quartzite</u> . ¼" Py veins at 1699' and 1734' but elsewhere only very occasional narrow Py veinlets, generally at angles of 5-10° to core length. F.g. tuffaceous quartzite from 1707'-1709', with f.g. Py-Po-specks Angles: 50° at 1680' gen trend at 1683' 70° at 1682' 55-65° from 1684'-1688' warped footages conn. 1700'-1708 55-80 from 1703'-1724' p. " Var. up to 65° 1724'-1728' some buckli: Mainly low angles from 1728'-1734' folded 0-65 from 1734'-1740' contorted 60-65 from 1740'-1754'. Gen. 60-70 contort in places.	
1754'	1818		Interbedded <u>quartzite</u> and banded <u>argillite</u> with quartzite greatly predominant, and increasing to end of section. Occasional 1/8" wide Py veinlets at angles of 20° to core length. Angles: from 1754'-1759' gen 75 55-70 from 1750'-1810' fairly uniform Gen 70 from 1810'-1818' buckled, deformed	
1818	1844		<u>Quartzite</u> , with only very occasional narrow argillite bands. Several very narrow Py veinlets at 20° angles as previously. ¼" wide joint at 1823'. Var. gen 65	
<u>END OF HOLE</u>				

FROM	TO	WIDTH	% Sn ⁽¹⁾	% Zn	% Sn ⁽²⁾
100 '6"	103	2 '6"	.256	1.40	.26
103	108	5'	.60	.50	.59
108	113	5'	.742	.20	.71
113	118	5'	.987	.07	.89
118	123	5'	.283	1.70	.26
123	128	5'	.286	1.20	.25
128	132 '3"	4 '3"	.474	.33	.50
(1)	by	B.H.S.			
(2)	by	Tas. Dept of Mines			
315	320	5'	.113	.18	
320	325	"	.214	.22	
325	330	"	.149	.19	
330	335	"	.483	.98	
335	340	"	1.811	.84	
340	345	"	.256	.28	
345	350	"	.328	.15	
350	355	"	.697	.14	
355	360	"	.208	.14	
360	365	"	.208	.10	
365	370	"	.465	.10	
370	375	"	.322	.14	
375	380	"	.185	.18	
380	385	"	.042	.14	
385	390	"	.322	.14	
390	395	"	.065	.14	
395	401	6'	.065	.18	
401	405	4'	.25		
405	410	5'	.45		
410	415	"	.10		
415	420	"	2.15		
420	425	"	.33		
425	430	"	.45		
430	435	"	.21		
435	440	"	.12		
440	445	"	.15		
445	450	"	.16		
450	455	"	.11		
455	460	"	.78		
460	465	"	.19		
465	470	"	.52		
470	475	"	.15		
475	480	"	.27		
480	485	"	.68		
485	490	"	1.65		
490	495	"	.78		
495	500	"	1.00		
500	505	"	3.18		
505	510	"	.92		
510	515	"	.27		
515	520	"	.09		
520	525	"	.18		
525	530	"	.45		

032

ASSAY SHEET
HOLE NUMBER B9

560083

FROM	TO	WIDTH	FROM	TO	WIDTH	%SN (1)	%SN (2)	%ZN
530	535	5'	100'6"	132'3"	31'9"	.53	.51	.73
535	540	5						
540	545	5						
545	550	5						
550	555	5						
					True Width	% Sn		
			315	355	20'		.50	
721	725	4'	315	375	30'		.44	
725	732	7'	315	395	40'		.36	
555	560	5'	315	490	175'		.42	
560	565	"						
565	570	"	315	600	285		.425	
570	575	"	315	510	195		.53	
575	580	"						
580	585	"	315	630	315		.39	
585	590	"						
590	595	"	480	510	30		1.37	
595	600	"						
600	605	"	455	515	60		0.87	
605	610	"						
610	615	"						
615	620	"	401'6"	490	90		.46%	
620	625	"						
625	630	"						
1127	1130	3'						
1130	1135	5'						
1135	1140	5						
1140	1145	5						
1145	1150	5						
1150	1155	5						
1155	1157	2						

033

STATE TASMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

HOLE NUMBER B10
 BEARINGS (M) 333°
 CO-ORDS 625N, 835W
 DIP 55°

560084

FROM	TO	CORE DESCRIPTION	C. to B. Angles
0	123	<u>Loose boulder fill</u> . Recovered material generally weathered dolomite, in part containing sulphides and/or talc. A few pebbles of quartz porphyry.	
123	139(?)	Weathered barren dolomite.	
139(?)	151	<u>Friable lode material</u> of a type usually associated with the porphyry dykes. Comprises fine-grained Py and crystalline carbonates.	
151	178	<u>Blue and green talcose dolomite lode</u> , with re-crystallised carbonates, abundant Py some Po. In part 'contorted' dolomite.	
178	184'6"	<u>Massive Po</u> . rare Py in dolomite, which is partly of 'contorted' type.	
184'6"	220'6"	' <u>Contorted</u> ' dolomite lode. Po decreases and talc increases with depth. Blue and green colouration becomes more intense towards bottom of section. 6" of vughy re-crystallised Py at 187' and 188'.	
220'6"	302'6"	<u>Quartz-porphyry dyke</u> with disseminated grains Po, some Py. Several veins of flourite up to ½". Altered zone 236'-302'6" characterised by pitted core, fine-grained recrystallised Py, disseminated grains of flourite. Flourite abundant 295'-302'6". Po, Py concentrations as follows:- 9" at 269'6" 2" at 270'6" 12" at 273' 5" at 276' 2" at 279'6" 3" at 287'3"	
302'6"	333'	<u>Grey shaley quartzite</u> . Contact zone at upper limit as follows:- a. 2'6" intensely silicified shaley quartzite. b. 1' pug showing relict bedding. c. then normal shaley quartzite. Rock shows disturbed bedding suggesting pre-consolidation slumping.	315'-40 325'-40 332'-60

END OF HOLE

034

ASSAY SHEET

560085

HOLE NUMBER B10

FROM	TO	WIDTH	Sn%	Zn%			
138'6"	145'	6'6"	.94	1.2			
145	150	5'	.23	.11			
150	155	5'	.54	.10			
155	160	5'	1.21	.29			
160	165	5'	.31	.31			
165	170	5'	.13	.03			
170	175	5'	Nil	.04			
175	180	5'	.95	.02			
180	185	5'	2.21	.01			
185	190	5'	4.30	.02			
190	195	5'	3.64	.02			
195	200	5'	3.38	.02			
200	205	5'	1.14	.03			
205	210	5'	1.71	.04			
210	215	5'	1.16	.03			
215	220'6"	5'6"	.65	.46			
230	235	5'	.40	.21			
235	240	5'	.09	.19			
240	245	5'	.12	.19			
245	250	5'	.26	.11			
250	255	5'	.08	.10			
255	260	5'	.30	.12			
260	265	5'	.17	.12			
265	270	5'	.45	.61			
270	275	5'	.75	.15			
275	280	5'	.37	.17			
280	285	5'	.09	.12			
285	290	5'	.21	.18			
290	295	5'	.72	.21			
295	302'6"	7'6"	.18	.15			
138'6"	220'6"	82'	1.39	.19			
175	215	40'	2.31				
230	302'6"	72'6"	.30				

035

STATE TASMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

HOLE NUMBER B11
 BEARINGS (M) 330.5° 560086
 CO-ORDS 670 S, 210 W
 DIP -60°

FROM	TO	RECOVERY	CORE DESCRIPTION
0	28		No core recovered
28'	35'		Carbonaceous Argillite with minor carbonate veining.
35'	83'		J.G. dark grey quartzite with carbonate veining throughout.
83'	92'		Interbedded quartzite and carbonaceous argillite Minor carbonate veining throughout.
92'	102'		No core recovery.
102'	103'		Carbonaceous argillite.
103'	111'		No core recovery.
111'	112'		Dark grey c.g. quartzite with carbonate veining.
112'	113'		No core recovery.
113'	116'		Interbedded carbonaceous argillite and c.g. dark grey quartzite. The carbonaceous argillite is very graphite rich.
116'	125'		No core recovery.
125'	127'		= 113'-116'
127'	128'		No core recovery.
128'	156'		Graphite rich carbonaceous argillite
156'	170'		Interbedded carbonaceous argillite and c.g. dark grey quartzite. At 164' and 171' 2" vein of Py-carbonate-desoiterite mineralization.
170'	199'		Dark grey c.g. quartzite with small bands of carbonaceous argillite. Minor crosscutting carbonate veining.
199'	204'		Dark grey f.g. banded argillite with small bands of carbonaceous argillite.
204'	206'		Strongly brecciated and sheared carbonaceous argillite.
206'	216'		Tuffaceous dark grey quartzite with f-carbonate- Py veins parallel to bedding. Contact at 206' : 60°, at 216' : 30°.

036

STATE
COMPANY
AREAHOLE NUMBER
BEARINGS (M)
CO-ORDS
DIP

B11

560087

FROM	TO	RECO- VERY	CORE DESCRIPTION
216'	217'		Highly sheared and brecciated carbonaceous argillite. At 217' : 1" f-carbonate-Py-Sl veins
217'	219'		= 206-216. Contact at 219 : 20°.
219	229		Dark grey f.j. banded argillite with minor carbonate veining.
229'	283'		Tuffaceous dark grey quartzite with narrow bands of carbonaceous argillite. Minor Q and carbonate veining.
283'	285'		Tuff containing grains of kaolin, Q, F and Hcl.
285'	344'		Strongly sheared and contorted carbonaceous argillite with bands of c.g. qtz minor carbonate veining throughout.
344'	368'		Tuff with bands of light grey argillite lurd carbonaceous argillite. The tuff is consisting of fragments of carbonaceous argillite, argillite, feldspar minor Py mineralization throughout.
368'	372'		Interbedded light grey argillite and carbonaceous argillite.
372'	382'		= 344'-368'. At 382':1" veins of Py-carbonate-Siderite.
382'	402'		Light grey f.g. argillite with narrow bands of quartzite. Flourite veining throughout.
402'	449'		Carbonaceous argillite interbedded with c.g. quartzite and f.g. light grey argillite carbonate veining throughout.
449'	459'		Tuff with fragments of Feldspar, argillite and carbonaceous argillite.
459	467		Light grey f.g. argillite. Minor Py veining.
467	473		Sheared tuff. Contact at 467':20°, 473':40°.
473	522		c.g. light these quartzite with thin bands of argillite and carbonaceous argillite.
522	542		Interbedded tuff and tuffaceous quartzite. The tuffaceous quartzite has abundant flourite veining.

037

STATE
COMPANY
AREAHOLE NUMBER B11
BEARINGS (M)
CO-ORDS
DIP

560088

FROM	TO	RECOVERY	CORE DESCRIPTION
542	580'		Interbedded c.g. quartzite, f.g. light grey argillite and minor carbonaceous argillite. minor carbonate veining.
580	693		Carbonaceous argillite with bands of light grey c.g. quartzite. In places the qte bands are sheared and contorted.
693	694		C.g. tuffaceous quartzite.
694	747		Carbonaceous argillite with faulted and brecciated bands of c.g. quartzite. Minor Py veins concentrated in the qte bands.
747	778		Light grey f.g. argillite with their bands of carbonaceous argillite and qte. Strong carbonate veining from 756'-761'. Py mineralization in blebs and veins.
778	781		Carbonaceous argillite with bands of c.g. Qte Strong Py min. in the qte bands.
781	789		C.g. tuffaceous Qte.
789	837		Carbonaceous argillite with contorted and faulted bands of c.g. qte. 789 - 805 medium-strong PyR min. in veins and blebs. 805 - 831 Strong Py min. 831 - 837 Medium-strong Py-Sl min.
837	1004		Interbedded carbonaceous argillite and c.g. light grey contorted and faulted qte. From 851-857 ½ wide Py-Sl-Flourite veins. Moderate Py min in veins and blebs throughout with the lighter concentrations in contorted carbonaceous argillite.
1004	1020		C.g. dark grey quartzite, very muscorite rich Strong f veining containing Py-Po min.
1020	1027		Interbedded dark grey qte and carbonaceous argillite.
1027	1056		Brecciated carbonaceous argillite with strong cl-flourite veining throughout. Minor Py mins.
1056	1068		Carbonaceous argillite with weak carbonate-Py-Po veining.
1068	1093		Interbedded carbonaceous argillite and c.g. broken and brecciated Qte. In places strong Py

038

STATE
COMPANY
AREA

HOLE NUMBER B11
BEARINGS (M)
CO-ORDS
DIP

560089

FROM	TO	RECOVERY	CORE DESCRIPTION																
1093	1106		C.g. dark grey Qte with minor Q veining.																
1106	1165		Interbedded carbonaceous argillite and c.g. blue grey quartzite. From 1153'-1165' the Qte is brecciated and the carb. argillite is sheared. Weak Py min. throughout.																
1165	1170		C.g. light grey quartzite with weak Py veining.																
1170	1182		Strongly sheared carbonaceous argillite. At 1180' : 1/2" vein of Q-Py min																
1182	1196		Interbedded c.g. light grey Qte and carbonaceous argillite. The Qte is brecciated and faulted.																
1196	1212		C.g. muscorite rich tuffaceous Qte.																
1212	1262		Interbedded C.g. qte and carbonaceous argillite. Py min. throughout.																
1262	1300		Banded Qte alternating with f.g. siliceous argillite. Flourite and carbonate veining throughout. Q-Py veins at: <table style="margin-left: 200px;"> <tr><td>1262'</td><td>(1")</td></tr> <tr><td>1267</td><td>(6")</td></tr> <tr><td>1271</td><td>(1")</td></tr> <tr><td>1272</td><td>(1/2")</td></tr> <tr><td>1275</td><td>(1/4")</td></tr> <tr><td>1276</td><td>(1/2")</td></tr> <tr><td>1278</td><td>(1/4")</td></tr> <tr><td>1279-80</td><td>(1/4")</td></tr> </table>	1262'	(1")	1267	(6")	1271	(1")	1272	(1/2")	1275	(1/4")	1276	(1/2")	1278	(1/4")	1279-80	(1/4")
1262'	(1")																		
1267	(6")																		
1271	(1")																		
1272	(1/2")																		
1275	(1/4")																		
1276	(1/2")																		
1278	(1/4")																		
1279-80	(1/4")																		
1300	1317		Siliceous carbonaceous argillite with minor Py veining.																
1317	1341		C.g. light grey Qte with bands of carbonaceous argillite. Minor Q-Py veining. Strong flourite veining throughout.																
1341	1348		Siliceous carbonaceous argillite.																
1348	1363		Interbedded Qte and carbonaceous argillite. From 1358' to 1382' strong Py-Q-Flourite-cassiterate veining. From 1360'6"-1362' 1" vein parallel to core.																
1363	1508		Carbonaceous argillite with thin bands of brecciated Qte. <table style="margin-left: 200px;"> <tr><td>f-Py veins at 1384'</td><td>(1/2", Co x 40°)</td></tr> <tr><td>1406'</td><td>(1", " 30°)</td></tr> <tr><td>1418'</td><td>(1/2")</td></tr> <tr><td>1419'</td><td>(6")</td></tr> <tr><td>1421</td><td>(1" " 30°)</td></tr> </table>	f-Py veins at 1384'	(1/2", Co x 40°)	1406'	(1", " 30°)	1418'	(1/2")	1419'	(6")	1421	(1" " 30°)						
f-Py veins at 1384'	(1/2", Co x 40°)																		
1406'	(1", " 30°)																		
1418'	(1/2")																		
1419'	(6")																		
1421	(1" " 30°)																		

039

STATE
COMPANY
AREA

HOLE NUMBER
BEARINGS (M)
CO-ORDS
DIP

B11

560090

FROM	TO	RECO- VERY	CORE DESCRIPTION
1363	1508 Cont.		<p>Strong concentrated Q-Py veining from 1421'-1440'.</p> <p>Q-Py veins at 1452' (1", Co 40°) 1475 (1/4", " 20°) 1484' (1/2", " 30°)</p> <p style="text-align: right;">1363'-1430' 30-50° 1430'-1458' 30° 1458'-1481' 0-20° 1481'-1508' 30-70°</p> <p style="text-align: center;">DRILLING COMPLETED</p>

ASSAY SHEET

560091

HOLE NUMBER

B11

FROM	TO	% Sn	Depth	Mag. Az	Trop Dip	Etch D.
850	810	0.001	200'	325	60	58
810	815	0.006	500	320	61	58
815	820	0.006	800	319	64	61
820	825	0.005	62			72½
825	830	0.005	70			69½
			100			72½
1262	1267	0.014	1100			64
1267	1272	0.098	1380			64½
1272	1277	0.073				
1277	1280	0.091				
1358	1362	1.106				
1419	1424	0.084				
1424	1429	0.014				
1429	1434	0.012				
1434	1440	0.010				
1262	1267	0.014	200	325	60	68
1267	1272	0.098				
1272	1277	0.073				
1277	1280	0.091	500	320	61	58
1358	1362	1.106	800	319	64	61
1419	1429	0.084				
1429	1434	0.014				
1434	1440	0.010	1100		67	
805	810	0.001	1380		69	
810	815	0.006				
815	820	0.006				
820	825	0.005				
825	830	0.005				

041

STATE TASMANIA
 COMPANY MINES EX. PTY LTD
 AREA MT BISCHOFF

HOLE NUMBER B12
 BEARINGS (M) 333°
 CO-ORDS 400N, 710W
 DIP 55°

560092

FROM	TO	RECOVERY	CORE DESCRIPTION
0	72		<u>Loose boulder fill</u>
72	77'3"		<u>Massive barren dolomite breccia</u> (possibly pre-consolidation breccia)
77'3"	93'		<u>Quartz-porphry dyke</u> with some recrystallised Py. Sl unusually abundant (2%). Bleached and pitted core 87'3"-93' with sulphides coarser and more abundant. Some purple and green fluorite, particularly in last 1'9".
93	132		<u>Quartz-felspar-porphry dyke</u> , with partially altered felspar grains. Some fine-grained disseminated sulphides. Intensely altered below 126'6" with an abundant blue-green tourmaline mineral (radiating crystals) and badly-pitted core.
132	140'6"		<u>Severely altered dolomite</u> with abundant fluorite, Py, some (?) marcasite. Talc present throughout.
140'6"	301		<u>Massive barren dolomite</u> , commonly of a brecciated nature (? preconsolidation breccia); several sections of "contorted" type. Rare blebs of Sl, Py. Narrow fractures are in some cases healed with siderite. Py seams and blebs are more common 218'-225', with some coarse-grained carbonate and fluorite from 222'-223'6". Irregular seams of talc, minor PY, 267'6"-269'.
301'	303		<u>Banded talcose rock</u> and strongly talcose dolomite
303	318	10'	<u>Massive dolomite</u> , as before. Occasional blebs of sulphides.
318	339		<u>Massive talcose rock</u> with abundant irregular veining by Py, minor Sl. Less Py after 333'. Talc rock 336'6"-339'.
339	356		<u>Fine-grained quartzite and shale</u> showing severe preconsolidation brecciation. Several narrow veins, healed with carbonates and tourmaline (?). Some fine-grained disseminated Py. (Petrological studies indicate that this rock is tuffaceous).
356	399		<u>Shaley quartzite</u> with some shale sections (the latter show severe preconsolidation brecciation) This horizon could be considered a transition between " <u>Ribbon</u> " shale and the previous horizon (339'-356'). Brecciated shale 378'-389'.
399	439		<u>Banded grey shales and sandstones</u> . Abundant narrow veins of fluorite with only minor amounts of sulphide. Severely broken and altered zones with veins of coarse-grained carbonate as follows: 400' -409' (3' core loss) 416'6"-421'6" (2' core loss) 424' -428' (1'6" core loss)
			Becomes more finely-banded after 430'. 1" vein of carbonates, fluorite, Fe, Sl, and tourmaline at 436'3".

042

STATE TASMANIA
COMPANY MINES EX. PTY LTD
AREA MT BISCHOFF

HOLE NUMBER B12
BEARINGS (M) 333°
CO-ORDS 400N, 710W
DIP 55°

560093

FROM	TO	RECOVERY	CORE DESCRIPTION
439	485		<p><u>Fine-grained quartzite</u>. Some grey shale sections exhibiting preconsolidation brecciation. Numerous pyritic veins throughout: heavily mineralised 463'-466'9", with blebs of Po, some Py, fluorite.</p>
485	506		<p><u>Banded shales</u> and sandy shales exhibiting preconsolidation brecciation. (This rock type is similar to the section 339'-356'). Some Py as blebs and narrow veins. Several bands of fine-grained quartzite after 500'.</p>
			<p>END OF HOLE</p>

043

ASSAY SHEET

560094

HOLE NUMBER B12

HOLE SURVEY

FROM	TO	WIDTH	% Sn			DEPTH	ETCH DI
132	140.5	8.5	.51			100'	55.5°
320	326	6	.09			300'	56°
326	331	5	.59			500'	58.3°
79'6"	85	5.6	.034				
85	90	5	.019				
90	95	5	.108				
95	100	5	.015				
100	105	5	.016				
105	110	5	.018				
110	115	5	.022				
115	120	5	.012				
120	125	5	.028				
125	130	5	.050				
130	132	2	.039				

044

STATE TASMANIA
 COMPANY MT BISCHOFF T.M.Co
 AREA MT BISCHOFF

HOLE NUMBER B13
 BEARINGS (M) 333°
 CO-ORDS 215N, 555W
 DIP -45°

560095

FROM	TO	RECOVERY	CORE DESCRIPTION
			<u>RESUME</u>
			AMS wireline was drilled to 404', where the hole was lost; a BX runoff was obtained from about 290'. 8' of barren dolomite, prior to the 32' mark, was stolen from the shed.
			Structureless dolomite occurs from first core to 160', with insignificant widths of mineralisation at about 100'. There follows blue-grey to black slates. A notable feature is that the hole was drilled virtually down dip from 210'.
			AMDL specimens taken at 104', 186', 272', 404'.
0	32'		No core
32'	101'		Massive pale <u>dolomite</u> . Possible 45° dips, but this direction cannot be verified as bedding.
101'	102'		Talcose pyritic <u>lode</u> .
102'	116'9"		Massive pale <u>dolomite</u> , in part brecciated
116'9"	120'		Pyrite-sphalerite mineralisation in <u>dolomite</u> .
120'	160'		Massive pale <u>dolomite</u> .
160'	485'		Pink-grey, becoming grey-blue, and after 248', ribboned <u>slate</u> . Py not prominent, but more common near 220'. Py films on joints. Narrow veins of Py, fluorite, calcite at 357', 388', 390', 396'. Banding, which appears to be bedding is well developed
			0° from 160' - 164'
			65° " 164' - 180'
			30° - 50° " 180' - 215'
			0° - 30° " 215' - 340'
			20° - 30° " 340' - 370'
			5° at 376'
			10° " 381'
			35° " 388'
			35° " 392'
			30° from 395' - 420'
			50° at 422'
			35° " 426'
			45° " 436'
			40° " 446'
			30° " 456'
			30° " 460'
			30° " 472'
			35° " 475'
			Thereafter, banding becomes doubtful.
485'	510'		Blue-grey <u>slate</u> as before, but more brecciated, and some sections are black with carbonaceous material. These sections are characteristically fretted and broken. Some pyrite-quartz-calcite veins. Very deformed.

045

STATE TASMANIA

HOLE NUMBER B13

COMPANY MT BISCHOFF T.M. Co. BEARINGS (M) 333°

560096

AREA MT BISCHOFF

CO-ORDS 215N, 555W

DIP -45°

FROM	TO	RECOVERY	CORE DESCRIPTION
510'	551'		<p>Blue-grey <u>slate</u> with some grey siliceous sections Pyrite and pyrrhotite are prevalent, both disseminated and on joints, especially at 548'. Very brecciated from 519' to 540'.</p> <p style="text-align: center;">Angles 35° at 517' 35° at 543'</p> <p style="text-align: center;">END OF HOLE</p>

046

ASSAY SHEET

560097

HOLE NUMBER

B13

HOLE SURVEY

FROM	TO	WIDTH	% Sn		DEPTH	ETCH DIP °	
101	102	1	.04		325	-44	
116'9"	120	3'9"	.23				

042

STATE ALABAMA HOLE NUMBER B14
 COMPANY MT BISCHOFF TIN MIN. BEARINGS (M) 333° 560098
 AREA MT BISCHOFF CO. CO-ORDS 215N, 555W
 DIP 70°

FROM	TO	RECOVERY	CORE DESCRIPTION
0	33		Overburden
33	75		Massive barren dolomite and dolomite breccia, in part resembling off-reef facies. Occasional veins of coarse-grained carbonate. Core broken and bleached over last 6".
75	76		No core recovered (possible fault zone).
76	194'6"		Interbanded dark shales and fine-grained sandstone. Some sections of fine-grained quartzite, some black carbonaceous shale. Occasional narrow pyritic veins. Core generally well-banded, though severely broken in places. Core recovery: 70% for first 25' 80% for next 50' then 80-90%.
194'6"	211'		Extensive preconsolidation brecciation. Mineralised zone 185'-194'6" with fine-grained disseminated Py, Sl, some Po. 1"-2" veins of fluor, Py some Sl at 185'6", 187', 187'6". Becomes dolomitic over last 3'. Massive barren dolomite and dolomite breccia. Numerous narrow veins filled with carbonates, Py, Sl.
211'	550'		Grey shales and sandy shales. Core shows severe preconsolidation deformation. Occasional narrow Py, Po, veins and blebs. Widespread folding occurs throughout this horizon. 1" vein of carbonates and fluorite at 250' 1" veins of quartz, fluorite, Po, Py, at 362' 310'-340' 453'-474' 482'-509' 524'-531'
			Core finely banded 380'-405'. Narrow veins of fluorite, Py, Sl, are more frequent between 405'-440'.
			END OF HOLE

048

ASSAY SHEET

560099

HOLE NUMBER B15A

FROM	TO	WIDTH	Sn%				
18	23	5	.028				
23	28	5	.018				
28	33	5	.021				
33	38	5	.0085				
38	43	5	.024				
43	48	5	.020				
48	53	5	.023				
53	58	5	.020				
58	63	5	.025				
63	68	5	.022				
68	71	3	.027				
18	71	53'	.021				

049

STATE TASMANIA

HOLE NUMBER B16

560100

COMPANY MT BISCHOFF T.M. Co. BEARINGS (M) 333°

AREA MT BISCHOFF

CO-ORDS 40S, 480W

DIP -70°

FROM	TO	RECOVERY	CORE DESCRIPTION
			<p><u>RESUME</u></p> <p>Apart from a few feet of coarse tuff early in the hole, the core comprises shales and slates. The core is generally very broken, possibly due to the large quantities of carbonaceous material present. Iron sulphides are again present throughout (up to several percent), but the only massive sulphide occurs at 266'3"-268'9". Angles tend to be $< 45^\circ$ down to 370', and then $> 45^\circ$. There is no dolomite. Apart from this absence of carbonate rock, the core may be likened to Mungana (Qld) stratigraphy.</p> <p>AMDL specimens taken at 100', 200', 229', 354, 410', 482'.</p>
0	84'	10%	Interbedded dark shales and fine-grained quartzites with some quartz-pyrite veins and occasionally pyritic films on fractures. Dips generally less than 45° , commonly flat to hole.
84'	96'	50%	Medium to coarse-grained tuffaceous sandstone.
96'	106'	90%	Coarse-grained volcanic grit with particles up to $\frac{1}{4}$ ", and several narrow siltstone sections. Fine-grained disseminated Py throughout. Volcanic material more coarse below 103'.
106'	107'6"		Grey brecciated shale
107'6"	109'		Coarse volcanic grit
109'	115'		Very broken black carbonaceous shale
115'	150'		Grey laminated shales
150'	152'		Quartzite
152'	168'		Very broken black carbonaceous slate, some quartzite
168'	178'		Well banded carbonaceous shale and quartzite
178'	245'		Interbanded, brecciated slaty quartzites and carbonaceous slates. Some disseminated Py and pyritic films on joints.
245'	284'		Ribboned black and white slates. Massive Py at 258' (1"), 259' (1"), 266'3" - 268'9".
284'	409'		Grey and black slates, generally broken. Angles 30° to $370'$, then average 65° . Some disseminated Py throughout.
409'	421'		Gritty tuff with some disseminated Py, Po.
421'	459'		Grey and black slates, rather broken. Short sections of volcanic grit at 434' and 437'. Slates become ribboned after 455'. Fine-grained Py throughout.
459'	471'		Volcanic grit, some shaley sections.
471'	500'9"		Grey slates. Disseminated Py throughout.

END OF HOLE

050

ASSAY SHEET

560101

HOLE NUMBER B16

HOLE SURVEY

FROM	TO	WIDTH	% Sn		DEPTH	ETCH DIP ^o
266'6"	268'6"	2'	.012		100'	67 ^o
					300'	67 ^o
					500'	67 ^o

051

STATE TASMANTIA HOLE NUMBER B17
 COMPANY MT BISCHOFF TIN MIN. BEARINGS (M) 330.5° 560102
 AREA MT BISCHOFF CO. CO-ORDS 400N, 480W (approx)
 DIP -55°

FROM	TO	RECOVERY	CORE DESCRIPTION
0	46		Strongly oxidized dolomite, but only 4' of core recovered.
46	176		Bluish-grey and creamy-grey dolomite. Occasional narrow, soft oxidized zones, especially at 64', 106', 124' and 136'. Brecciation structures very common, and numerous irregularly banded or zonal structures thro'out. Sulphides generally rather sparse, being mainly confined to narrow Py-Sl veinlets and minor splashes. ¼" Sl vein at 52' and very strong massive Py min with minor talc from 96'6"-97'6".
176	181'6"		Weak talcy lode, with moderate proportion of green talc gangue and lesser purple fluorite. Strong Py-Po min thro'out.
181'6"	313		Bluish-grey dolomite as from 46'-176'. Very strong Py-Po Min as massive splashes in carbonate gangue from 198'9"-200', and strong Py Min from 208'-209' and at 204', 206', 211' and 305' as splashes. Mainly black argillite from 305'-307'. Angles: 0° at 299' 0°-10° from 305'-307'.
313	561		Black argillite. Colour generally fairly constant with only occasional lighter bands where undisturbed, or lighter angular fragments in brecciate zones. Strong deformation and brecciation from 333'-340' (with some dolomite from 337'-338', and strong Py Min thro'out), moderate brecciation from 440'-470', strong from 470'-483', moderate from 483'-502', very strong from 502'-548' and moderate from 548'-561'. Apart from strong Py Min from 333'-340', Py veins at 464' (1½"), 465' (¾") and 559' (1"). Numerous narrow and irregular Py veinlets in strongly deformed zones noted above, and very finely disseminated and often banded Py Min thro'out most of section. Angles: 0°-10° from 313'-332' 10°-30° from 332'-333' 45° from 360'-363' 50°-60° from 368'-410' 80° from 413'-415' variable 40°-80° from 415'-473' 30° from 484'-500' very variable from 500'-555' 50°-70° from 555'-561'.

END OF HOLE

052

STATE TASMANIA

HOLE NUMBER B18

560103

COMPANY MT BISCHOFF TIN MIN-
AREA MT BISCHOFF

BEARINGS (M) 150.5°
CO-ORDS 250N; 1000W
DIP -60°

FROM	TO	RECOVERY	CORE DESCRIPTION
0'	168'		<p>Greyish-black carbonaceous argillite. (6" oxidized porphyry from 0'-6', and only 4' recovered in first 20' of drilling). Scattered Py blebs and veinlets to 105' then only traces. Broad moderately deformed zones from 32'-90', and several narrow fluorite-talc veins from 53'-59'. 6" carb-talc-fluorite veins with weak Sl Min at 77' and 81', and larger vein of similar appearance but with v. strong Sl. Min from -86' (all three veins v. flat angles to core length). Angles: 45° at 73' 0° - 30° from 127' - 186', but nowhere very distinct.</p>
168'	238'		<p>Massive porphyry, with feldspar partially decomposed throughout. Moderately strong disseminated Py Min throughout, becoming weaker from 215' -238'. Narrow fluorite- carb-qtz-Sl vein at 203', and 6" wide Sl-Py vein at 213'3". Quite strong disseminated Sl Min throughout and strong cassiterite Min in narrow fluorite-carb veinlet at 168'. Contact at 168' = 50°, and that at 238' = 60°.</p>
238'	481'		<p>Greyish-black carbonaceous argillite. Generally weak Py Min throughout as occasional blebs, v. narrow stringers and f.g. disseminations. 3" wid massive Py-Zl vein at 259' with minor fluorite gangue. Strong finely disseminated Py Min at 347', and also as numerous veins and splashes from 397'-426' (a very strongly deformed zone). A weakly deformed zone from 361'-445', being strongly deformed and light greyish-brown in colour from 406'-423'. Strong developments of chlorite (?) in joints to ½" width at 255' and 288'6". Scattered narrow carb. veinlets at angles of 20° to core length. Angles: 0° - 10° from 274' - 280' 20° at 312' 30° from 333' - 341' 40°- 50° " 341' - 346' 20°- 30° " 406' - 423' 40°- 60° " 446' - 450'</p>
481'	487'		<p>White dolomite, with very weak Sl and Py Min as occasional veinlets and blebs.</p>

053

STATE TASMANIA

HOLE NUMBER B18

560104

COMPANY MT BISCHOFF TIN MIN-BEARINGS (M) 150.5°

AREA MT BISCHOFF

ING CO-GRDS 250N; 1000W

DIP -60°

FROM	TO	RECOVERY	CORE DESCRIPTION
487'	513'		Dark greyish-black argillite and quartzite. Weak to fair Py Min as veinlets and f.g. disseminations. Angles: variable and indistinct, but generally 35°.
513'	572'		Barren white and grey dolomite, with no notable mineralisation or banding. Contact at 513' = 50°; that at 572' = 60°.
572'	576'		Mid-grey siliceous argillite, tending to black carbonaceous argillite nearer 576'. Angles: 0° - 30° from 572' - 576'
576'	579'		White dolomite with only traces Py-Sl Min. Contact at 576' = 20°; that at 579' = 35°.
579'	902'		Black and greyish-black carbonaceous shales and argillites, generally well banded, but with broad zones of deformation. Tending to mid-grey siliceous argillite rather than carbonaceous shale from 730' - 764', and from 776' - 799'. Quite strong deformation for 590' - 721', and much weaker from 852' - 897'. Weak to moderate Py Min throughout, especially in deformed zones, occurring as veinlets, blebs, conformable bands, isolated c.g. crystals and f.g. disseminations. Massive Py with minor carbonate, fluorite and Sl in vein from 611' - 613'. Several carb-fluorite-Py-Po veins with talc margins from 609' - 627'. 1" wide qtz-carb-Py vein at 771', but elsewhere this type of vein is rare. Angles: 20° from 579' - 592' 20°-40° " 592' - 729' 45°-55° " 729' - 760' 55°-65° " 760' - 802' 45°-55° " 802' - 835' 60°-65° " 835' - 851' 30°-60° " 851' - 897' 55°-60° " 897' - 902'

END OF HOLE

ASSAY SHEET
 HOLE NUMBER B18

560105

FROM	TO	WIDTH	%Sn		Depth	Mag. Az ^o	Trop Di
168	170	2x	.182		100'	144	60
170	175	5	.090		300'	144	61
175	180	5	.066		600'	142	62
180	185	5	.128		900'	140	64
185	190	5	.74				
190	195	5	.034	Surveys completed on 19.7.65			
195	200	5	.057				
200	205	5	.142				
205	210	5	.061				
210	215	5	.057				
215	220	5	.031				
220	225	5	.015				
225	230	5	.201				
230	235	5	.055				
235	238	(3)	.044				
398	403	5	.689				
403	408	5					
408	413	5	.537				
413	418	5	.078				
418	423	5	.480				
423	425	2	.330				
168	238	70'	.12				
398	425	27	.36				

055

STATE TASMANIA
 COMPANY
 AREA MT BISCHOFF TIN
 MINING CO.

HOLE NUMBER B19
 BEARINGS (M)
 CO-ORDS 250N; 1000W
 DIP -80°

560106

FROM	TO	RECOVERY	CORE DESCRIPTION
0	185'		<p>Black carbonaceous argillite and quartzite (only 7' recovery in first 24'). Sulphides v. sparse to 60', then fair Py Min as f.g. disseminations from 60'-77', and then again becoming sparse with only scattered veinlets from 77'-185'.</p> <p>Quartz-fluorite-talc-Py-Po-Sl vein from 66'-67' (at 45° angle to core) with an unknown dark greenish mineral.</p> <p>Angles: 45° to 24' indistinct - possibly 35° from 24' - 109' 20° at 115' 30° at 122' 20° at 167'</p>
185'	281'		<p>Porphyry, with only weak-fair sulphide mineralization as disseminations, veinlets and occasional splashes. Generally finer grained than usual, with less quartz, and rather soft due to partial breakdown of feldspars.</p> <p>Much pitting, and porphyry strongly decomposed from 222' - 233', where only traces Py remain. Dark carbonaceous shale from 209'-213'6" with v. strong cassiterite min in ¼" carb. vein at 212'. Sulphides moderately abundant from 234' - 263' (with appreciable Sl content), then generally sparse to end of section.</p>
281'	396'6"		<p>Greyish-black carbonaceous argillite, mod. deformed throughout, with only weak Py Min occurring as irregular veins and f.g. disseminations. Strongest veins at 327', 361' and 393'.</p> <p>Angles: occasional 30°-40° from 346'-377'</p>
396'6"	399'6"		Massive white dolomite. No notable min.
399'6"	404'		<p>Greyish-black carbonaceous argillite, with minor dolomite at 400'6", 401'6" and 402"</p> <p>Weak f.g. Py Min. Contacts with dolomite at 50°-60°.</p>
404'	407'		Massive white barren dolomite.
407'	808'		<p>Greyish-black carbonaceous argillite, with light-grey f.g. qtz in first 1' of section. Generally well banded. Weak-fair Py Min throughout as veins and f.g. disseminations.</p>

056

COMPANY
AREA

MT BISCHOFF TIN
MINING CO.

BEARINGS (M)
CO-ORDS
DIP

250N; 1000W
-80°

560107

FROM	TO	RECO- VERY	CORE DESCRIPTION
407'	808'		<p>Strong Py veins ($\frac{1}{4}$" - 1" width) at 425', 448', 456' and 479. Occasional talc-fluorite veins, with c.g. cassiterite in one such vein at 599'. Interbedded mid-grey quartzite from 675'-680', 796'-799' and 807'-808'.</p> <p>Broad zones of deformation from 626'-640', 661'-670', 682'-727' (strongest), 747'-750', 757'-764' and 804'-806'.</p> <p>Angles: 30° from 410'-412' 5° - 25° from 416' - 427' 40° at 454' 30° - 45° from 522' - 530'</p> <p>70° from 550' - 613' 45° - 60° from 613' - 618' variable 45° 70° from 618' - 658' v. variable 40° - 80° from 658'-727' 80° from 727' - 731' 60° - 70° from 731' - 765' 75° - 85° from 765' - 808'</p> <p style="text-align: center;">END OF HOLE</p>

057

ASSAY SHEET

560108

HOLE NUMBER B 19

FROM	TO	WIDTH		Depth	Mag. Az	Trop Dip	Etch D
185'	190'		.07	200	21	91	80½
190'	195'		.017	400	130	80	80½
195	200		.04	600	134	85	79½
200	205		.02	800	183	90	80
205	210		.07				
210	215		.07				
215	220		.14				
220	225		.02				
225	230		.02				
230	235		.06				
235	240		.05				
240	245		.03				
245	250		.175				
250	255		.04				
255	260		.02				
260	265		.01				
265	270		.03				
270	275		.01				
275	280		.02				
280	281"6"		.01				
205	250	45	.07				

058

STATE TASMANIA
 COMPANY MT. BISCHOFF TIN
 MINING CO.
 AREA MT. BISCHOFF

HOLE NUMBER B20
 BEARINGS (M) 150.5°
 CO-ORDS 807N, 642W
 DIP 80°

560109

FROM	TO	CORE DESCRIPTION	C. to D. Angles °
0	87'	<p>Mineralised porphyry. Strongly pitted, rather soft and only weakly min'd from 0-29' and scattered pitted zones from 52' - 58' and 78'-80'</p> <p>Otherwise mod. strong Po-Py Min, and occasional dissem. Sph, Min. Contact at 87' =40°</p>	
87'	99'	<p>Severely altered dolomite (?) - a mottled green and white rock, with green mineral tourmaline or amphibole. Becoming less mottled towards end of section. Scattered fluorite and possibly talc, with a weakly lody appearance overall. Strongly pitted and decomposed from 89 (6" - 94'6" and 96' - 99'.</p> <p>Massive 2" Py-Po Min along porphyry contact at 87'. Mod. Py-Po Min throughout as splashes and disseninations. (c.f. a similar rock from approx. 134' - 140' in B12).</p>	
99'	108'	<p>Mod. strong greenish talcy lode, with appreciable pale fluorite and yellowish carbonate (?). Fair Py Min. throughout.</p>	
108'	322'	<p>Barren white dolomite. Minor Py and Sph Min. in blebs and veinlets every few feet throughout section. Strong Py splashes in 6" zone at 131'. Mod talcy developments from 191' - 194'.</p> <p>V.c.g. greenish-purple fluorite from 315' - 316'6".</p>	
322'	375'6"	<p>V. weakly banded black carbonaceous argillite. Generally weak Py Min as occasional blebs and veinlets. ¼" - ¼" carb + Sph veins at 332'6" and 350'6". ¼" carb -Fl vein at 355'6".</p> <p>Angles folded 60° - 0° - 60° at 345' 75° from 367' - 369'.</p> <p style="text-align: center;">END OF HOLE</p>	

059

ASSAY SHEET

560110

HOLE NUMBER B20

FROM	TO	WIDTH	% Sn	Depth	Etch Dip
0'	10	10	.022	100'	80½
10	15	5	.035	200'	80½
15	20	5	.012	375'	80½
20	25	5	.010		
25	30	5	.898		
30	35	5	.568		
35	40	5	.135		
40	45	5	.241		
45	50	5	.263		
50	55	5	.871		
55	60	5	.113		
60	65	5	.058		
65	70	5	.234		
70	75	5	.295		
75	80	5	.055		
80	85	5	.075		
85	90	5	.133		
90	95	5	.134		
95	100	5	1.044		
100	105	5	.257		
105	108	3	.845		
25	55	30	.50		
95	108	13	.70		

Surveys Completed
on 14/10/65

060

COMPANY AAA
 AREA MT. BISCHOFF

BEARINGS (M) 330.5°
 CO-ORDS
 DIP -60°

560111

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0'	26'	Yellowish partially decomposed dolomite. 2" gossaneous vein at 19'.	
26'	151'	Mineralised porphyry. Weakly oxidized from 26'-45', and several strongly pitted zones from 59' - 73' and 93' - 96'. Generally well mined after 50'. Massive Py vein with minor Fl and carbo from 114'6" - 115'6", and strong carb-fl. from 113'6" - 114'6".	
151'	166'6"	Severely altered porphyry, possibly with some oxidized dolomite. Very broken and deformed. Only moderately min'd.	
166'6"	177'6"	Yellowish-brown dolomite, with numerous purple Fl blebs and veins, and only minor Py Min. Moderate Py Min in lody section from 174'-175'.	
177'6"	192'6"	Fair Py-Do-Fl lode, with approx. 10% sulphide content. Characteristic greenish colouration, but no apparent talc.	
192'6"	200'	Yellowish-brown dolomite, with only very minor sulphides.	
200'	214'6"	Mod. strong Py-Po-carb-Fl lode with approx. 40% sulphides. Occasional short barren dolomite sections.	
214'6"	234'6"	Very weakly Min'd yellowish-brown dolomite, with brown angular fragments to ½" across (res. dolomitic breccia?). Several lody min'd zones in first 2' of section.	
234'6"	250'	Barren greyish-white dolomite.	
250'	293'	Mod. strong lode, with weak section from 255'-266'. Greenish-white talc v. strongly developed from 270'-293', with sulphides strongly oxidized to 284'.	
193'	311'	Light grey v. weakly banded argillite.	65 - 85°
311'	370'	Mainly dark grey carbonaceous argillite, with a little interbedded mid grey wkly banded argillite.	Mainly 60°
370'	420'	Interbedded mid-grey and dark carbonaceous argillite.	Variably 50° - 90°

061

STATE
COMPANY
AREA

HOLE NUMBER 521
BEARINGS (N)
CO-ORDS
DIP

560112

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
420'	432'	Massive porphyry. Fair Sl Min throughout as f.g. disseminations, but only traces iron sulphides.	
432'	448'	Mid-grey quartzite, and v. minor interbedded mid-grey argillite.	45°-60°
448'	461'6	Dark grey banded argillite, res. carbonaceous argillite. Weak Py min. as blebs and veinlets. Angles: 20°-30°, but with some folding.	
<u>END OF HOLE</u>			

062

560113

ASSAY SHEET

HOLE NUMBER

B21

FROM	TO	WIDTH	Sn %				
26'	31'	5	.034				
31'	36'	5	.035				
36'	41'	5	.017				
41	46'	5	.016				
46	51'	5	.019				
51	56'	5	.117				
56	61'	5	.115				
61	66'	5	.046				
66	71'	5	.218				
71	76	5	.128				
76	81	5	.154				
81	86	5	.164				
86	91	5	.138				
91	96	5	.330				
96	101	5	.287				
101	106	5	.176				
106	111	5	.145				
111	116	5	.111				
116	121	5	.088				
121	126	5	.213				
126	131	5	.032				
131	136	5	.297				
136	141	5	.137				
141	146	5	.067				
146	151	5	.284				
151	156	5	.194				
156	161	5	.130				
161	166	5	.118				
166	171	5	.138				
171	176	5	.126				
176	181	5	.370				
181	186	5	.507				
186	191	5	.361				
191	196	5	.113				
196	201	5	.037				
201	206	5	.387				
206	211	5	.517				
211	216	5	.619				
216	221	5	.167				
221	226	5	.034				
226	231	5	.096				
231	236	5	.015				
236	241	5	.010				
241	246	5	.033				
246	251	5	.085				
251	256	5	.876				
256	261	5	.297				
261	266	5	.306				
266	271	5	1.080				
271	276	5	2.725				
276	281	5	3.64				
281	286	5	.256				
286	291	5	2.60				

063

STATE TASMANIA
 COMPANY TIN MINING CO.
 AREA MT. BISCHOFF

HOLE NUMBER B22
 BEARINGS (M) 330.5° Mag.
 CO-ORDS 455N 925W
 DIP -60°

560114

FROM	TO	CORE DESCRIPTION	C. to E. Angles
0'	9'6"	No core recovery	
9'6"	10'6"	Py-Po-Sph lode	
10'6"	85'	Light grey dolomite with veins of Py-Po-Sph	
85'	95'	Sludge	
95'	144'	Light grey dolomite with veinlets of Py-Po and Fl.	
144'	150'	Mixture of dolomite and porphyry. Strong Py-Po-Fl min.	
150'	217'	Mineralised porphyry containing Py-Po-Sph and occasional Ca veins. At 180' 3" vein of Py-Sph-Ca	
217'	246'	Dark grey siliceous argillite with strong Ca veining containing Py-Sph mineralisation.	20°-40°
246'	279'	Dark grey fine grained interbanded argillite and quartzite with veins of Ca. Minor veining of Py.	30°-50°
279'	279'6"	Veins of massive Sph-Ca mineralisation Contact angle 30°.	
279'6"	296'	= 246'-279' Strong Py veining 293'-294'	30°-50°
296'	338'	Fine grained light grey argillite with minor Ca veining throughout. At 317'6" 1/2" wide vein of Py At 326' " " " " Sph	
338'	355'	Light grey argillite alternating with bands of contorted carbonaceous argillite. Veins of Ca Min throughout.	Varying
355'	367'	Light grey fine grained argillite with veins of Fl, Ca and minor Py.	
367'	391'	Dark grey banded argillite with numerous Ca veins at 385' massive Ca-Sph vein.	20°-40°
391'	399'	Vein with Py-Po-Sph mineralisation in tuff	30°-60°
399'	411'	Interbanded tuff and argillite. Strong Ca-Py veining.	

064

COMPANY
AREA

BEARINGS (M)
CO-ORDS
DIP

560115

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
411'	414'	Light grey fine grained argillite.	Varying
414'	435'	Interbanded light grey argillite and contorted carbonaceous argillite. Strong veining of Ca.	
435'	436'6"	Massive Py-Po vein	
436'6"	483'	Dark grey banded argillite with Ca veining throughout. Minor Py mineralisation.	30°-50°

CORE RECOVERIES

0	- 9'6"	0	185'-190'	60%
9'6"	- 10'6"	100%	190'-202'	80%
10'6"	- 24'6"	4%	202'-206'	30%
24'6"	- 30'	8%	206'-216'	40%
30'	- 72'	7%	216'-223'	14%
72'	- 85'	8%		
85'	- 95'	Sludge		
95'	- 144'	100%		
144'	- 150'	33%		
150'	- 156'	16%		
156'	- 161'	60%		
161'	- 163'	90%		
163'	- 172'	66%		
172'	- 178'	100%		
178'	- 185'	100%		

065

ASSAY SHEET

560116

HOLE NUMBER B22

FROM	TO	WIDTH	%Sn			DEPTH	ETCH DI
144	149	5	.185			100'	52½
149	154	5	.032			200'	55½
154	159	5	.041			400'	54½
159	614	5	.058				
164	169	5	.021				
169	174	5	.060				
174	170	5	.101				
179	184	5	.066				
184	189	5	.366				
189	194	5	.335				
194	199	5	.178				
199	204	5	.240				
104	209	5	.257				
209	217	8	.103				
184	209	25	.275				

066

STATE TASMANIA HOLE NUMBER B23
 COMPANY MT BISCHOFF TIN MIN. BEARINGS (M) 330.5°
 AREA 760N, 1085W CO. CO-ORDS
 DJP -45°

560117

FROM	TO	RECOVERY	CORE DESCRIPTION
0	42'		No core recovered.
42'	168'		Light grey dolomite with splashes of Py-Po mineralisation and veins of fluorite. At 94' shear ½" wide with Sn mineralisation. At 123' vein of massive sphalerite.
168'	208'		Py-Po-Fl dolomitic lode. Folding intensive, irregular.
208'	211'		Py-Po-Fl mineralisation in mixture of argillite and dolomite.
211'	221'		Argillite with strong calcite min. in veins and fluorite.
221'	229'		Massive pitted pyrite mineralisation in altered Porphyry (?).
229'	308'		Dark grey slightly banded argillite with minor veins and splashes of Py-Sl mineralisation. Minor veins of calcite-fluorite. At 293'4" wide vein of Sl-Py-Fl-Ca mineralisation. Contact angles 40°.
308'	309'		Tuff with minor veins of Py-Ca.
309'	319'6"		Light grey interbanded quartzite and argillite with veins of Py.
319'6"	320'6"		Mineralized tuff. Contact angles 50°.
320'6"	322'6"		= 309'-319'6"
322'6"	326'		= 319'6" - 320'6" Contact angles at 322'6" 60° at 326' 20°
326'	342'		Banded light grey argillite with veins of Py, Ca, Fl.

DRILLING COMPLETED

067
ASSAY SHEET
HOLE NUMBER B23

560118

AVERAGE ASSAYS

FROM	TO	WIDTH	% Sn	FROM	TO	WIDTH	% Sn
168	173	5	.457	168	208	40	.70
173	178	5	.016	178	208	30	.86
178	183	5	1.025				
183	188	5	1.068				
188	193	5	.766				
193	198	5	.695				
198	203	5	.839				
203	208	5	.752				
208	213	5	.144				
213	218	5	.056				
218	223	5	.073				
223	229	6	.520				

068

STATE TASMANIA

HOLE NUMBER B24

COMPANY Mt. Bischoff Mining

BEARINGS (M)

560119

AREA Mt. Bischoff

Co. CO-ORDES 350N, 870W

DIP -80°

FROM	TO	CORE DESCRIPTION	C. to B. Angles	
0	50'	Light blue quartzite with veins of Py-Po		
50'	65'	Chunks of quartzite, dolomite and pitted porphyry. Apparently loose rubble 0-65'		
65'	106'	Yellowish-grey brecciated dolomite with minor Py-Sf min in veins		
106'	115'	Py-Po-Cp-Ca-Fl- vein. Sulphide content 50%-70%		
115'	178'	Mineralized porphyry containing Py-Po-Sf. Weakly Mind and pitted 139' x 148' Well Mind Sf rich 148'-157' Weakly Mind 157'-173' Well Mind Sf rich 173'-178'		
178'	179'	Black carbonaceous argillite		
179'	209'	Strong Py-Po-Cp-Fl mineralization in extremely contorted and brecciated dolomite Sulphide content 179' - 193' 50%(approx.) 193' - 209' 15% " Contact angles at 179' 30° at 209' 20°		
209'	314'	Contorted and brecciated carbonaceous argillite. Calcite veining throughout. At 225' :6" of Po-Py-Cp-Fl mineralisation.		
314'	315'	Light blue coarse-grained quartzite with veins of calcite.		
315'	359'	Black carbonaceous argillite with lenses of contorted quartzite. At 328' 2" veins of Py-Po-Sf-Ca Min.	30° -50°	
359'	371'	Quartzite with veins of calcite and minor veining of Py	30° -50°	
371	413' 9"	Black carbonaceous argillite with contorted lenses of quartzite. Minor Py veining, moderate calcite veining	20° -40°	
<u>FINISH CORE RECOVERIES</u>				
	0	-	8'	12%
	8'	-	20'	3%
	20'	-	22'	7%
	22'	-	30'	6%
	30'	-	40'	2%
	40'	-	50'	10%

ASSAY SHEET

560120

HOLE NUMBER 824

FROM	TO	WIDTH	%Sn	%Zn		Depth'	Etch Di
						100	77½
						200	77½
						400	74
106	111	5	1.332	.50			
111	116	5	2.318	.14			
116	121	5	.090	.06			
121	126	5	.032	.52			
126	131	5	.022	.55			
131	136	5	.019	.27			
136	141	5	.022	.44			
141	146	5	.019	.52			
146	151	5	.022	.60			
151	156	5	.028	2.1			
156	161	5	.027	.34			
161	166	5	.017	.14			
166	171	5	.010	.08			
171	176	5	.182	.11			
176	181	5	.401	.08			
181	186	5	.172	.05			
186	191	5	1.219	.07			
191	196	5	2.394	.01			
196	201	5	.600	.05			
201	206	5	.688	.05			
206	209	3	.146	.14			
106	116	10	1.83				
176	206	30	.91				
186	206	20	1.22				

FINISH CORE RECOVERIES

50'	-	54'	25%
54'	-	65'	13%
65'	-	72'	2%
72'	-	76'	40%
76'	-	83'	28%
83'	-	88'	80%
88'	-	96'	25%
96'	-	104'	85%
104'	-	106'	40%
106'	-	116'	90%
116'	-	126'	100%

070

STATE TASMANIA
 COMPANY TIN MINING CO.
 AREA MT. BISCHOF

HOLE NUMBER B25
 BEARINGS (M) 150.5°
 CO-ORDS 350N - 870N
 DIP 52°

560121

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0'	61'	Chunks of dolomite, quartzite, porphyry and lode material. Presumably loose rubble	
61'	102'	Strongly brecciated dolomite, with veinlets of fluorite.	30°-40° (?)
102'	119'	Dark grey banded argillite with carbonate veins, at 112'6": ½" vein containing Po-Py-Sph min.	20°-30°
119'	159'	Pitted mineralised Porphyry containing weak-med. Po-Py-Sph mineralisation. Contact angles at 119' : 80° " " " 159' 60°	
159'	193'	Black carbonaceous argillite, in places severely brecciated.	300-600
193'	201'	Light-blue fine grained quartzite with med-strong veining of Py-Po.	varying
201'	401'6"	Black carbonaceous argillite with minor veining of carbonate and Py-Po.	0-40° but 30° mainly

DRILLING COMPLETED.

071

ASSAY SHEET

560122

HOLE NUMBER B25

FROM	TO	WIDTH	%Sn			DEPTH	ETCH DI.
120	125		.022			100'	45
125	130		.014			200'	45
130	135		.064			400'	47
135	140		.023				
140	145		.020				
145	150		.078				
150	155		.038				
155	160		.030				

072

COMPANY
AREA MT. BISHOFF

BEARINGS (M) 330.5
CO-ORDS
DIP 52°

560123

FROM	TO	RECOVERY	CORE DESCRIPTION	Angles °
0	50'	4%	Chunks of dolomite, prphyry, Qte and lode (surface rubble).	
50'	67'		Light-blue dolomite with veins of fluorite	30° (?)
67'	73'		Dolomite with very strong talc mineralisation	30-40°
73'	101'		Light-blue dolomite with strong veining of fluorite and carbonate. At 76' 2" of Sl. Min.	30-40°
101'	109'		Brecciated and faulted dolomite with minor Py mineralisation.	10-30°
109'	111'6"		Dolomite lode with Py-Po-fluorite min.	10-30°
111'6"	116'		Brecciated grey-blue dolomite with Py-Po and fluorite veining.	
116'	117'		Dark-grey argillite with Py-Po veining. Probable fault contact at 116', 30°.	
117'	118'		Dolomite lode with Py-Po-fluorite min.	30°
118'	257'		Dark grey f.g. argillite with minor carbonate-Py-Po veining. From 144'-160' core badly sheared and broken. Strong carbonate throughout. From 217'-218' strong shearing with carbonate Py-Po min. Contact angles of shear 20°.	40°
257'	274'		Extremely contorted and brecciated banded argillite. Strong carbonate-Sph-Py-Po veining. At 262' 1" vein of Sph-Py-Po) 263' 1/2" " " ")angles 264' 1" " " ") 264'6" -267' 1" parallel vein Sph-Py-Po 267'6" 1/2" vein of Sph-Py-Po 268'6" 1/4" " " ")angles 273' 1" " " " " "	40° 40° 40° 40°
274'	322'		Severely contorted and brecciated argillite with overall minor Py-Po veining. At 295' 4" vein of Py-Po-Sph cassiterite min. angles. 20-40° 303' 2" vein of Py-Po-Sphmin angles. 20-40° 305' 1/2" " " " " " "	20-40° 20-40°

073

COMPANY
AREA

BEARINGS (M)
CO-ORDS
DIP

560124

FROM	TO	RECO- VERY	CORE DESCRIPTION	C to B Angles °
322'	420'		Mineralised porphyry containing Py-Po-Sph Contact angles at 322' 60° 420' 30° (undulating)	
379'	388'	66%	From 379' - 388' the porphyry is pitted. At 379' and at 382' and at 388' shearing is apparent. The "C to B" angles of these. Shears are: 379' 40° 382' 40° 388' 10°	
420'	431'		Interbanded dark-grey argillite and quartzite. Sub parallel veins of carbonite.	60-70°
431'	432'		Coarse-grained light-blue qte with minor carbonate veining.	30-50°
432'	438'6"		Banded argillite with carbonate-Py veining parallel to bedding.	50-70°
438'6"	439'		Mineralised porphyry containing Py min. Contact angles at 438'6" 60° 439' 70°	
439'	464'		Banded dark-grey argillite From 449' - 449'6") bands of carbonaceous 40-60° 457' - 470') argillite Carbonate-Py veining parallel to bedding.	
464'	486'		Interbanded dark grey argillite and light-grey c.g. qte. Carbonate veining parallel to bedding.	40-60°
486'	504'		Light-grey banded argillite with minor carbonate veining. At 493' 2" vein of massive Py-Po min. angles 45°	30-60°
Drilling completed.				

07A

ASSAY SHEET

560125

HOLE NUMBER B 26

FROM	TO	WIDTH	%Sn		Depth	Etch Dip
256	261	5	1.3		100	52½
261	266	5	2.6		200'	54
266	271	5	2.2		400'	52½
271	274	3	3.4			
322	327	5	.173			
327	332	5	.302			
337	342	5	.528			
342	347	5	.389			
347	352	5	.186			
352	357	5	.116			
357	362	5	.090			
362	367	5	.141			
367	372	5	1.37			
372	377	5	.235			
377	382	5	.350			
382	387	5	.691			
387	392	5	.347			
392	397	5	.404			
397	402	5	.534			
402	407	5	.110			
407	412	5	.084			
412	417	5	.697			
417	420	3	.132			
256	274	18	2.37			
367	387	20	0.66			
367	402	35	0.56			

075

STATE TASMANIA
 COMPANY
 AREA Mt BISCHOFF

HOLE NUMBER
 BEARINGS (M)
 CO-ORDS
 DIP

B27

-58°

560126

FROM	TO	RECOVERY	CORE DESCRIPTION
0	34'		No core recovered.
34'	35'		Coarse-grained blue-grey quartzite.
35'	67'		Yellow-blue coarse-grained dolomite with strong fluorite veining throughout. From 60'6" - 61'6" core sheared and broken.
67'	70'		Weak dolomitic lode. Total sulphide content low. Strong fluorite mineralization.
70'	74'3"		No core recovered.
74'3"	94'		Grey-blue dolomite with strong fluorite veining, minor Py min.
94'	97'		Dolomitic lode containing Q-dolomite-Py-fluorite. Total sulphide content low.
97'	118'		Grey-blue coarse-grained dolomite with Py-Sl veining. Minor fluorite.
118'	119'6"		Q-Dolomite-fluorite lode with Py-Cassit. Min. Angles at 118' 30° 119'6" 30°
119'6"	125'		Blue-grey c.g. dolomite with Py-fluorite veining throughout.
125'	148'		Dolomitic lode containing fluorite-Q-Py-Cass. From 133'-136' sulphide content high, rest low. Angles at 125' 40°
148'	168'		Yellow dolomite with abundant fluorite veining.
168'	170'		No core recovered.
170'	263'		Q-fluorite-Py-Po-Cassiterite lode. Strongly leached and cavities are abundant. Minor talc. min at places. c.g. cassiterite visible at places. Core recovery very poor (see overleaf)
263'	280'		Hard fine-grained light-grey quartzite. Structureless, no banding.
280'	284'		No core recovered.

076

STATE
COMPANY
AREA

TASMANIA
Mt BISCHOFF

HOLE NUMBER
BEARINGS (M)
CO-ORDS
DIP

B27

-58°

560127

FROM	TO	RECO- VERY	CORE DESCRIPTION
284'	305'		Quartz-feldspar, porphyry with minor disseminated Py Min. No contact angles discernible.
305'	318'		Intermixed Q-F porphyry and brecciated dark-grey qte, and argillite.
318'	326'		Dark-grey argillite with carbonate and fluorite veining. Minor Py min. angles. indistinct.
			Hole abandoned. (Collapsed at 226')

ASSAY SHEET

560128

HOLE NUMBER

B27

HOLE SURVEY

FROM	TO	WIDTH	%Sn	DEPTH	MAG. Az ^o	TROP DIP ^o	ETCH DIA
125	130	5	0.088	100'			57½
130	135	5	0.140				
135	140	5	0.355	332'			58½
140	145	5	0.360				
145	150	5	0.143				
150	157	7	0.009				
157	168	11	0.007				
170	173	3	0.107				
173	178	5	0.386				
178	183	5	0.091				
183	188	5	0.053				
188	198	10	0.005				
198	208	10	0.203				
208	218	10	0.010				
218	228	10	0.026				
228	231	3	0.002				
231	239'6"	8'6"	0.009				
239'6"	249	9'6"	0.129				
262	267	5	0.006				
267	272	5	0.010				
272	277	5	0.006				
277	280	3	0.006				
284	289	5	0.014				
289	294	5	0.012				
294	299	5	0.014				
299	304	5	0.016				
304	309	5	0.012				
309	314	5	0.009				
<u>CORE RECOVERIES</u>							
148	157		55%				
157	168		25%				
168	170		0				
170	173		30%				
173	178		10%				
178	183		20%				
183	188		20%				
188	198		10%				
198	208		10%				
208	218		5%				
218	228		7%				
228	231		16%				
231	239'6"		13%				
239'6"	249'		30%				
249	257		0				
257	262		0 (Cavity)				
262	267		50%				
267	269		100%				
269	280'9"		100%				
280	284		0				

078

COMPANY
AREA

BEARINGS (M) 330.5°

CO-ORDS

DIP 63°

560129

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0	5	No core recovered	
5	50	Q-Feldspar porphyry, pitted and containing minor Py min. Contact angles at 50' 40° 5' indistinct	
50	123'6"	Carbonaceous argillite containing faulted and contorted bands of c.g. qte. Py veining throughout.	
123'6"	124'	Massive Py vein	
124'	125'	Brecciated carbonaceous argillite with strong py mineralisation.	
125'	126'	Dolomitic lode containing Py-Sph-cassiterite mineralisation.	
126'	127'6"	Brecciated light-blue dolomite with strong fluorite veining.	
127'6"	130'6"	= 125' - 126'	
130'6"	131'6"	Brecciated dolomite	
131'6"	132'6"	Cavity (no core)	
132'6"	140'	Brecciated light-blue dolomite	
140'	146'	Dolomitic lode containing py-po-sph min.	
146'	216'	Carbonaceous argillite with carbonate veining throughout, minor Q veining. Puggy zone from 169'-171' (shear ?) 146' - 160' 160' - 171' 171' - 216'	60-70° 0-20° 20-40°
216'	224'	Coarse-grained dark-grey qte with carbonate-pyrite min. throughout.	30-40°
224'	347'	Carbonaceous argillite with contorted and broken bands of coarse-grained light-grey qte. Minor carbonate and Q veining	30-40° (although indistin
347'	360'	Coarse-grained grey-blue qte with minor py and carbonate veining	indistinct
360'	465'	Carbonaceous argillite with broken and contorted bands of coarse-grained light-grey qte. Minor carbonate and py veining.	30-40°

DRILLING COMPLETED.

079
ASSAY SHEET

HOLE NUMBER B28

560130

FROM	TO	WIDTH	%Sn	%Zn			
5	10		0.012				
10	15		0.019				
15	20		0.011				
20	25		0.017				
25	30		0.012				
30	35		0.014				
35	40		0.017				
40	45		0.018				
45	50		0.016				
123'6"	125'		0.011	0.035			
125'	130'		0.368	1.0			
130'	135'		0.007	0.18			
135'	140'		0.091	0.32			
140'	146'		0.375	1.0			

080

STATE
COMPANY
AREAHOLE NUMBER D 29
BEARINGS (M) 330.5°
CO-ORDS
DIP 65°

560131

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0	22'	Loose rubble consisting of coarse-grained light-blue quartzite.	
22'	42'	Coarse-grained light-blue quartzite.	indistinct
42'	76'	Strongly weathered tuff and argillite	"
76'	87'	Coarse-grained muscovite rich blue-grey quartzite.	"
87'	92'	Coarse-grained light-grey quartzite	30-40°
92'	107'	Tuff	
107'	127'	Brecciated and sheared carbonaceous argillite	30-60°
127'	153'	Interbanded carbonaceous argillite and quartzite. Quartzite broken and brecciated.	60-30°
153'	154'	Massive pyrite-sphalerite-carbonate min. Contact Angles at	154' 30°
154'	178'6"	Interbanded coarse-grained blue-grey qte. and carbonaceous argillite.	varying
178'6"	189'	Tuff	
189'	196'	Coarse-grained Qtz with thin bands of carb. argillite at 194'. 6" of sheared carbonaceous argillite with blebs of Py. min.	
196'	246'	Sheared and contorted, very graphite rich carbonaceous argillite, with bands of coarse-grained light-grey qtz. Py veining throughout.	varying 20-90°
246'	264'	Coarse-grained blue qte. with bands of brecciated carbonaceous argillite.	30-60°
264'	285'	Interbanded coarse-grained qtz. and carbonaceous argillite. Minor carbonate veining throughout.	"
285'	382'	Sheared carbonaceous argillite. Py veining throughout at 336', 339', 342', 349', 353' ¼" vein of Py min. At 372' 3" vein of Py min.	20-50°
382'	383'	Massive Py-Q-Carbonate veins. contact angles at 382 383	400 "

081

STATE
COMPANY
AREA

HOLE NUMBER B 29
BEARINGS (M)
CO-ORDS
DIP

2.

560132

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
383'	393'	Carbonaceous argillite Weak carbonate-pyrite veining DRILLING COMPLETED	20-40°

082

ASSAY SHEET

560133

HOLE NUMBER B29

FROM	TO	WIDTH			DEPTH	ETCH DI
			CORE RECOVERIES			
0	2		25%		600	62½
2	23		5%		300	63¼
23	28		40%			
28	42		7%			
42	51		28%			

083

STATE TASMANIA
 COMPANY TIN MINING CO.
 AREA MT. BISHOPP

HOLE NUMBER B30
 BEARINGS (M) 2830 Grid
 CO-ORDS 1055N, 1325W 560134
 DIP Horiz.

FROM	TO	CORE DESCRIPTION	C. to B. Angles
		<u>RESUME</u> The first 10'6" is barren dolomite and black slate, followed by massive sulphide lode, some pyritic, some pyrrhotitic, which continues to 61'6". After this comes further dolomite and slate. Core to-bedding angles are indefinite and the core is very greasy (rod grease) AMDL specimens taken at 10', 82'.	
0'	3'6"	<u>Dolomite</u>	
3'6"	5'	Brecciated <u>slate</u> , shears at 45-60°	
5'	7'6"	<u>Dolomite</u> with minor slate	45°
7'6"	10'6"	<u>Tuff</u> or slate with some yellow carbonate	
10'6"	54'	Talc-carbonate - pyrrhotite <u>lode</u> . No definite banding, but a preferred direction at 35°.	
54'	61'6"	Pyritic <u>lode</u> , in part leached and broken. Shearing at end at 60°.	30-50°
61'6"	74'	Pale <u>slate</u> , in part gritty, and possibly dolomitic	
74'	75'	<u>Slate</u> , with pyrite mineralisation	
75'	75'6"	Pale <u>slate</u>	
75'6"	79'	Coarse-grained <u>tuff</u> . Broken core. Some evidence of folding.	50°
79'	122'6"	Grey <u>slate</u> , well banded. Pyritic mineralisation on joints after 89'. This rock type is also described as a creamy-grey coloured <u>cherty argillite</u> . Quartz-pyrite veins are well developed at 98'-99' and at 113'-114'6". Some brecciation seen. (Slate-Siltstone breccio)	30-60°
122'6"	145'	Dull vitreous grey <u>siliceous argillite</u> . Some folding at first, then uniform banding.	45°
145'	160'	Creamy-grey coloured <u>cherty argillite</u> with fine pyrite veins. Core is broken and some is lost. Some foliation, possibly bedding, around 156 ft.	65°
160'	170'	Dark-grey <u>siliceous argillite</u>	60-30°
170'	200'	Creamy-grey <u>cherty argillite</u> . A 6" wide vein of quartz-pyrite occurs at 172'. Foliation, with minor shearing occurs at variable angles. Minor pyrite throughout. Only 4 ft. of core, including puggy chips, recovered between 182' and 190'.	

END OF HOLE

084

ASSAY SHEET

HOLE NUMBER B30

560135

FROM	TO	WIDTH	% Zn		ETCH DIP		
11'6"	15'	3'6"	.12		5.08		
15	20	5	.34				
20	25	"	.115				
25	30	"	.05				
30	35	"	.155				
35	40	"	.31				
40	45	"	.05				
45	50	"	.09				
50	55	"	.05				
55	60	"	.06				
60	65	"	.06				
11'6"	40	28'6"	.17				

COMPANY TIN MINING CO.
 AREA MT. BISCHOFF

B31
 BEARINGS (M) 203°
 CO-ORDS 1045 N, 1310 W
 DIP Horizontal

560136

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0'	26'6"	<p>Chert with minor shaly sections. Calcite-spalerite veins at 18'6" and 20'. Locally tending to show weakly brecciated structures, especially at 22'. Angles (banding) variable from 15° - 45°. Upper contact with ore is at about 45°.</p>	
26'6"	33'	<p>Ore, mainly pyritic, being slightly leached, with silica, dolomite and talc gangue. Lower contact is again 45°</p>	
33'	200'	<p>Argillaceous Chert, Siliceous Siltstone or <u>Cherty Argillite</u>, i.e. as from 0' - 26'6" but softer. ½" wide spalerite vein at 44'3", ½" PB (Galena) vein at 48'9" and ¼" Py vein @ 148'. Uniform grey to 120', then green and brown colours, becoming quite characteristic after 120'.</p> <p>Lithological banding, possibly bedding, of: 30° @ 120' - 126' (bedding) 40° @ 129' " 40° @ 133' (Foliation) 40° @ 140' " 70° @ 189' (bedding) V. contorted @ 197' " 35° @ 200' "</p> <p>Very broken (from 96' - 138' especially) from 96' to end of hole, with poor recoveries from 173' - 200' (5' lost). 166' - 171' is brecciated and irregularly veined with sulphide. Occasional mineralised sections from 148' - 200', especially at 173' and 181', and sulphides at 200'. Possibly some decomposed slate from 193' - 199', but very broken and recoveries low. Specimen taken at 167' for examination by AMDL.</p>	

END OF HOLE

085

088

ASSAY SHEET

HOLE NUMBER B31

560137

FROM	TO	WIDTH	%Sn				
26'6"	33'	6'6"	.05				

087

STATE TASMANIA
 COMPANY
 AREA MT BISCHOFF

POLE NUMBER B32
 BEARINGS (M) 330.5
 CO-ORDS 830N, 175W
 DIP -60° 560138

FROM	TO	CORE DESCRIPTION	C to Po Angles
0	68'	No core recovered	Indistinct
68'	74'	Yellow blue barren dolomite with strong fluorite veining	
274'	91'	Cavity	
91	97	=68'-74'	
97'	98'	Dolomitic lode containing Py-Sl min	
98'	102'6"	Brecciated yellow dolomite with strong fluorite veining	
102'6"	103'	97-98	
103'	109'	Cavity	
109'	112'	Yellow blue dolomite with strong fluorite veining	
112'	113'	Dolomitic lode, containing Py-Po fluorite Total sulphide content low	
113'	115'	=109-112	
115'	121'	Cavity	
121	250'	Yellow blue dolomite with strong fluorite veining. Scattered chert bands throughout From 241'-244 splashes of sulphides	
250	266'6"	Brecciated yellow-blue dolomite	
266'6"	273	Dark grey c.g. qtz in places - Argillite	30°-50°
273'	297'	Light grey f.g. Argillite with bands of c.g. qtz. Minor carbonate and Py veining.	40°-60°
297'	324'	Carbonaceous Argillite with moderate carbonate veining throughout. At 324': 1" veins of Q-Py min	30°-50°
324	365	Interbedded carbonaceous argillite and c.f. dark grey qtz. Moderate carbonate-Py veining From 356-358 strong Q-Py veining	30°-60°
365'	387'	c.g. dark grey qtz with bands of carbonaceous argillite. Weak Q-Py and carbonate veining throughout	20°-50°

088

STATE
COMPANY
AREA

HOLE NUMBER
BEARINGS (M)
CO-ORDS
DIP

560139

FROM	TO	CORE DESCRIPTION	
387'	432'	Carbonaceous argillite with bands of brecciated and contrasted c.g. qtz. Q-Py veining throughout and strong from 387'-394'	30°-50°
432'	440'	Interbedded argillite and contrasted carbonaceous argillite. Carbonate veining throughout.	30°-50°
440'	444'	Cavity	
444'	457'6"	c.g. dark grey qtz with narrow bands of carbonaceous argillite. Py veining throughout.	30°-50°
457'6"	462'	Brecciated qtz with very strong Py mineralization and fluorite veining	40°-70°

HOLE ABANDONED

089

ASSAY SHEET

HOLE NUMBER

B32

HOLE SURVEY

560140

FROM	TO	WIDTH	%Sn	Depth	Mag Az ^o	Trop Dip ^o	Etch D
457'6"	462'	4.5'	0.488	100 300 400			61½ 61½ 61½

090

STATE
COMPANY
AREA

TASMANIA
MT BISCHOFF

HOLE NUMBER
BEARINGS (M)
CO-ORDS
DIP

B33
560141
2692780N, 1069770E
-50°

FROM	TO	RECOVERY	CORE DESCRIPTION
0	16		No core recovery
16	41		Light grey sludge (resembles f.g. light grey quartzite)
41'	42'		Grey blue micaceous quartzite
42'	62'		Dark grey mica rich sludge with minor Py
62'	63'		Grey blue micaceous quartzite
63'	70'		6" of leached dolomitic ore and black pyrite rich sludge.
70'	78'		Leached q-Solomite lode with strong Py-Cassiterite - Sphalerite mineralisation. At 77' : 6" band of puffy talc rich clay.
78'	79'6"		Puggy talc rich clay with lumps of Porphyry Q-feldspar Porphyry (At 82' : 9" of timber)
111'	115'6"		Q-Carbonate lode with strong galena - sphalerite min.
115'6"	118'6"		Sludge containing Q-F-Py-Sl and 6" of Q-Carbonate lode with Py-Sl min.
118'6"	123'		1' of strong Q-carbonate lode and beach pyritic sludge.
123'	133'6"		Pyritic sludge
133'6"	139'	5%	Dolomite with minor sulphide min.
139'	142'	50%	Leached dolomite with strong sulphide min.
142'	146'6"	30%	Barren light grey dolomite and brown sludge with minor Py
146'6"	153'	50%	Light grey barren dolomite containing chert and fluorite. Also light brown sludge with minor Py min.
153'	157'	60%	Good dolomitic ore containing Py-Po Siderite. Also Black Py rich sludge
157'	162'	45%	= 153-157 No sludge recovered.

091

COMPANY
AREA

BEARINGS (M)
CO-ORDS
DIP

560142

FROM	TO	RECOVERY	CORE DESCRIPTION	
162'	171'	3%	Dolomitic Code and brown sludge with minor Py min	
171'	177'	50%	Massive dolomitic ore containing 60% sulphides (Py-Po-Sl)	
177'	181'	90%	Dark brown Py rich clay	
181'	186'6"	0	No core or sludge recovered	
186'6"	200'6"	0	Black Py rich sludge	
200'6"	205'	100%	Strongly mineralised talc rich rock.	
205'	205'6"	0	Black Py rich sludge	
215'6"	225'6"	20%	Siliceous ore with strong Py-Po-Sl min	
225'6"	230'6"	0	Black Py rich sludge	
230'6"	233'6"	50%	Rock resembling carbonaceous argillite Very strong sulphide carbonate-talc mineralisation. Also black Py rich sludge	
233'6"	237'6"	10%	= 230'6" - 233'6"	
237'6"	248'6"	0	Black Py rich sludge	
248'6"	250'	0	Cavity	
250'	254'	0	Black Py rich sludge	
254'	263'	100%	Blue grey interbedded qtz and argillite	
263'	322'	100%	Grey blue qtz with Py veining all through	
322'	379'	100%	Carbonaceous argillite with contorted and Roke bands of light grey quartzite. Py and G carbonate veining all through.	
			322'-340'	40-60°
			340'-356'	20-50°
			356'-361'	60-90°
			361'-379'	20-40°
379'	401'6"		Blue Siliceous banded quartzite with strong Q-Py-Cp veining all through. From 383-384 Q-Py-Cassiterite vein at 396' 4" of Q-Py	30-50°
401'6"	404'6"		Q-Py Contact at 404'6"	35°
404'6"	411'6"		Fine grained light grey quartzite with disseminated Py all through and Q=Py veining in places.	40°
				40°-60°

DRILLING COMPLETED

HOLE NUMBER

B 33

092

FROM	TO	WIDTH	% Sn		From To	Width	% SN
63	70	7	.005				
63	70	7	.017	(Sludge)			
70	75	5	.033				
75	78	3	.091				
78	83	5	.020				
83	88	5	.010				
88	93	5	.015				
93	98	5	.019				
98	103	5	.021				
103	108	5	.024				
108	111	3	.028				
111	115'6"	4'6"	.069				
115'6"	118'6"	3	.560				
115'6"	118'6"	3	.087	(Sludge)	115'6"	123' 7'6"	.39
118'6"	123'	4'6"	.217				
118'6"	123	4'6"	.017	(Sludge)			
123'	128'6"	5'6"	.037	"			
128'6"	133'6"	5'	.014	(Sludge)			
133'6"	134'	5'6"	.005				
139'	142'6"	3'6"	.037				
142'6"	146'6"	4'6"	.010				
142'6"	146'6"	4'6"	.030	(Sludge)			
146'6"	153'	6'6"	.362		146'181'	35	.48
146'6"	153'	6'6"	.233	(Sludge)			
153'	157'	4	1.202				
153'	157'	4	.236	(Sludge)			
157'	162'	5	.518				
162	171	9	.094				
162	171	9	.332	(Sludge)			
171	177'	6	.028				
177	181	4	.676				
186'6"	193	6'6"	.029	(Sludge)			
193	198	5	.011	"			
198	200'6"	2'6"	.027	"			
200'6"	205'6"	5	.012				
205'6"	210'6"	5	.007	(Sludge)			
210'6"	215'6"	5	.012				
215'6"	220'6"	5	.003				
220'6"	225'6"	5	.002				
225'6"	230'6"	5	.004	(Sludge)			
230'6"	233'6"	3	.003				
230'6"	233'6"	3	.011	(Sludge)			
233'6"	237'6"	4	.004				
233'6"	237'6"	3	.0007				
240'6"	248'6"	8	.002	(Sludge)			
250'	254'	4	.009	"			

HOLE NUMBER B33

FROM	TO	WIDTH	%Sn				
379'	384'	5	.063				
384'	389'	5	.546				
389'	394'	5	.051				
394'	399'	5	.097				
399'	404'	5	.532				
404'	409'	5	.227				
409'	411'6"	2'6"	.291				

09A

STATE TASMANIA
 COMPANY
 AREA MT. BISCHOFF

HOLE NUMBER B34
 BEARINGS (M) 330.5 560145
 CO-ORDS 2692805N, 1069965E
 DIP -50°

FROM	TO	RECOVERY	CORE DESCRIPTION
0	16	15%	Light grey micaceous Qtz and carbonaceous argillite as for 0-16. Also dark grey sludge.
16	30	25%	
30	50	0	Dark grey sludge with minor Py. Sludge resembles carbonaceous argillite.
50	57	7%	Dark grey micaceous quartzite and carbonaceous argillite. Also dark grey sludge with minor Py.
57	64	25%	Carbonaceous argillite.
64	71'6"	0	Dark grey sludge resembling carbonaceous argillite.
71'6"	83	12%	Carbonaceous argillite.
83	88'6"	40%	Dark grey micaceous quartzite and carbonaceous argillite. Also dark grey sludge and minor Py.
88'6"	146	0	Dark grey sludge with minor Py. Sludge resembles CA and contains chunks of dark grey Qtz occasionally.

HOLE ABANDONED

095

STATE TASMANIA
 COMPANY
 AREA MT. BISCHOFF

HOLE NUMBER B35
 BEARINGS (M) 330.5° 560146
 CO-ORDS 2692865N, 1070165E
 DIP -50°

FROM	TO	RECOVERY	CORE DESCRIPTION	
0'	12'(?)	25%	Chunks of dark grey quartzite and carbonaceous argillite only recovered.	
12'(?)	43'	Sludge)	Mid-grey sludge	
43'	48'	(20%+Sludge)	Dark grey quartzite + carbonaceous argillite	
48'	51'	60%	Dark-grey micaceous quartzite	
51'	66'	100%	Dark-grey massive quartzite.	
66'	77'	35%	Carbonaceous argillite with bands of dark grey quartzite	
77'	79'6"	100%	Interbedded carbonaceous argillite and quartzite	30-40°
79'	79'6"	50%	Light-grey quartzite and pyrite	
86'	92'	50%	Sheared carbonaceous argillite	
92'	108'	100%	Carbonaceous argillite in places- dark grey quartzite. Medium carbonate veining all through. Strong carbonate veining 100-102'	20-40°
108'	108'			
108'	129'		Light grey quartzite with strong quartz-carbonate and fluorite veining all through. In places strong brecciation.	
129'	143'		Interbedded carbonaceous argillite and dark grey quartzite with quartz veining throughout.	30-50°
143'	152'		= 108' - 129'	
152'	164'		= 129' - 143'	30-60°
164'	180'		= 108' - 129'	30-40°
180'	239'		Interbedded quartzite and carbonaceous argillite. Quartzite brecciated and broken. Quartz carbonate veining throughout. From 217-218' quartz-carbonate-pyrite vein. (contact angles 65°)	40-50°
239'	256'		= 108' - 129'	50-60°

096

STATE TASMANIA
 COMPANY
 AREA MT. BISCHOFF

HOLE NUMBER B35 560147
 BEARINGS (M) 330.5°
 CO-ORDS 2692865N, 1070165E
 DIP -50°

FROM	TO	RECOVERY	CORE DESCRIPTION	
256'	366'		Strongly banded interbedded light grey quartzite and carbonaceous argillite. From 360'-361' strong pyrite veining.	30-50°
366'	395'		= 108' - 129'	
395'	466'		Interbedded light grey quartzite and black argillite. Quartz-carbonate veining throughout.	
			395-400' :	40-50°
			400-466' :	20-40°
466'	489'		Quartz-felspar porphyry with medium pyrite-sphalerite mineralisation. Weak pyrite and fluorite veining. Contact angles at 466' : 50°, and 489' : 70°.	
489'	559'		Interbedded black argillite and light grey coarse-grained quartzite. The quartzite is brecciated and broken. Medium-strong pyrite mineralization throughout.	
			Varying but mainly:	40-80°
			END OF HOLE	

ASSAY SHEET

560148

HOLE NUMBER B35

FROM	TO	WIDTH	%Sn			
466'	471'	5	.046			
471'	476'	5	.066			
476'	481'	5	.103			
481'	486'	5	.087			
486'	489'	3	.098			

098

STATE TASMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

HOLE NUMBER B36
 BEARINGS (M) 330.5° 560149
 CO-ORDS 2692040N, 1069740E
 DIP -60°

FROM	TO	CORE DESCRIPTION	C. to E. Angles
0'	9'	No core recovered.	
9'	18'	Carbonaceous argillite with bands of broken and brecciated light grey quartzite. Strong pyrite veining.	10-40° Irreg.
18'	38'	Tuffaceous(?) rock. Strong shearing gives the rock a definite foliation.	20-40°
38'	43'6"	Mid-grey quartzite with bands of carbonaceous argillite.	
43'6"	48'	Tuffaceous quartzite.	10-30°
48'	68'	Mid-grey quartzite with bands of carbonaceous argillite. Weak pyrite veining.	10-40° Irreg.
68'	72'9"	Sludge consisting of carbonaceous argillite and pyrite.	
72'9"	87'	Carbonaceous argillite with bands of brecciated light grey quartzite. Strong pyrite mineralisation. Gen. irreg. but folded 0-10; 85-86.	10-30°
87'	91'6"	Sludge, consisting of carbonaceous argillite and pyrite.	
91'6"	97'	Carbonaceous argillite with strong pyrite veining.	Indistinct
97'	124'	Carbonaceous argillite interbedded with mid-grey quartzite and light grey argillite.	"
124'	138'	Interbedded black argillite and light grey quartzite, in places strongly banded.	0-40°
138'	165'	Light-grey quartzite with minor black argillite. Angles indistinct but occasionally	20-40°
165'	168'	Brecciated carbonaceous argillite.	
168'	184'	= 138'-165'	Indistinct
184'	208'	Carbonaceous argillite with bank of broken and brecciated light grey quartzite. Gen. irreg.	30-60°
208'	224'	Mid-grey quartzite with minor carbonaceous argillite.	
224'	250'6"	Carbonaceous argillite with bands of broken and brecciated light grey quartzite	Contorted

099

STATE
COMPANY
AREA

HOLE NO. B36
BEARINGS (M)
CO-ORDS
DIP

560150

FROM	TO	CORE DESCRIPTION	C. to P. Angles °
250'6"	254'6"	Flourite-Py-Sl veins more or less parallel to core axis. Width varies (1/2"-1/4").	
254'6"	255'6"	Quartz-pyrite veining on carbonaceous argillite. Also some flourite, sph.	
255'6"	279'9"	Interbedded carbonaceous argillite and light grey quartzite (in places broken and brecciated).	Up to 70°
279'9"	280'6"	Tuff. Angles of contact slightly irregular at 279'9":	60°
280'6"	338'	Muscovite rich grey blue quartzite with occasional bands of carbonaceous argillite.	30-60°
338'	368'	Carbonaceous argillite with bands of broken and brecciated light grey quartzite. At 349': 2" vein of quartz-pyrite-chalcopyrite mineralisation.	30-60°
368'	487'	Interbedded mid-grey quartzite, black argillite and mid-grey argillite. 1" wide quartz-pyrite vein at 408'. Strong quartz-dolomite veining at 411'. 1" wide quartz-pyrite vein at 419'. 368' - 390' 390' - 487'	10-30° 40-70°
487'	504'	Mid-grey coarse-grained quartzite. From 491' - 491'6" strong quartz-dolomite-pyrite veining.	40-60°
504'	546'	Interbedded mid-grey quartzite and black argillite.	40-60°

END OF HOLE.

ASSAY SHEET

560151

HOLE NUMBER B36

FROM	TO	WIDTH	Sn	Zn			
250'6"	255'6"		0.056	6.2			

100

101

COMPANY

BEARINGS (M)

150.5°

AREA 7AP/AM, Mt. Bischoff

CO-ORDS

2691360N, 1068180E

DIP

560152

FROM	TO	RECOVERY	CORE DESCRIPTION	
0	10	Nil		
10	25	20%	Tuff. Doubtful maybe floater.	
25	50	12%	Carbonaceous argillites, tuff and quartzite (floaters).	
50	81		Micaceous black argillite and light grey quartzite.	
81	110		Tuff with fragments of quartzite, black argillite and kaolin?	
110	119		Carbonaceous argillite with bands of light grey quartzite.	40-65°
119	124		Quartz felspar porphyry with medium to strong sphalerite mineralisation.	
			Contact angles	119' 30° 124' 60°
124	137		Black micaceous argillite with weak pyrite veining.	50-70°
137	205		Strongly leached quartz felspar porphyry with occasional pyrite. In general mineralised.	
			Contact angle	137' 60° 205' 40°
205	225		Black to mid-grey argillite with weak quartz-carbonate veining.	40-90°
225	231		Coarse-grained lithic tuff. Foliation angle.	50°
231	250		Mid grey argillite with weak carbonate veining.	50-60°
250	261		Carbonaceous argillite with carbonate veining.	Indistinct
261	279		Mid grey argillite with carbonate and fluorite veining.	40-70°
279	286		Interbedded carbonaceous argillite and mid grey quartzite.	40-60°
286	310		Light grey brecciated argillite with strong fluorite veining.	Indistinct
310	535'6"		Carbonaceous argillite with occasional bands fine-grained mid-grey argillite and quartzite. Medium to strong brecciation in places. Strongly banded 409-504', strongly brecciated 504-518'6", 518'6"-535'6", strongly banded.	30-60°
535'6"	544		Fine-grained mid-grey quartzite, strongly brecciated, cracks filled with black argillite? Occasional specks of pyrite.	Indistinct

STATE TASMANIA
 COMPANY
 AREA 7AP/AM, Mt. Bischoff

HOLE NUMBER
 BEARINGS (N)
 CO-ORDS
 DIP

B37

560153

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
544	557'6"	Interbedded black argillite and mid grey fine quartzite. Occasional quartz-carbonate veins.	20-40°
557'6"	575'	Medium grained, mid grey quartzite occasionally micaceous.	40-50°
575	588'3"	Interbedded black argillite with grey quartzite.	60-80°
588'3"	606'	Medium grained mid grey quartzite.	45°
606	644	Black argillites with some interbedded fine quartzites. Strongly pyritic in places. Thin carbonate veins and quartz veins.	40-80°
644	680)	Strongly banded black argillites and thin quartzites. Strong dolomite veining from 686'-687'. 644'-654' 654'-735'	25-50° 50-90°
680	686)		
686	694)		
694	735)		
735	744'6"	Fine-grained mid grey quartzite micaceous in parts. Thin carbonate veins not seen.	
744'6"	747	Brecciated carbonaceous argillite with numerous thin pyrite laminae.	40-60°
747	752'6"	Medium grained dark grey quartzite with interbedded carbonaceous argillite.	70-80°
752'6"	757		
757	764	Strongly banded carbonaceous argillite with strong pyrite bands.	60-80°
764	808	Brecciated black argillites with numerous thin pyrite laminae.	80°
808	820		
820	826	783'1½" dolomite-pyrite vein contact angle	
826	856	801'1" pyrite vein contact angle 60°	
856	868	804-805'1¼" pyrite vein contact angle 10°	
868	1029	821' dolomite quartz pyrite vein. 867' dolomite, fluorite, pyrite, sphalerite, galena, vein 950'6"-951'6". Strong pyrite mineralisation. 772'6"-904'	40-70°
1029	1033	Quartz felspar porphyry, rounded phenocrysts no visible mineralisation.	
1033	1075'6"	Brecciated black argillites with numerous thin dolomite-pyrite veins.	

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ASSAY SHEET
HOLE NUMBER B37

560154

FROM	TO	WIDTH		De pth	Mag. Az ^o	Trop Dip ^o
119	124	5		137'	142 ^o	-81 ^o
				200'	141 ^o	-81 ^o
				500'	155 ^o	-81 ^o
				1000'	165 ^o	-81 ^o
				1300'	179 ^o	-81 ^o
				1650'	184 ^o	-80 ^o

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10A

STALL, MASHANLA
 COMPANY
 AREA MT. BISCHOFF

HOLL ... B58
 BEARINGS (M) 330.5° 560155
 CO-ORDS 2692450N, 1068820E
 DIP 70°

FROM	TO	CORE DESCRIPTION	C. to B Angles °
0	6		
6	33	Carbonaceous argillite with bands of sheared and boudinaged quartzites. Quartz pyrite veining all through. Core to bedding angle irregular but mainly.....	0-40°
33	56	Sheared and brecciated argillite and light grey quartzite with strong quartz pyrite veins.	30-40°
56	76	Strongly deformed and sheared mid-grey quartzite and black argillite.	Irreg- ular
76	78	Fine grained blue grey quartzite.	30-60°
78	79	Strongly deformed and sheared mid-grey quartzite and black argillites	Irregu- lar.
79	89	Strongly brecciated yellowish chert and carbonaceous argillite. Strong fluorite veining all through.	Irregu- lar
89	108	Carbonaceous argillite with band of brecciated mid-grey and light-grey quartzite.	0-50°
108	140	Mid-grey quartzite, very biotite-rich. Very strong quartz pyrite veins throughout. From 130°-140° the pyrite content is very high consisting of cross veins and very fine-grained disseminated pyrite.	40-90°
140	251	Interbedded carbonaceous argillite with light-grey and mid-grey quartzites (brecciated). Medium to strong pyrite mineralisation.	20-60°
251	356	Quartz porphyry with strong pyrite mineralisation. Contact angle at 251'. Occasional pyrite - <u>native copper</u> - pyrrhotite veining.	60°
356	363	Mixture of quartz-felspar-porphyry and brecciated mid-grey argillite and quartzite. Medium to strong quartz-carbonate veining parallel to core axis.	
363	375	Strongly brecciated mid-grey argillite and light grey quartzite.	60-90°
375	431	Light grey quartzite with bands of mid grey argillite. Weak to medium pyrite veins. Strong carbonate veining 392-393'. Strong quartz pyrite veins 398-400'. Varying mainly	40-60°
431	446	Quartz porphyry with strong pyrite-pyrrhotite veining throughout. Contact angle at 431' contact angle at 446'	70° 70°
446	492	Well banded quartzite and mid-grey fine grained argillite. Weak to medium quartz pyrite and pyrite veining.	30-70°

105

COMPANY
 AREA MT. BISCHOFF

BEARINGS (N) 330.5° 560156
 CO-ORDS 2692450N, 1068820E
 DIP 70°

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0	6		
6	33	Carbonaceous argillite with bands of sheared and boudinaged quartzites. Quartz pyrite veining all through. Core to bedding angle irregular but mainly.....	0-40°
33	56	Sheared and brecciated argillite and light grey quartzite with strong quartz pyrite veins.	30-40°
56	76	Strongly deformed and sheared mid-grey quartzite and black argillite.	Irregular
76	78	Fine grained blue grey quartzite.	30-60°
78	79	Strongly deformed and sheared mid-grey quartzite and black argillites	Irregular.
79	89	Strongly brecciated yellowish chert and carbonaceous argillite. Strong fluorite veining all through.	Irregular
89	108	Carbonaceous argillite with band of brecciated mid-grey and light-grey quartzite.	0-50°
108	140	Mid-grey quartzite, very biotite-rich. Very strong quartz pyrite veins throughout. From 130°-140° the pyrite content is very high consisting of cross veins and very fine-grained disseminated pyrite.	40-90°
140	251	Interbedded carbonaceous argillite with light-grey and mid-grey quartzites (brecciated). Medium to strong pyrite mineralisation.	20-60°
251	356	Quartz porphyry with strong pyrite mineralisation. Contact angle at 251'. Occasional pyrite - <u>native copper</u> - pyrrhotite veining.	60°
356	363	Mixture of quartz-felspar-porphyry and brecciated mid-grey argillite and quartzite. Medium to strong quartz-carbonate veining parallel to core axis.	
363	375	Strongly brecciated mid-grey argillite and light grey quartzite.	60-90°
375	431	Light grey quartzite with bands of mid grey argillite. Weak to medium pyrite veins. Strong carbonate veining 392-393'. Strong quartz pyrite veins 398-400'. Varying mainly	40-60°
431	446	Quartz porphyry with strong pyrite-pyrrhotite veining throughout. Contact angle at 431' contact angle at 446'	70° 70°
446	492	Well banded quartzite and mid-grey fine grained argillite. Weak to medium quartz pyrite and pyrite veining.	30-70°

STATE TASMANIA
 COMPANY
 AREA MT. BISCHOFF

HOLE NUMBER
 BEARINGS (M)
 CO-ORDS
 DIP

B38 560157
 330.50

106

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
492	506	Quartz porphyry with strong pyrite-pyrrhotite veins and weak to medium sphalerite, mineralisation in cross cutting veins. Strong pyrite-sphalerite from 501-502'. Contact angle at 492'.	60°
506	585	Banded quartzite and mid-grey argillite with weak to medium quartz-pyrite veins. 1" pyrite-sphalerite veins at 408'6". 2" pyrite-sphalerite veins at 409'.	50-70°
585	610	Very hard fine-grained mid-grey quartzite with strong disseminated pyrite mineralisation in places.	
610	669	Interbedded mid-grey argillites and light grey quartzite. Weak quartz-pyrite veins. Strong folding brecciation.	40-80°
669	671	Quartz-felspar-porphyry with weak to medium pyrite. Contact angle at 669' Contact angle at 671'	35° 45°
671	673	As for 610' to 669'.	
673	679	Quartz felspar porphyry. Weak-medium pyrite. Contact angle at 673' Contact angle at 679'	Irregu- lar 30°
679	699	Quartz felspar porphyry. Weak-medium pyrite Contact angle	
699	715	Very hard fine-grained mid-grey quartzite with strong disseminated pyrite in places and minor quartz-pyrite veins.	Indist- inct
END OF HOLE			

ASSAY SHEET

HOLE NUMBER B38

560158

FROM	TO	WIDTH	% Sn			
108	113	5	.004			
113	118	"	.008			
118	123	"	.006			
123	128	"	.005			
128	133	"	.008			
133	138	"	.006			
138	143	"	.009			
143	148	"	.015			
148	153	"	.036			
153	158	"	.008			
251	256	5	.123			
256	261	"	.220			
261	266	"	.034			
266	271	"	.143			
271	276	"	.119			
276	281	"	.095			
281	286	"	.122			
286	291	"	.075			
291	296	"	.243			
296	301	"	.651			
301	306	"	.091			
306	311	"	.235			
311	316	"	.330			
316	321	"	.634			
321	326	"	1.620			
326	331	"	.220			
331	336	"	.521			
336	341	"	.410			
341	346	"	.122			
346	351	"	.098			
351	356	"	.266			
421	426	"	.105			
426	431	"	.110			
431	436	"	.100			
436	441	"	.201			
441	446	"	.244			
492	497	"	.347			
497	502	"	.496			
502	507	"	.219			
667	672	"	.017			
672	677	"	.010			
677	682	"	.049			

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108

STATE TASMANIA
 COMPANY Mt. Bishoff Tin Mining
 AREA MT. BISCHOFF CO.

BOLE NUMBER B44
 BEARINGS (M) 153
 CO-ORDS 1309N, 972W
 DIP Horizontal

560159

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0'	76'6"	<p><u>Chert</u> (?) with some darker shaly sections. This chert is hard, creamy-grey to dark grey, and contains narrow (up to 2") veins of quartz-pyrite mineralization. Chert becoming increasingly argillaceous towards end of section.</p> <p>Veins from 0' - 2'6" (with purple fluorite), 19' - 20', 39', 41', 43', 51'6" and 56'.</p> <p>Banding generally fairly flat, being relatively gently warped along the hole, being perhaps 0° - 20° to about 33' then slightly steeper at 10° - 30° from 33' - 58', increasing to 45° at 68', and 35° at 76'6". Angle of ore contact is 35°.</p> <p>Specimen taken at 32', showing dark and light banding, for AMDL examination.</p>	
76'6"	119'	<p>Banded <u>Talcy Lode</u> with some pyrrhotite. Strong sulphide begins at 81'6", then massive banded Po ore to 91', with angles of 100° - 30°. Then a weak zone with minor mineralization (mainly dolomite to 108'), then massive Po ore to 119', with some dolomite gangue.</p>	
119'	129'6"	<p>Siliceous <u>dolomite</u> gangue with minor sulphides.</p>	
129'6"	142'6"	<p>Massive sulphide <u>ore</u>, mainly pyrrhotite. Some vague banding at an angle of 35°.</p>	
142'6"	145'	<p>Massive green <u>talc</u>.</p>	
145'	163'	<p>Massive pyrrhotite <u>ore</u>.</p>	
163'	245'	<p><u>Dolomite</u>, barren at first, then becoming rich in pyrite by 172'. High pressure water flow at 172'. Dolomite with talc and scattered mineralization continues to 211', then almost barren dolomite, rather siliceous, with massive talcy pyrite-pyrrhotite ore from 217'-218'. Elsewhere only very scattered sulphide veinlets and blebs.</p> <p>Angles: 50° @ 195'-196' 45° @ 197' 30° @ 198'-199'</p>	
245'	248'	<p>Talcy pyrrhotite-pyrite lode. Angles possibly 0°</p>	
248'	288'	<p>Barren siliceous dolomite, with occasional strong banding. Only occasional sulphide specks and veinlets.</p> <p>Angles: 40° @ 268' & 270' 35° @ 272' & 276'</p>	

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STATE
COMPANY
AREA

HOLE NUMBER B44
BEARINGS (M)
CO-ORDS
DIP

2.

560160

FROM	TO	CORE DESCRIPTION	C. to R. Angles °
288'	312'6"	<p>Highly siliceous barren dolomite, tending to creamy-grey chert. Appears slightly oxidised from 292' to end of hole (only 15" recovered from 302'6"-312'6"). Two strong pyrite veins, one 12" wide at 288' and other 3" wide at 312'6".</p> <p style="text-align: center;"><u>END OF HOLE</u></p>	

110

ASSAY SHEET

560161

HOLE NUMBER B44

FROM	TO	WIDTH					
75'	80'	5'					
80'	85'	"					
85'	90'	"					
90'	95'	"					
95'	100'	"					
100'	105'	"					
105'	110'	"					
110'	115'	"					
115'	120'	"					
120'	125'	"					
125'	130'	"					
130'	135'	"					
135'	140'	"					
140'	145'	"					
145'	150'	"					
150'	155'	"					
155'	160'	"					
160'	165'	"					
165'	170'	"					
170'	175'	"					
175'	180'	"					
180'	185'	"					
185'	190'	"					
190'	195'	"					
195'	200'	"					
200'	205'	"					
205'	210'	"					
210'	215'	"					
215'	220'	"					

111

STATE TASMANIA
 COMPANY MT BISCHOFF T.M.CO.
 AREA MT. BISCHOFF

ROLE BEARING (M)
 CO-ORES
 DIP

231° (Grid)
 1207N 112SW
 HORIZONTAL

560162

FROM	TO	RECOVERY	CORE DESCRIPTION
0	9		Talcy dolomite lode Fair Po ore from 0' - 1' then only sparsely min'd with Py and Po. Gangue mainly dolomite to 2', then green and dark grey talc from 2' - 9'. Lower contact at 60°.
9	29		Light grey siliceous argillites and slates with minor interbanded quartzite near end of section. Scatt'd narrow Py veinlets, with veins to 1/2" width at 10', 13', 23'6" and 28'. Angles 45° to 16' 80° from 16' - 18'
29	49		Quartzite with some interbanded argillite at 35' and 44'6" - 46'6". Occasional narrow Py veinlets, with strong Py vein from 40'6" - 42'6" (5° wallrock contact angles). Angles : 20° at 35' 10° lower contact
49	319		Light to mid=grey siliceous argillites and slates. Yellowish coloured argillites from 136' - 147', possibly due to weak oxidation. Very occasional narrow quartzitic bands, generally highly deformed. Banding quite variable from moderate to absent. Scattered narrow Py veinlets at first, generally less than 1/4" wide, with larger veins from 106'3"-108' (with fair Sl Min) and 1" Py veins at 131'6", 134' and 147'. Then, apart from 1/4" Py vein at 191' only very minor traces of sulphides from about 150' - 319'. Angles: indistinct 35°-40° to 140' 0°-20° from 140'-152' 20° increasing to 60° from 152'-159' 30° from 159' - 177' 0° - 10° from 177' - 188' 30° from 188'-202' 5°-10° from 202'-221' 40°-65° from 221'-230' 25° from 230'-249' 0° -5° from 249' -259' 5°-10° from 259'-266' 30° from 266'-270' 0° from 270'-274' 30° from 274'-276' 0°-5° from 276'-283' 10° from 283'-286' 0° from 286'-291' 30° at 292' 0°-10° from 292'-310'

112

STATE TASMANIA

HOLE NUMBER

B46

COMPANY MT. BISCHOFF T.M.CO.

BEARINGS (M)

231° (Grid)

AREA MT. BISCHOFF

CO-GRDS

1207N 1128W

560163

DIP

HORIZONTAL

FROM	TO	RECOVERY	CORE DESCRIPTION
			<p>25°-35° from 310'-317' 45° from 317'-318'</p> <p>Strong brecciation in last 9" of section.</p>
319	341		<p>Massive <u>porphyry</u>, quite strongly min'd except for barren section at 326'. Narrow Sl vein from 324'-333'. Felspars partially altered and porphyry has a distinct greenish colour from 325'-341'. Upper contact of 55°.</p>
341	346		<p>Banded grey-brown <u>siliceous argillite</u>. Angles: 30°-50°.</p>
346	380		<p>Fine grained light grey <u>Quartzite</u>, with minor interbanded <u>siliceous argillite</u>, especially from 360'-363' and 377'.</p> <p>Angles: 0° from 356'-360' 30° -35° from 360' - 362' 0° from 362' - 363' 30° at 372'.</p>
380	396		<p>Banded grey-brown <u>siliceous argillite</u> with minor interbanded quartzite. Occasional narrow Py veinlets.</p> <p>Angles: 20° from 380'-384' 0° from 391'-395' 45° from 395'-396'</p>
396	410		<p><u>Quartzite</u>, with very minor interbanded <u>siliceous argillite</u>. Occasional narrow Py veinlets.</p> <p>Angles: 0° from 396'-401' variable 0°-30° from 401'-405'</p>
410	470		<p>Mid-grey to grey-brown <u>siliceous argillite</u> with varying degree of banding. Only very minor interbanded quartzite. No notable sulphides, except for 12" Sl-Py-Carbonate vein at 469'.</p> <p>Angles: 0° from 410' - 414' 5°-10° from 414' - 418' 30° from 418'-425' 20° - 30° from 432'-457' 40° - 50° from 457'-468'</p>

113

COMPANY MT. BISCHOFF T.M.CO. BEARINGS (M)
 AREA MT. BISCHOFF CO-ORDS
 DIP

231° (Grid)
 1207N 1128W 560164
 HORIZONTAL

FROM	TO	RECOVERY	CORE DESCRIPTION
470	481		Fine grained <u>Quartzite</u> , with minor inter-banded siliceous argillite. Several narrow Py-Sl-Carbonate veinlets.
481	515		Mid-grey to grey-brown <u>Siliceous Argillite</u> . 1" Py-Fluorite vein at 506', but elsewhere only very minor traces of sulphides. Angles: 10° - 20° from 481' - 497' 35° from 497'-508' 25°-30° from 508'-515'
515	538		Fine grained <u>Quartzite</u> , with interbanded siliceous argillite from 523'-524' and at 530'. Angles of 30° in these two sections of argillite, but no apparent in quartzite.
538	573'6"		Interbanded mid-grey <u>siliceous argillite</u> and fine grained quartzite. Only minor traces of fine grained Py Min. Angles: 60° from 538'-541' indistinct and variable 10°-30° from 541'-561' 0° at 563'6" <u>End of Hole</u>

ASSAY SHEET

560165

HOLE NUMBER

B46

FROM	TO	WIDTH	%Sn			
0	5	5	.075			
5	10	"	.15			
10	15	"	.29			
15	20	"	.095			
319	325	6	.115			
325	330	5	<.05			
330	335	5	.05			
335	341	6	<.05			

115

COMPANY
AREA

MT BISCHOFF

BEARINGS (M)
CO-ORDS
DIP331°
1055N, 1325W

Horizontal 560166

FROM	TO	CORE DESCRIPTION	C. to P. Angles °
0	10	Light grey argillite, with several 2"-6" wide zones of softer dark greyish-black argillite from 6'-10'. Scattered dev's of white talc throughout in narrow severely jointed zones. Apart for ¼" Py vein at 4' sulphides are very sparse. Angles very indistinct and variable from 50°-80°.	
10	43	Talcy Po Ore. Massive Po are with a little light green talc gangue to 23', then white talc and Po in about equal amounts from 23'-43'. Locally banded with angles of: 30° @ 26', 0° @ 29' 60° @ 30', 0° @ 31'6", 50° @ 36' and 0° @ 39' Upper contact of 70°, lower possibly 35° Light grey-brown <u>siliceous argillite</u> , with some interbedded fine grained quartzite from 50'-52'. Only traces Py Min in occasional narrow veinlets and joints. No distinct angles.	
56	60	Massive very fine grained <u>quartzite</u> . No notable sulphides.	
60	67	Light grey-brown <u>siliceous argillite</u> . ¼" Py vein at 67" and moderately strong joint from 63'-65' Angles: 55° at 61' 30° at 66' Dark grey siliceous argillite or shale (not carbonaceous shale). No distinct angles and no apparent sulphides.	
77	117	Mid grey <u>siliceous argillite</u> with a little interbedded very fine grained quartzite. Only traces Py Min in occasional narrow joints and veinlets. Angles: 50° - 60° at 80' 25° at 96'6" 35° at 105'	
177	166	Mainly very fine grained light grey <u>quartzite</u> but with some interbedded siliceous argillite, latter becoming more prevalent below 150" Core very broke 140'-166', with recoveries from 75%-100. Sulphides sparse, being limited to occasional narrow Py veinlets. Angles: 35° at 123' 30° at 151' 45° at 155' but all indistinct.	

END OF HOLE

116

ASSAY SHEET

HOLE NUMBER

B47

560167

FROM	TO	WIDTH	%Sn				
10'	15'	5'	.64				
15'	20'	5'	.065				
20'	25'	5'	.055				
25'	30'	5'	<.05				
30'	35	5'	"				
35'	40	5'	"				
40'	43	3'	"				

117

CORRELATION
AREA

MT BISCHOFF

EARTHINGS (18)

120

CO-ORDS

1968N 720W

DIP

Horizontal

560168

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0	23	Greyish-white fine grained (possibly tuffaceous) <u>quartzite</u> , occasionally weakly bedded. Interbedded mid-grey siliceous argillite at 3' (6"), 17' (6") and 19' (2"). Occasional very narrow and irregular Py veinlets throughout. Quartzite contains aggregates to 1/4" across of a dark fine grained mineral, giving rise to a spotted appearance.	40°
23	33	Mainly mid-grey weakly bedded <u>siliceous argillite</u> , with lesser greyish-white fine grained quartzite, latter again with spotted appearance. Weak to fair Py Min throughout in scattered blebs and veinlets, and is occasional narrow qtz-py veins.	40°
33	46	Massive greyish-white fine grained tuffaceous <u>quartzite</u> , with very strong spotted appearance. 1/2" wide qtz-pyrite vein with trace of Sl from 34'-35', but elsewhere only several minor Py veinlets. Strongly spotted specimen taken at 44' for examination by AMDL.	
46	66	Interbedded light greyish-white tuffaceous <u>quartzite</u> and mid-grey weakly bedded <u>siliceous argillite</u> , being about equal amounts of each and bands varying from 3" to 3' in width (average about 18"). Quartzite strongly spotted as previously. Only traces of sulphides in scattered narrow and irregular veinlets. Angles: 0° from 47'-49' 25° from 49'-66'	
66	144	Mid-grey <u>siliceous argillite</u> , in places having a light spotted appearance suggesting interbedded tuffaceous material (but distinct from tuffaceous quartzites above). A black f.g. platy or elongate mineral, being directed parallel to bedding, is also widespread (specimen showing both features taken at 79' for examination by AMDL). Banding variable from weak to moderate. Moderate Py-Po Min as irregular veinlets to 1/8" width from 66'-92' and 135'-144', elsewhere sulphides very sparse, 1/8" wide crystalline quartz vein at 72' with traces Py and Sn as very f.g. crystals. Angles: 20° from 66'-110' 25°-35° from 110'-144'	

STATE
COMPANY
AREA

HOLE NUMBER B48
BEARINGS (M)
CO-CRDS
DEP

560169

FROM	TO	CORE DESCRIPTION	C to B0 Angles
144	172	Fine grained <u>quartzite</u> , possibly tuffaceous, with very minor interbedded siliceous argillite, mainly from 155'-160'. Minor Py Min as irregular veinlets and f.g. specks.	25° to 40°
172	208	Moderately banded mid-grey <u>siliceous argillite</u> , with fair Py Min as irregular veinlets. Generally strongly deformed and recoveries low.	15°-20° where visible
208	256	Fine grained tuffaceous (?) <u>quartzite</u> with minor interbedded siliceous argillite from 237'-238' and 247'-248'. Occasional irregular Py veinlets and f.g. specks throughout. Angles: 30° at 229' 15° at 237' 30° at 243' and 247' 35° at 250' 30° at 256'	
256	332	Interbedded mid-grey <u>siliceous argillite</u> and very f.g. <u>quartzite</u> . Fair Py Min at 271', 277' and 280'-282' as irregular veinlets in strongly deformed zones. Elsewhere only traces. Scattered zones which appear moderately weathered from 258'-280' and 301'-203'. Angles: 40° from 256'-261' 25°-30° from 261'-322'.	
332	345	Massive porphyry, with moderately strong disseminated Py Min. Appears extensively weathered, with altered feldspars and Py leached out in many places. 60° contact at 345'.	
345	364	Mid-grey <u>siliceous argillite</u> Angles: 55° from 350'-351' 20°-30° from 353'-360'	
364	383	<u>Quartzite</u> , with very minor interbanded argillite. Fair Py Min as veinlets and medium grained disseminations	35°
383	427	Mid-grey weakly banded <u>siliceous argillite</u> . Last foot of section appears strongly oxidized. Only traces of Py Min. Angles 30°, except for 10° at 397' and 423'.	

118

119

STATE
COMPANY
AREA

HOLE NUMBER B48
BEARINGS (M)
CO-ORDS
DIP

560170

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
427	463	Massive <u>porphyry</u> , strongly mineralised with disseminated pyrite throughout. Quite strongly oxidized throughout, with feldspars decomposed and some sulphide material leached. 55° contact at 463'.	
463	586	<p>Banded light and dark grey <u>argillite</u>, tending to weak 'carbonaceous shale' from 530'-550' where dark bands predominate. A little interbedded quartzite throughout, especially from 575'-580'. Argillite and quartzite appear weakly oxidised from 463'-471'. Weak Py Min throughout as scattered disseminations, rarely as veins.</p> <p>Angles: 20° from 463'-490' 0°-10° from 490'-507' 10°-15° from 507'-542' 30° from 542'-565' 40°-60° from 565'-569' 35°-45° from 569'-586'</p> <p style="text-align: center;">END OF HOLE</p>	

120

ASSAY SHEET
HOLE NUMBER B48

560171

FROM	TO	WIDTH	%Sn				
433	440	7	.133				
440	445	5	.109				
445	450	5	.130				
450	455	5	.185				
455	462	7	.189				

121

STATE TASMANIA
 COMPANY Mt Bischoff Tin Mining Co.
 AREA MT. BISCHOFF

HOLE NUMBER B49
 BEARINGS (M) 180° (grid)
 CO-ORDS 1959N, 1917W
 DIP Horizontal

560172

FROM	TO	CORE DESCRIPTION	C. to P. Angles °
0	15	Interbedded light-grey argillite and quartzite, very thinly banded. Conformable sulphide stringers from 7'-15'. Angles: 0° increasing to 45°.	
15	23	'Thompson Lode'. Massive Po-Py vein with little yellowish carbonate and purple fluorite gangue. Contact at 15' = 10°, and that at 23' = 20°.	
23	75	Interbedded light grey argillite and quartzite, moderately well banded. Very narrow and generally conformable sulphide veinlets, strongest from 23'-50', then decreasing in number. Mineralized porphyry from 54'-54'6" and 61'-62'6". Angles: generally 40°, but variable from 30°-50°.	
75	81	'Thompson Lode'. Massive Po-Py vein with quartz and carbonate gangue. Minor Sl and strong cassiterite mineralization thro'out. Vein contacts both 5°.	
81	129	Light grey quartzite with some interbedded argillite. Only very occasional narrow and conformable Py stringers. Angles: 10°-30° from 81'-115' 45°-60° from 115'-129'.	
129	135	Massive porphyry with disseminated Py Min thro'out. Contact at 129' = 35°.	
135	163	Light grey quartzite with minor interbedded argillite. Massive Py vein from 138'-139' and numerous stringers and small splashes of Py thro'out (not conformable as before). Angles: indistinct 20°-40° to 151' 25°-30° from 152'-160' 35°-40° from 160'-163'.	
163	212	Massive quartzite. Scattered Py veins to ¼" width, with 1" vein at 182'.	
212	293	Quartzite with lesser interbedded light grey argillite. 'Fingers' of weakly mineralized porphyry from 247'6"-248'6". Scattered Py veins to ¼" width thro'out. Angles: mostly 10°-20° thro'out, with occasional to 0°, especially at 243'.	

End of Hole

122

ASSAY SHEET

HOLE NUMBER B49

560173

FROM	TO	WIDTH	%Sn				
15	23	8	1.66				

123

STATE TASMANIA
 COMPANY Mt. Bischoff Tin
 Mining Co.
 AREA MT. BISCHOFF

HOLE NUMBER B50
 BEARINGS (M) 0° (grid north)
 CO-ORDS 1972N, 1917W
 DTP Horizontal

560174

FROM	TO	CORE DESCRIPTION	C. to Angles
0	85	Mid grey-brown banded argillite, with a little interbedded quartzite. Scattered irregular Py veinlets thro'out, tending to become more conformable from 62'-71'. 1" wide quartz-carbonate-fluorite veins at 17'6" and 18'6", and 1/4" Py-qtz-carb vein at 6'6", all with strong to very strong cassiterite mineralization. Angles: 0° from 0'-2' gently warping 5°-20° from 2'-64' 30° from 64'-85' 30° contact at 85'.	
85	117'6"	Massive porphyry, strongly and evenly min'd with disseminated Py and Po. Several Po-Py veins to 1/4" width at angles of 30° to core. Irregular contact at 117'6".	
117'6"	127	Brownish-grey banded siliceous argillite. No notable mineralization. Angles: mainly 20°, but variable from 0°-25°.	
127	156'6"	Massive porphyry, strongly and evenly min'd as previously. Strongly deformed siliceous argillite from 133'-135', and quartzite and argillite from 137'-140', with strong Py veining in quartzite at 140'. 20° contact at 156'6".	
156'6"	160	Banded mid-grey argillite. 1/4" Py-carb vein with strong cassiterite mineralization at 159'. Angles of 40°.	
160	184	Massive porphyry, mineralized as previously. Possibly cassiterite noted at 162'6". 30° contact at 160'.	
184	239	Mid-grey and grey-brown siliceous argillite, generally well banded. Numerous narrow Py veinlets thro'out, not conformable with bedding. Numerous generally irregular porphyry veins (typically mineralized) to 1" width from 184'-193', with longer section from 227'-228'. Angles: indistinct from 184'-193' 35°-40° from 193'-200' 45° from 200'-213' variable but mainly 30° from 213'-239'.	
239	245	'Thompson Lode'. Quartz-Py-Po vein with minor carbonate and fluorite. Total sulphide content about 30%. Scattered c.g. cassiterite mineralization. 30° contact at 239' and other contact occurs from 243'3"-245'.	

124

COMPANY MT. Bischoff Tin
 AREA Mining Co.
 MT. BISCHOFF

BEARINGS (M) 0° (grid north)
 CO-GRDS 1972N, 1917W
 DIP Horizontal

560175

FROM	TO	CORE DESCRIPTION	C. to B. Angles
245	253	Well banded grey-brown siliceous argillite. No notable mineralization. Angles 30°-40°.	
253	262	'Thompson Lode'. Quartz-carbonate vein with minor fluorite. Strong (40%) Py-Po mineralization thro'out, and strong to very strong c.g. cassiterite, especially from 254'9"-261'. 40° contact at 262'.	
262	271	Interbedded f.g. quartzite and mid-grey banded argillite. Angles 20°-30°. Massive Py-quartz vein (Thompson Lode) from 268'6"-270' at angle of 0°-5° to core (vein occupies half core width).	
271	273	'Thompson Lode'. Massive Py-quartz vein with Py content about 70%. Traces of cassiterite mineralization. 20° contacts at 271' and 273'.	
273	275'6"	F.g quartzite with minor interbedded siliceous argillite. Scattered Py veinlets and little very f.g. disseminated Py Min. Angles: 45° where visible.	
275'6"	293	'Thompson Lode'. Massive quartz-Py-Po vein with lesser carbonate and fluorite gangue. Sulphide content about 80% to 284', then 30%-40%. Scattered c.g. cassiterite.	
293	301	F.g. quartzite with minor interbedded argillite. Angles indistinct 40°. Occasional irregular Py veinlets, and massive quartz-Py vein at angle of 0° occupies half core width from 299'-301'.	

End of Hole

125

ASSAY SHEET

HOLE NUMBER B50

560176

FROM	TO	WIDTH	%Sn				
85	90	5	.080				
90	95	5	.088				
95	100	5	.041				
100	105	5	.033				
105	110	5	.037				
110	115	5	.153				
115	117.5	2.5	.052				
127	130	3	.069				
130	135	5	.149				
135	140	5	.167				
140	145	5	.034				
145	150	5	.025				
150	155	5	.022				
155	160	5	.077				
160	165	5	.033				
165	170	5	.068				
170	175	5	.018				
175	180	5	.015				
180	185	5	.055				
185	190	5	.085				
190	195	5	.129				
239	245	6	1.16				
245	250	5	.056				
250	255	5	.72				
255	260	5	4.04				
260	265	5	.130				
265	270	5	.061				
270	275	5	.81				
275	280	5	1.12				
280	285	5	3.44				
285	290	5	1.69				
290	293	3	.35				
239	293	54	1.32				

126

COMPANY AAA
 AREA MT. BISCHOFF

BEARINGS (M)
 CO-ORDS
 DIP

180° (grid)
 2004N, 1682 W
 Horizontal

560177

FROM	TO	CORE DESCRIPTION	C. to E. Angles °
0	6	Mid-grey siliceous argillite. Angles obscure, but possibly 30°.	
6	16	Massive quartz-pyrite vein, with minor arsenopyrite. Very numerous vughs, and only 5' of core recovered. Vein appears to be at angle of 0°-5° to core length.	
16	131	Interbedded mid-grey siliceous argillite and light-grey quartzite, argillite generally predominating. Weakly deformed throughout and rarely well banded. Scattered Py veinlets to 1/4" width, and weak f.g. Py disseminations thro'out, but overall not a highly mineralised section. C.g. cassiterite noted in 1/4" Py vein at 104'6". Angles not highly distinct, but 20° overall, with many local variations from 0°-40°.	
131	178	Moderately well banded grey and brown siliceous argillite. Occasional Py veinlets to 1/4" width as previously, and weak Py Min in narrow conformable stringers from 139'-155'. C.g. cassiterite noted in cross-cutting Py-carbonate veins from 1/8" 1/4" width from 140' - 155'. Angles: 5°-20° from 131'-152' 45° from 152'-158' 30° from 158'-164' 20°-50° from 164'-172' 0°-20° from 172'-178'.	
178	187	Interbedded mid-grey siliceous argillite and light-grey quartzite. Irregular Py veining as previously, and arsenopyrite noted at 183' and trace chalcopryite as 183'6". Angles	10°-30°
187	201	Light-grey quartzite, with only minor interbedded siliceous argillite. Sulphides very sparse. Angles 30°-35° from 193'-197'.	
201	293	Interbedded mid-grey (and minor grey-brown moderately banded siliceous argillite and light-grey quartzite. Scattered Py (often with arsenopyrite) veins to 1/4" width thro'out and f.g. Py disseminations, but overall, not a highly mineralised section. Angles 10°-25° overall, with only occasional local variations to 45°.	
293	307	Light-grey quartzite, with minor interbedded siliceous argillite. Scattered Py-AsPy veins as previously. Angles 0°-15° from 299'-305'	

127

ASSAY SHEET

HOLE NUMBER B51

560178

FROM	TO	WIDTH	Sn%	Zn%			
193	198	5	.070	0.5			
198	203	5	.079	0.4			
203	208	5	.107	Nil			
208	213	5	.047	Nil			
6	16	.10	.606				

128

STATE TASMANIA
 COMPANY MT BISCHOFF TIN
 AREA MINING CO.

HOLE NUMBER B52
 BEARINGS (M) 150.5°
 CO-ORDS
 DIP Horizontal

560179

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0'	109'	<p>Interbedded light grey argillite and light grey f.g. quartzite, with argillite predominating. Quite well banded overall. Weak sulphide mineralization throughout as narrow veinlets, tending to be conformable with banding from 46'-66' (but not a prominent feature.)</p> <p>Quartz-carbonate veins, with or without Py and Sl, to ¼" width at 14', 32', 60', 85' and 95'. These veins carry occasional c.g. cassiterite crystals.</p> <p>Angles: variable 20°-35° from 0'-34' 0°-10° from 34'-85' 0° from 85'-100' 0°-45° from 100'-109'</p>	
109'	209'	<p>Interbedded light grey f.g. quartzite and banded argillite, with quartzite predominating and generally increasing towards end of section.</p> <p>Sulphides not highly abundant, occurring in carbonate veins almost parallel to core length or as f.g. disseminations. Larger veins (to ¼" width) at 127', 135', 155', 163', 168' - 170' and 233'.</p> <p>F.g. black mineral (Sl or cassiterite) occurs in narrow irregular veinlets from 163'-165'.</p> <p>Angles: 5° - 15° from 120' - 217' 25°-30° " 127' - 188' 0°-15° " 188' - 214' 5°-25° " 214' - 290'</p>	
290'	356'	<p>Light grey/quartzite with only v. minor interbedded argillite. Weak to fair Py Min as previously, occurring in occasional veins to ¼" width almost parallel to core length and as f.g. disseminations. C.g. cassiterite noted in narrow Py-carb vein at 317'.</p> <p>Angles: 0° - 25°</p>	
356'	361'	<p>Interbedded quartzite and argillite as previously, with quartzite predominating. No notable sulphides.</p> <p>Angles: 0° - 30°</p> <p>END OF HOLE</p>	
<p>N.B. Divisions in this log are rather arbitrary, but are designed to show some lithological changes in otherwise monotonous interbedded stratigraphy.</p>			

129

ASSAY SHEET

HOLE NUMBER B52

560180

FROM	TO	WIDTH	%SN	From	To	Width	Sn%	Zn%
100	105	5	.087					
106	110	"	.068	93	198	5	.070	0.5
110	115	"	.086					
115	120	"	.042	198	203	5	.079	0.4
120	125	"	.027	203	208	5	.107	NIL
125	130	"	.107					
130	135	"	.118	208	213	5	.047	NIL
135	140	"	.023					
140	145	"	.031					
145	150	"	.066					
150	155	"	.006					
155	160	"	.068					
160	165	"	.202					
165	170	"	.132					
170	175	"	.094					
175	180	"	.033					
180	185	"	.029					
185	190	"	.029					
190	195	"	.011					
195	200	"	.015					
200	205	"	.020					
205	210	"	.015					
210	215	"	.048					
215	220	"	.040					
220	225	"	.092					
225	230	"	.563					
230	235	"	.085					
235	240	"	.081					
240	245	"	.104					
245	250	"	.026					
250	255	"	.051					
255	260	"	.059					
260	265	"	.089					
265	270	"	.020					
270	275	"	.004					
275	280	"	.089					
280	285	"	.037					
285	290	"	.048					
290	295	"	.041					
295	300	"	.006					
300	305	"	.069					
305	310	"	.090					
310	315	"	.034					
315	320	"	.492					
320	325	"	.095					
325	330	"	.245					
330	335	"	.070					
335	340	"	.169					
340	345	"	.050					
345	350	"	.035					
350	355	5	.034					
355	361	6	.046					

130

STATE TASMANIA
 COMPANY TIN MINING CO.
 AREA MT. BISCHOFF

HOLE NUMBER B53
 BEARINGS (M) 330.50
 CO-ORDS

DIP Horizontal 560181

FROM	TO	CORE DESCRIPTION	C. to F. Angles ^c
0'	61'	<p>Mid-grey, generally well banded argillite, with lesser interbanded light-grey f.g. quartzite. Weak sulphide mineralisation throughout, mostly as veinlets and stringers parallel to banding, but this is not a strong feature.</p> <p>Py-carb. veins from ¼"-½" width at 8'. 21', 28' and 50', with c.g. cassiterite visible in vein at 21'.</p> <p>Angles: 35° from 0' - 54' 70° - 80° " 54' - 55' 0° - 75° " 55' - 59' 35° " 59' - 61'</p>	
61'	145'	<p>Fine grained light grey quartzite with lesser interbanded grey argillite, less well banded than previously. Weak sulphide mineralisation throughout, mostly as scattered narrow irregular veinlets, with lesser f.g. disseminations. ¼" Py vein with fair c.g. cassiterite mineralisation from 141'3" - 142'3".</p> <p>Angles: slightly variable, but generally 30° - 45°</p>	
145'	158'	<p>Light grey f.g. quartzite, with only traces f.g. Py min.</p> <p>Angles: indistinct 20° - 35°.</p>	
158'	196'	<p>Light grey f.g. quartzite with lesser interbedded grey argillite. Sulphide not very abundant, being confined to occasional narrow veinlets and specks. Less well banded than previously.</p> <p>Angles: 30° - 35° from 158' - 175' 45° " 175' - 196'</p>	
196'	216'	<p>Fine grained light grey quartzite with minor argillite from 213'-216'.</p> <p>Stronger Py Min, occurring throughout as strong f.g. disseminations with lesser narrow veinlets. Numerous small pits present throughout quartzite.</p> <p>Angles: indistinct from 196' - 213' 0° - 20° from 213' - 216'</p>	
216'	220'	<p>Quartz-Py-Po vein, with 30-40% total sulphides. Moderately c.g. cassiterite mineralisation throughout.</p>	

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STATE TASMANIA
 COMPANY TIN MINING CO.
 AREA MT. BISCHOFF

HOLE NUMBER B53
 BEARINGS (M) 330.5°
 CO-ORDS
 DIP Horizontal 560182

FROM	TO	RECOVERY	CORE DESCRIPTION
220'	287'		<p>Mainly mid-grey moderately banded argillite, with lesser interbanded light-grey f.g. quartzite. Sulphides again rather sparse, being restricted to occasional narrow veinlets and f.g. specks. Angles: 25°-40°, generally 30°</p>
287'	315'		<p>Light-grey f.g. quartzite with only very minor interbanded argillite. Sulphides confined to occasional distinct veins, generally 1/8" width. Possibly c.g. cassiterite in 1/4" qtz-carb-Py vein at 304' Angles: indistinct 30°-35°.</p>
315'	331'		<p>Moderately banded mid-grey argillite, with lesser interbanded f.g. quartzite. Sulphides confined to occasional veinlets as previously. Angles : 45° from 315' - 323' variable 15° - 30° from 323' - 331'</p>
331'	348'		<p>Well mineralized porphyry, with 4" Py-Po vein at 331', with very numerous 1/8" vughs.</p>
348'	420'		<p>Interbanded argillite and quartzite, with mostly quartzite in first 2' of section. Argillite quite well banded. Fair sulphide mineralization as narrow veinlets, many being conformable. Angles: 40° - 45° to 393' 30° - 35° from 393' - 401' mainly 40° from 401' - 420' Quite strong conformable sulphide veining from 370' - 406'.</p> <p style="text-align: center;">END OF HOLE</p>

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ASSAY SHEET

HOLE NUMBER B53

FROM	TO	WIDTH	% Sn				
216	220	4	1.150				
331	336	5	.023				
336	341	5	.023				
341	346	5	.020				
346	348	2	.037				

133

STATE TASMANIA

HOLE NUMBER B54

COMPANY Mt. Bischoff Tin Mining Co.

BEARINGS (M) 150.5°

AREA

MT. BISCHOFF

CO-ORDS

DIP Horizontal

560184

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0'	13'6"	Light grey well banded argillite, with thin conformable sulphide veinlets. Angles: 5°-10	
13'6"	24'	Massive quartz-pyrite-sphalerite-pyrrhotite-carbonate vein. Very strong Sl. Min, especially from 20'-22'. Py strongly pitted.	
24'	186'	Light grey well banded argillite, with numerous thin sulphide veinlets to 60', generally conformable. Below 60' veinlets more irregular. Strong qtz-carb-Py-Po-Fl veins at 68' (3"), 79', 98'6", 104', 130', 131' and 181'.	
186'	190'	Massive qtz-carb-Py-Po-Fl-Sl vein, with strong c.g. cassiterite from 186'-187'. Strong Sl Min throughout. Contacts at 186' and 190' both 15°.	
190'	228'	Light grey well-banded argillite with minor interbedded f.g. quartzite. Thin conformable Py veining from 215'-228'. ½" massive Sl-carb vein at 197' and 4" qtz.-Py-Sl vein at 208'. Angles: 10°- 20°.	
228'	237'	Massive qtz-Py-Sl-carb vein, with v. strong Sl Min from 234'-236'. Occasional c.g. cassiterite crystals visible. Contacts at 228' and 237' both 10°, and argillite from 233'-234' (indicating hole almost parallel to vein)	
237'	331'	Light grey banded argillite with v. minor interbedded f.g. quartzite. Numerous narrow Py veinlets to 250', then becoming sparse. ¼" carb-Fl vein at 244', and ¼"-½" qtz-carb-Py veins at 264'6", 284' (with c.g. cassiterite), 292' (with c.g. cassiterite), 301', 303' and 307'. ¾" qtz-Py vein at 321' and 3" qtz-carb-Po-Py-cassiterite vein at 322'. Angles: 0°-20°.	
331'	333'	Massive Sl-Py-carb-qtz vein. Contacts 10°.	
333'	406'	Light grey well banded argillite, with v minor interbedded f.g. quartzite. ½" Py-Fl-qtz veins at 333'6", 341' and 394'. 2" massive Sl vein at 362', and 1"-2" qtz-Py veins at 366' and 375'. Angles: 5°-30° to 372' variable 5°-60° from 372'-385' 0°-30° from 385'-406'	

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STATE TASMANIA
 COMPANY Mt. Bischoff Tin
 Mining Co.
 AREA MP. BISCHOFF

HOLE NUMBER B54
 BEARINGS (M) 150.5°
 CO-ORDS
 DIP

560185

FROM	TO	CORE DESCRIPTION	C. to B Angles
406'	408'	Massive qtz-Py-Sl-FI vein, with contact angles of 45° at 406' and 55° at 408'.	
408'	585'	Light grey banded argillite with interbedded f.g. quartzite. ¼" Py-carb vein at 411'. At 547' is a 1" vein of Ca-Sl mineralisation	0° - 30°
585'	592'	Fine grained quartzite with veinlets of Py-Po	
592'	596'	Py-Po-Sl vein	
596'	603'	Fine grained banded argillite with veins of Py-Po	
603'	628'	Mineralized porphyry containing Po-Po-Sl-Cass. Min.	
628'	642'	Fine grained banded argillite with veinlets of Py-Po mineralisation	30° - 50°
642'	650'	Mineralized porphyry containing Py-Po-Sl mineralisation	
650'	712'	Light grey banded argillite with veinlets of Py-Po min.	30° - 40°
		FINISH	

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STATE TASMANIA
 COMPANY TIN MINING CO.
 AREA MT. BISCHOFF

HOLE NUMBER B55
 BEARINGS (M) 330.5°
 CO-ORDS
 DIP Horizontal

560186

FROM	TO	CORE DESCRIPTION	C. to E. Angles °
0	163'	Interbedded mid-grey banded argillite and light-grey quartzite. Weak sulphide min throughout, mainly as f.g. disseminations and narrow veinlets, with only occasional veins to 1/8" width. 1/4" carb-Py vein with mod. cassiterite min at 50'. Angles: 35° from 0 - 15 5° - 10° from 15' - 25' variable 20° - 50° from 25' - 54' 0° - 20° from 54' - 67' 30° - 50° from 67' - 90' 30° from 127' - 163	
163'	193'	Massive light-grey quartzite. No notable min.	
193'	287'	Banded mid-grey argillite, with lesser interbedded f.g. quartzite from 233'-287'. Weak sulphide min. as very narrow veinlets, generally parallel to bedding. Angles: 30° from 193' - 195' 0° " 195' - 200' 0° - 30° from 200' - 214' 30° from 214' - 233' 0° - 25° from 233' - 287'	
287'	293'6"	Weakly min'd porphyry. Strongly pitted, soft and with feldspars breaking down. Traces Sph min with Py disseminations.	
293'6"	348'	Well banded light grey argillite. Sulphides v. sparse. Angles : 45° to 325', then indistinct but much flatter.	
348'	368'	Light grey f.g. quartzite, with minor argillite at end of section. Only traces of sulphides. No distinct angles.	
END OF HOLE			

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STATE TASMANIA HOLE NUMBER B56
 COMPANY BEARINGS (M) 150.5
 AREA MT. BISCHOFF CO-ORDS 1720N 770W
 DIP Horiz.

560187

FROM	TO	RECOVERY	CORE DESCRIPTION	C to B0 Angles
0	193'		Fine-grained light-grey banded argillite with veinlets of pyrite and carbonate.	10°-30°
193'	213'		Well mineralized slightly pitted porphyry containing Py-Po-Sl mineralization. Contact angles at 193': 35° 213' indistinct	
213'	312'	30%	Light grey fine-grained banded argillite with veins of pyrite and carbonate.	10°-30°
312'	329'		Coarse-grained light blue quartzite with indistinct veinlets of Py-Po-Sl mineralisation. Strong pyrite mineralisation all through.	
329'	408'		Fine-grained interbanded argillite and quartzite with veins of fluorite. Minor Py mineralisation.	20°-40°
408'	536'	*	Extremely well mineralised pitted porphyry containing Py-Po-Sl mineralisation. Coarse crystalline cassiterite clearly visible in places. Contact angles indistinct, but presumably low.	
536'	547'	0	No core recovery	

DRILLING COMPLETED

Core recoveries

*408-418	70%
418-421	6
421-431	100
431-441	60
451-461	50
461-464	66
464-474	90
474-487	15
487-494	100
494-504	90
504-514	80
514-524	40
524-534	10
534-536	4
536-546	0

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ASSAY SHEET

HOLE NUMBER

B56

560188

FROM	TO	WIDTH	%Sn	%Zn			
408	413	5	.155	.57			
413	418	5	.256	.03			
418	423	5	.065	.05			
423	428	5	.087	.02			
428	433	5	.242	.03			
433	438	5	.406	.04			
438	443	5	.653	.02			
443	448	5	3.75	.03			
448	453	5	.847	.06			
453	458	5	.652	.02			
458	463	5	.756	.02			
463	468	5	.588	.02			
468	473	5	1.696	.02			
473	478	5	.872	.02			
478	483	5	.513	.05			
483	488	5	.234	.02			
488	493	5	.410	.02			
493	493	5	.361	.03			
498	503	5	.183	.03			
503	508	5	.138	.02			
408	513	5	.358	.01			
513	518	5	.424	.02			
518	523	5	.210	.01			
193	198	5	.07	.5			
198	203	5	.079	.4			
203	208	5	.107	Nil			
208	213	5	.047	Nil			
428	503	75	.718				
438	483	45	1.08				

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STATE TASSMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

BEARINGS (M) 327°
 CO-ORDS 1740N, 790W
 DIP Horiz ontal

560189

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0	171'	Light grey banded argillite with strong Py-Po veining.	10-30°
171'	208'	Grey-blue c.g. Qte with Py-Po veining thr-out	20-30°
208'	216'	Q-Flourite-Py-Po-Sl vein. Angles at 208' 30°	
216'	220'	= 171 - 208' Qtz	
220'	222'	Grey f.g. banded argillite	30°
222'	244'	= 171-208 Qtz at 227' ½" (?) vein of pure cassiterite.	10-30°
244'	248'	Q-Py-Po-Cass vein. Angles 248' 20°	
248'	256'	Grey-blue c.g. Qte with Cp-Py-Po veins throughout. Angles of veining with core 10-30°	
256'	258'	Q-Py-Po-Cass vein. Contact angles. at 256' 10° 258' 20°	
258'	266'	Grey-blue c.g. qte. with Py-po veining thr-out	20-30°
266'	269'	F.G. light grey argillite with sulphide veining throughout. Q-Py-Po-Sl vein, ½" wide parallel to core from 267'-269'.	
269'	288'	Grey-blue pitted c.g. quartzite(?) (This rock could be equally as well a very fine-grained porphyry) Disseminated Py-Po Min. throughout Q-PY-Po-Cass veining parallel to core from 267' - 272'. At 281' ½" vein of Q-Py-Po. Contact angles 10°.	
288'	314'	Light-grey argillite with minor sulphide veining.	10-30°
314'	324'	Light-blue c.g. Qtz with sulphide Min in veins and blebs.	10-30°
324'	406'	Fine-grained light-grey argillite alternating with bands of light Blue c.g. Qtz. Core fractured from 359'-402'. Sulphide veining throughout.	20-30°
406'	433'	Light-blue c.g. Qte with strong Py-Po Min. in blebs and veins. Angles indistinct	(10-30°)

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STATE
COMPANY
AREA

HOLE NUMBER B57
BEARINGS (M)
CO-ORDS
DIP

560190

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
433'	451'	<p>F.g. light-grey argillite at 446' and at 450' approximately. ½" nuggets of pure cassiterite. Py-Po veining throughout.</p> <p>Drilling completed.</p>	10-30°

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ASSAY SHEET

560191

HOLE NUMBER

B57

FROM	TO	WIDTH	Sn%		From	To	Core recoveries
208	213	5	.6				
213	218	5	1.1		208'	211'	100%
218	223	5	.3		211'	215'	60%
223	228	5	1.0		215'	220'	60%
228	233	5	0.3		220'	237'	100%
233	238	5	.3		237'	244'	56%
238	243	5	.1		244'	247'	66%
243	248	5	.2		247'	248'	100%
248	253	5	.6				
253	258	5	.3		288'	294'	50%
258	263	5	0.859		294'	305'	30%
263	268	5	0.734		305'	310'	60%
268	273	5	1.59		310'	315'	60%
273	278	5	0.049		315'	319'	25%
278	283	5	0.040		319'	321'	75%
283	288	5	0.016		321'	324'	80%
288	293	5	0.014		324'	361'	100%
293	298	5	0.008		361'	365'	70%
298	303	5	0.010		365'	370'	60%
303	308	5	0.010		370'	378'	35%
308	313	5	0.019		378'	385'	40%
313	318	5	0.202		385'	390'	55%
318	323	5	0.105		390'	392'	70%
323	328	5	0.019		392'	397'	60%
328	333	5	0.030		397'	403'	75%
333	338	5	0.022		403'	406'	65%
338	343	5	0.019		406'	412'	100%
343	348	5	0.041		412'	415'	100%
348	353	5	0.033		415'	420'	60%
353	358	5	0.009		420'	423'	80%
358	363	5	0.012		423'	425'	100%
363	368	5	0.014		425'	429'	50%
368	373	5	0.016		429'	432'	100%
373	378	5	0.004		432'	433'	50%
378	383	5	0.014		433'	442'	9%
383	388	5	0.014		442'	446'	12%
388	393	5	0.018		446'	451'	20%
393	398	5	0.009				
398	403	5	0.012				
403	408	5	0.028				
408	413	5	0.028				
413	418	5	0.03				
418	423	5	0.012				
423	428	5	0.013				
428	431	3	0.017				

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STATE TASMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

HOLE NUMBER B58
 BEARINGS (M) 150.5°
 CO-ORDS 1710N 785W
 DIP -45° 560192

FROM	TO	CORE DESCRIPTION	C. to B. Angles
0	94'	Interbanded fine-grained: qtz and light-grey argillite. Parallel and cross-cutting veins of Py throughout. Minor carbonate veining At 34'1" vein of py-sl-carbonate min	30°-40°
94'	104'	Fine-grained light-grey qte with minor disseminated py min. throughout	40°-60° Indistinct
104'	138'	Interbanded fine-grained qtz and light-grey argillite in places strongly faulted and brecciated. Parallel and cross-cutting py veining throughout. At 109' 1" py-flourite-Sl-carbonate vein (but varying)	40°-60°
138'	162'	Coarse-grained light-blue qtz with weak-med. sulphide veining. Strong sulphide veining 145'-153'.	30°-50°
162'	177'	Light-blue qte with bands of fine-grained argillite. Parallel and cross-cutting veins of py from 166' - 167'. Q-Py-Sl vein.	30°-50°
177'	196'	= 138' - 162'	40°-50°
196'	199'	Fine-grained light-grey banded argillite with py veining throughout.	30°-50°
199'	229'	= 138' - 162'	Indistinct
229'	254'	Coarse-grained light-blue qtz interbanded with light-grey fine-grained argillite. Minor py veining throughout.	30°-50°
254'		= 138'-162'	Indistinct
271'	317'	Interbanded coarse-grained qtz and fine-grained light-grey argillite. Parallel and cross-cutting sulphide veining throughout. (indistinct)	
317'	339'6	= 138' - 162'	
339'6	409'	Strongly mineralised pitted Q-F prophyry containing Py-po-cassiterite mineralisation. Contact angles at 339'6" indistinct.	
409'	427'	Grey-blue coars-egrained "Qte" in places "argillite".	30°-40°

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STATE
COMPANY
AREA

HOLE NUMBER B58
BEARINGS (M)
CO-ORDS
DIP

560193

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
427'	437'	Fine-grained light-grey qtz. with disseminated f.g. py-po min. throughout. Slightly pitted.	Indistinct
437'	439'6	Strongly brecciated and sheared fault zone consisting of puggy qtz-argillite.	
439'6	446'	Fine-grained light-grey argillite	30°-40°
446'	452'	Coarse-grained grey-blue qtz with minor py min.	
452'	453'	No core recovered.	
Hold abandoned.			
<u>CORE RECOVERIES</u>			
439'6	440'	100%	
440'	445'	10%	
445'	446'	70%	
446'	450'	6%	
450'	452'	5%	
452'	453'	NIL	

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ASSAY SHEET

HOLE NUMBER

B58

560194

FROM	TO	WIDTH	Sn%		Depth	Etch Dip
339	344	5	0.080		100	49
344	349	5	0.021		300	56
349	354	5	0.010			
354	359	5	0.019			
359	364	5	0.328			
364	369	5	0.633			
369	374	5	1.276			
374	379	5	1.592			
379	384	5	0.180			
384	389	5	0.094			
389	394	5	0.124			
394	399	5	0.033			
399	404	5	0.247			
404	409	5	0.221			
339	409	70'	0.35			
359	409	50'	0.47			
359	379	20'	0.957			

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COMPANY AAA
 AREA MT. BISCHOFF

BEARINGS (M) 330.5° 560195
 CO-ORDS 1735N - 785W
 DIP -45°

FROM	TO	CORE DESCRIPTION	C. to E. Angles
0	80'9"	Fine-grained banded blue-grey argillite with weak-moderate parallel and cross-cutting veining of Pyrite-pyrrhotite-flourite.	30°-40°
80'9"	114'	Interbanded fine-grained argillite and coarse grained blue-grey qte. Weak-moderate parallel and cross-cutting veining of pyrite-pyrrhotite. Minor flourite veining.	30°-40°
114'	127'	Fine-grained banded light-grey argillite. Moderate pyrite-pyrrhotite veining.	
127'	151'	Interbanded qtz and argillite with strong sulphide veining. At 131' 1" vein of Py-Sl Cassit. 30° 140' 2" " " " " "	30°-40°
151'	208'6"	Interbanded qtz and argillite with weak-moderate Py veining, mainly parallel to bedding.	30°-40°
208'6"	210'	Q-Py-Sl-Cassit. vein	30°-40°
210'	243'	Light-blue coarse-grained Qtz with thin brecciated bands of argillite. Py and flourite veining throughout.	
243'	386'	Interbanded Qte and argillite. Py veining throughout. 294' - 305' strong Py-Po and Q-Py-Po-Sl veining. 335' - 351' 349' - 350' Q-Py-Po-Sl veins	30°-50° 10°-40° 30°
386'	426'	Coarse-grained light-grey Qtz. slightly pitted. Py min in veins, blebs and disseminated strong sulphide -Q mineralisation at 399', 403', 411', 415'. In general medium-strong sulphide veining from 386' - 415'.	Indistinct but mainly 30-40°
426'	446'	C.J. Wilfrey qtz with bands of broken and brecciated banded argillite.	30°-40°
440'	472'	Coarse-grained light-grey slightly pitted Qtz with disseminated sulphides throughout. This rock resembles porphyry in places. From 465'-465'6" puggy argillite.	Indistinct

Drilling suspended

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ASSAY SHEET

560196

HOLE NUMBER

B59

FROM	TO	WIDTH	Sn%		Depth	Etch Dip	
127	132		0.178		150	46%	
132	137		0.039				
137	142		0.067		350	47%	
142	147		0.053				
147	152		0.012				
294	299		0.057				
299	305		0.046				
335	340		0.242				
340	345		0.135				
345	351		0.213				
386	391		0.016				
391	396		0.025				
396	401		0.023				
401	406		0.015				
406	411		0.019				
411	415		0.020				

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B 20

ASSAY SHEET

HOLE NUMBER

B60

560198

FROM	TO	WIDTH	%Sn	Depth	Mag.Az ^o	Trop Dip ^o
					Core Recoveries	
161	161		.024			%
233	238		.108	288'	292'	75
238	243		.037	332	338	33
243	248		.027	338	342	50
248	253		.141			
253	258		.022	423	428	100
258	263		.082	428	432	75
263	268		.066	432	439	50
268	273		.058	439	444	40
273	278		.044	444	448	50
278	283		.028	448	450	30
283	286		.015	450	453	65
286	291		.072	453	455	45
296	301		.037	455	458	60
301	306		.015	458	459	50
306	311		.028	459	460	50
311	316		.0392	460	462	40
316	321		.039	462	464	25
321	326		.027	464	466	25
326	331		.276	466	467	30
331	336		.229	467	469	20
336	341		.287			
341	346		.156			
346	351		.182			
361	356		.177			
356	361		.271			
361	366		.571			
366	371		1.54			
371	376		.796			
376	381		.551			
381	386		.277			
386	391		.284			
391	396		.385			
396	401		.425			
401	406		.346			
406	411		.365			
411	416		.261			
416	421		.182			
421	426		.102			
426	431		.012			
431	436		.023			
436	441		.008			
441	446		.011			
446	451		.020			
451	456		.019			

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STATE TASMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

HOLE NUMBER AAB1
 BEARINGS (M)
 CO-ORDS
 DIP

560199

FROM	TO	CORE DESCRIPTION	C. to B. Angles °
0	127	Overburden - mixed grey shales, black shales, dolomite (pyritised)	
127	132	Massive vein of qtz, py, cassit and fluorite	
132	141	Dolomite breccia - pyritised	
141	143'6"	Massive vein - qtz, py, cassit.	
143'6"	160	Qtz, py with minor cassit and galena	
160	212	Porphyry with disseminated sulphide and cassiterite.	
212	234	Porphyry with py and pyrrholite	
234	241	Quartzite - fine grained	
241	272	Argillite/shale/siltstone	
272	283	Dolomite breccia, pyritised	
283	292	Shale	
292	306'6"	Argillite - black/grey, pyritic	
306'6"	326'	" " " with minor qtz veining and pyritic bands	

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ASSAY SHEET

HOLE NUMBER AAB1

560200

FROM	TO	WIDTH	Sn %				
70	110	40	.007				
110	115	5	.250				
115	133	18	.075				
133	134	1	.094				
134	135	1	.062				
135	136	1	.290				
136	139	3	.145				
139	144'6"	5'6"	.051				
144'6"	145'6"	1	.076				
145'6"	161	15'6"	.004				
161	162	1	.096				
162	277	1	.030				
277	281'3"	4'3"	.750				
281'3"	295'	13'3"	.02				

150

ASTANIA
 COMPANY AAA
 AREA MT. BISCHOFF

BEARINGS (M) 65
 CO-ORDS
 DIP -50"

560201

FROM	TO	CORE DESCRIPTION	C. to B. Angles ^c
0	37	Overburden with fragments of argillite, siltstone and dolomite.	
37	40	Dolomite breccia	
40	42'6"	Replaced dolomite/dolomite argillite	
42'6"	46'6"	Dolomite serpentinitised	
46'6"	51	Dolomite breccia	
51	59	Serpentinitised dolomite	
59	74'9"	Dolomite breccia	
74'9"	75'3"	Porphyry	
75'3"	85'6"	Dolomite breccia	
85'6"	86'6"	Serpentinite	
86'6"	95	Dolomite breccia replaced by sulphide (cassit)	
95	142'6"	Dolomite breccia with veining	
142'6"	146'	Barren dolomite breccia	
146	156	Porphyry	
156	226'6"	Qtz, sulphide and porphyry	
226'6"	253	Pyritic sand	
253	255'6"	Qtz, sulphide, minor cassit	
255'6"	259'6"	Argillite/siltstone, minor sulphide	
259'6"	268'6"	Siltstone/quartzite	
268'6"	274'6"	Argillite/siltstone	
274'6"	276'6"	Greyshale/argillite	
276'6"	278'6"	Argillite/siltstone	
278'6"	279'6"	Shale	
279'6"	288'6"	Argillite/siltstone	
288'6"	297'6"	Argillite/quartzite	
297'6"	302	Siltstone/quartzite	

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ASSAY SHEET

HOLE NUMBER AAB2

560202

FROM	TO	WIDTH	% Sn				
37	43'6"	6'6"	.035				
43'6"	45'	1'6"	.085				
45	67'	22'	.015				
67	68	1	.140				
68	69	1	.770				
69	70	1	.070				
70	71	1	.290				
71	108	37	.065				
108	109	1	.250				
109	110	1	.105				
110	111		.002				
111	116	5	.008				
117	119'6"	2'6"	.110				
119'6"	123'6"	4'	.002				
126'6"	156	29'6"	.025				
156'	166'6"	1'6"	.160				
166'6"	174'6"	8'	.025				
174'6"	178	3'6"	.730				
178	181	3	.095				
181	184	3'	.090				
184	253	69'	.020				
253	255'6"	2'6"	.420				
255'6"	259'6"	41	.320				
259'6"	265'9"	6'3"	.010				

152

STATE TASMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

HOLE NUMBER AAB3
 BEARINGS (M) 180
 CO-ORDS
 DIP 75°

560203

FROM	TO	CORE DESCRIPTION	C. to B Angles °
0	43	Overburden, mainly replaced dolomite clayey material	
43	53	Dolomite breccia, partially replaced. Veins with qtz, fluorite, py, cassiterite, chalcopy.	
53	54	Barren dolomite breccia.	
54	81	Dolomite breccia with qtz, sulphide, cassit in veins - disseminated.	
81	111	Dolomite breccia. Minor serp and travertine veinlets.	
111	120	Dolomite breccia, argillaceous somewhat sheared with minor cassiterite and sulphide.	
120	137	Dolomite breccia, minor serp. chlorite with travertine.	
137	161	Dolomite breccia brucite marble with travertine veinlets, minor disseminated sulphide.	
161	186	Dolomite breccia with some replacement by qtz sulphide and travertine, MnO ₂ veins.	
186	196	Dolomite breccia, minor travertine, serp and sulphide.	
196	244	Dolomite breccia. Qtz sulphide and minor travertine veins.	
244	305	Dolomite breccia, disseminated py with qtz, py veins.	
305	336	Dolomite breccia, minor serp, MnO ₂ qtz and sulphide.	
336	345	Black argillite/argillaceous siltstone with py.	
345	359	Dark grey argillite/siltstone with py.	

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ASSAY SHEET AAB 3

560204

HOLE NUMBER

FROM	TO	WIDTH	%Sn				
0	30	30'	<.015				
30	31'3"	3"	.150				
31'3"	32'3"	1	.510				
32'3"	33'3"	1	.300				
33'3"	35	1'9"	.054				
35	41	6'	.370				
41	43	2	.010				
43	45	2	.270				
45	51	6	<.04				
51	52	1	.130				
52	64'6"	12'6"	<.020				
76	79	3	<.016				
108	120	12'	<.015				
130'3"	144'10"	14'7"	<.007				
164'6"	186	21'6"	<.015				
203'6"	212'6"	9'	<.065				
225	240	15'	<.018				
250	251	1	.020				
262'10"	272'6"	9'8"	<.020				
298'4"	301'6"	3'2"	<.008				
335'10"	337'4"	1'6"	<.028				
343'11"	346'3"	2'4"	.005				

154

STATE TASMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

HOLE NUMBER AAB4 560205
 BEARINGS (M) 138°
 CO-ORDS 888.18N 3437.8W
 DIP -75°

FROM	TO	CORE DESCRIPTION	C. to E Angles °
0	33	Poor recovery	
33	38	Dolomite breccia	
38	46	Clay with dolomite breccia	
46	56'6"	Dolomite breccia with minor sulphide (cassiterite)	
58'6"	57	Dolomite breccia with minor quartz veining and sulphides	
67	94"	Dolomite breccia 82½ 5 m/m py vein 89 8 m/m qtz vein	
94	169	Dolomite breccia with minor sulphide along interfaces. 108'4" 3-8 m/m sulphide vein 108'10" 7-10 m/m 9/3 sulphide vein 109'1" 6 m/m 111'5" 2-5 m/m irregular sulphide vein 113-118 heavy irregular 9/3 sulphide veining	
169	209	Dolomite breccia with py, travertine and MnO ₂ veining some pale serp and zones of brucile? marble.	
209	249	Dolomite - slightly brecciated with some travertine/py veinlets.	
249	259	Dolomite breccia with py, po, chalcopy and cassit.	
259	271	Dolomite breccia - minor py, and cassit.	
271	306'6"	Dolomite breccia with some travertine/MnO ₂ veinlets.	
306'6"	310	Grey argillite/argillite siltstone.	
310	316	Grey argillite siltstone.	

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ASSAY SHEET
HOLE NUMBER

AAB4

560206

FROM	TO	WIDTH	%Sn				
35	37	.2	.002				
37	38	1	.11				
38	44	6	.008				
44	46	2	.030				
54'6"	56'8"	2'2"	.001				
56'8"	57'8"	1	.010				
59'6"	60'6"	1	.035				
63	67	4	.028				
73	74	1	.025				
74	75	1	.240				
75	78	3	.014				
82	98	16	<.003				
98	99'3"	1'3"	.035				
99'3"	103	3'9"	<.02				
103	115	12	<.005				
115	117	2	.055				
117	118	1	.150				
118	123	5	<.02				
128'6"	139	10'6"	<.001				
140'	182'9"	42'9"	<.045				
182'9"	185'	2'8"	.110				
185	186'7"	1'7"	.020				
202'3"	203'3"	1	.570				
203'3"	204'6"	1'3"	.230				
204'6"	208'6"	1	.160				
205'6"	223	17'6"	<.020				
223	232	9	.085				
232	234	1	.070				
234	242	8	.001				
248'8"	254'	5'4"	.035				
254	259	5	.170				
259	267	8	.013				
267	269	2	.130				
269	298'6"	29'6"	<.025				

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STATE TASMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

HOLE NUMBER AAB5
 BEARINGS (M)
 CO-ORDS
 DIP

560207

FROM	TO	CORE DESCRIPTION	C. to B. Angles
0	146	Dolomite. Some MnO ₂ stringers. Brecciated in parts. Trovitine veins.	
146	154	Serpentinite.	
154	171	Pyritised prophyry.	
171	178	Serpentinite with some qtz-py veins.	
178	185	Dolomite breccia with qtz-sulphide veins.	
185	186	Serpentinite vein. qtz-py-po-flourite.	
186	222	Dolomite breccia.	
222	225	Dolomite breccia - serpentinitised with minor flour. and sulphide veins.	
225	281	" " "	
281	286	Massive vein, of quartz. Silicified serp-py-po-galena-flour with occasional discreet quartz veins.	
286	289	Argillite/dolomite slightly brecciated.	
289	316	Argillite/sillstone/quartzite.	

157

ASSAY SHEET
HOLE NUMBER

AAB5

560208

FROM	TO	WIDTH	%Sn				
22'9"	26'9"	4'	.550				
146	154	8'	.470				
171'10"	179'10"	8'	.34				
185	186	1	.090				
186	194	8'	.06				
210'5"	218'8"	8'3"	.025				
222'3"	223'3"	1	.110				
223'3"	224'10"	1'7"	.060				
229'11"	230'6"	7"	1.75				
249'8"	251		.02				
256'6"	266'6"	10	.045				
269	270'9"	1'9"	.030				
272'6"	273'3"	9"	.380				
275'11"	276'3"		.030				
280'10"	281'10"	1	.300				
281'10"	282'10"	1	.740				
282'10"	283'10"	1	1.500				
283'10"	284'10"	1	.090				
284'10"	285'10"	1	.080				
285'10"	286'6"	8"	.130				

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STATE TASMANIA
 COMPANY AAA
 AREA MT. BISCHOFF

HOLE NUMBER AAB8
 BEARINGS (M) 066°
 CO-ORDS
 DIP 45° 560209

FROM	TO	RECOVERY	CORE DESCRIPTION
0	5		Fine grained re-crystallised argillaceous sandstone with barren quartz veinlets.
5	17		Porphyry. Two small oxidised greisen zones. Minor carriterite throughout.
17	41 1/4"		Quartzite. Qtz filled joints and breccia fracture. 34'6"-35'6" heavily brecciated and tourmalised. Tourmaline "veinlets" oxidised in part. Qtz filled joints with cassiterite.
41'4"	48'8"		Argillite with quartzite and tourmaline carriterite veins.
48'8"	74'2"		Shale and siltstone - in part brecciated and contorted. Qtz-tour-veins 58'0-60'3" Quartzite.
74'2"	113'		Quartzite
113'	250'		Argillite and siltstone and shales with irregular qtz veining, boudinage.
250	266		Quartzite - siltstone veined Qtz -
266'	283'6"		Qtz-Py-Cass veinlets.
283'6"	321'7"		Siltstones/shales/quartzite
321'7"	348'11"		Arkosic sediment/shale. Quartzite bands.
348'11"	359		Rhyolite. Argillite/quartzite breccia and boudin veined by pyrohotile and pyrite.
359	365		Argillite
365	375'6"		Qtz-Feld. Porphyry.
375'6"	394		Quartzite bands and shale interbedded pyrite, pyrrbotite, carbonate veins.
394	414		Banded argillite/quartzite and shale. Some sulphide veining.
414	452'9"		Siltstone and shales - folded and brecciated sulphide veining. 445'9" - 446'5") Vein and disseminated 448'4" - 449'8") sulphides throughout.
452'9"	463		Argillite/siltstone/shale - well bedded.

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ASSAY SHEET

AAB 8

560210

HOLE NUMBER

FROM	TO	WIDTH	% SA8			
0	5	5	600			
5	15	10	1600			
		10	1200			
		"	750			
		"	700			
		"	350			
		"	300			
		"	300			
		"	200			
		"	200			
		"	120			
		"	900			
		"	500			
135	145	11	200			
			50			
			240			
			70			
			900			
			600			
			100			
			250			
			80			
			110			
			700			
			850			
275	285	10	400			
			250			
			700			
			850			
			150			
305	315		2000			
			850			
			750			
			900			
			450			
			600			
			200			
			500			
385	395		2200			
			350			
			750			
			500			
			250			
			200			
			200			
455	463		200			

STATE
 COMPANY
 AREA MT BISCHOFF TIN MINE

10/10/1961
 BEARINGS (M)
 CO-ORDS
 DIP.

11

560211

161

FROM	TO	RECO- VERY	CORE DESCRIPTION
0	18.7		Weathered mineralised material.
18.7	51.8		<u>Very highly pyrrhotitic mineralisation</u> with talc or carbonate locally important; no pyrite no dip decipherable.
51.8	153.1		<u>Greenish pyrrhotitic (50%) ore</u> ; not "kernel ore" but probably same composition, talc not abundant; carbonate fairly plentiful; no pyrite; 68 - 78 green but low in pyrrhotite; carbonate important 110-138.
153.1	164.6		Dolomite
164.6	170.9		Green rock, fine-grained, with patchy pyrrhotitic-carbonate.
170.9	214.6		<u>Footwall Shale</u> - massive, dark gray, hard, finely sandy. Dip at two points 60°.
			END OF HOLE.

160

STATE
COMPANY
AREA

HOLE NUMBER H2
 BEARINGS (M)
 CO-ORDS
 DIP

560212

FROM	TO	RECOVERY	CORE DESCRIPTION
0	20.5		Placed dolomite, some carbonate, one piece high pyrrhotite.
20.5	21.0		Dolomite
21.0	21.7		Dolomite
	23.0		
	28.3		Dolomite, little carbonate
	38.7		Oxidised, high sulphide ore
	49.0		Pieces of caved material
	56.0		" " "
	60.0		" " "
			END OF HOLE

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COMPANY
 AREA MT BISCHOFF MINE

ROBE... D4
 BEARINGS (M)
 CO-ORDS
 DIP

560213

FROM	TO	RECOVERY	CORE DESCRIPTION
0	5.7		Not cored
5.7	12.5		<u>Dolomite</u> brecciated with 20% white carbonate and 2% sulphide (pyrite-pyrrhotite)
18.2	22.2		<u>White carbonate (50%), dolomite (40%) pyrrhotite-pyrite 10%</u>
22.2	63.8		Dolomite, 10% carbonate, 2% pyrrhotite-pyrite.
63.8	73.6		Carbonate and Dolomite with 10% pyrite-pyrrhotite (trace chalcopyrite)
73.6	78.8		Dolomite
78.8	84.7		9 inch band green "kernel" ore, then <u>talcose rock</u> with 5% pyrrhotite-pyrite. Last 2 feet has 60% sulphide.
84.7	111.1		Dolomite; 0.9' high pyrrhotite at 91.4; remainder carries less than 3% sulphide and small percentage of carbonate. From 94 to 100 ft. good bedding at 30° to core axis. <u>Bedding dips 60°?</u>
111.1	117.7		<u>Dark talc bands</u> with 5% pyrrhotite-pyrite, in dolomite.
117.7	131.9		<u>Dolomite</u> with less than 5% carbonate-pyrrhotite except for 6 inch high pyrrhotite band at 126.9'. Bedding dips <u>20-30°</u> in three places.
131.9	151.2		<u>Talc-pyrrhotite-carbonate.</u> Grey sandy shale, with few very small widely spaced areas & veins with pyrrhotite bedding dips 50° to 30°.
151.2	171.2		<u>Talc-pyrrhotite-carbonate-pyrite;</u> sulphides 50%; bedding dips 45°.
171.2	181.3		<u>Shaley band</u> - hard, dark grey, siliceous; some rhotite; 10% pyrrhotite. <u>Bedding dips 40°</u>
181.3	193.6		<u>Pyrrhotite (60%) - carbonate - some talc;</u> sharp contact at base; bedding appears to dip steeper than 45°.

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STATE
COMPANY

AREA MT BISCHOFF TIN MINE

HOLE NUMBER DS

BEARINGS (A)

CO-ORDS

DIP

560214

FROM	TO	RECOVERY	CORE DESCRIPTION
0	93.5		0-40 Not cored 40-95 Light grey <u>dolomite</u> ; indistinct brecciated appearance; trace pyrite along fractures
93.5	130.0		<u>Weakly pyritized dolomite</u> with carbonate
130.0	185.5		<u>Dolomite</u> , some weakly pyritized fragments
185.5	217.1		190-193 "Kerpel" type pyrrhotitic mineralization 193-215 High Pyrrhotitic (60%) mineralization, fine grained, hard. 215-220 Light pyrrhotitic mineralization
217.1	225.1		Gray shale, probably footwall shale, hard sandy, massive; One dip at 60° (Has tin)
225.0	240.2		Fine white porphyry, 5% disseminated pyrrhotite, little pyrite.

END OF HOLE 240.2 ft.

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COMPANY

BEARINGS (M)

AREA MT BISCHOFF TIN MINE

CO-ORDS

DIP

560215

FROM	TO	RECO- VERY	CORE DESCRIPTION
0	40.7		0-40.7 Not cored
40.7	72.6		40.7 - 72.6 <u>Porphyry</u> white with felspars largely replaced by pyrite
72.6	80.5		Porphyry grey, highly siliceous with pyrite
			END OF HOLE 80.5

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STATE
COMPANY
AREA

HOLE NUMBER
BEARINGS (M)
CO-ORDS
DIP

PLI

560216

FROM		TO		RECO- VERY	CORE DESCRIPTION
0	0	3	6	29	Weathered broken basalt
3	6	11	4	66	Vesicular basalt
11	4	36	4	61	Basalt
36	4	51	4	73	1'5" baked grit and yellow-brown sandstone followed by ferruginous grits and sandstone
51	4	52	5	97	Weathered broken basalt fragments
52	5	70	8	97	Basalt
70	8	80	8	20	Baked coarse sandstone
80	8	88	4	40	Yellow brown sandstone
88	4	88	10	100	Coarse ferruginous grit. (End tertiary rocks)
88	10	91	11	24	Fragments of grey siltstone and mudstone
91	11	93	4	77	Large fragments of grey siltstone and mudstone
93	4	97	5	50	Predominantly fawn sandstone.
97	5	100	8	80	Grey sandstone and siltstone
100	8	102	8	100	Breccia: black mudstone blocks in siltstone matrix.
102	8	106	10	30	Laminated dark grey mudstone and pale grey siltstone.
106	10	123	4	95	Predominantly breccia (dark grey mudstone blocks in siltstone) with bands of sandstone and siltstone. Few carbonate veins up to 1/2" wide.
123	4	129	1	72	Predominantly pale grey sandstone or coarse siltstone.
129	1	132	6	88	Dark grey mudstone with minor siltstone and breccia.
132	6	149	7	66	Pale grey sandstone with minor breccia.
149	7	152	4	88	Pale grey sandstone-strong pyrite development in patches.
152	4	154	6	81	Dark grey sheared mudstone-minor pyrite

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COMPANY
AREA

BEARINGS (M)

CO-ORBS

DIP

560217

FROM	TO	RECO- VERY	CORE DESCRIPTION
154 6	163 8	63	Pale grey coarse siltstone-minor carbonate and pyrite.
163 8	168 4	55	Soft sheared dark grey mudstone-minor pyrite.
168 4	170 3	100	Dark grey mudstone and siltstone. Strongly developed purple fluorite and carbonate veining with minor pyrite.
170 3	172 4	100	Siltstone and dark grey mudstone with numerous small fluorite, carbonate and pyrite veins.
175 8	180 6	97	Predominantly dark grey mudstone with bands of siltstone and sandstone.
180 6	192 8	100	Predominantly pale grey sandstone with minor mudstone and siltstone
192 8	198 1	75	Sandstone with minor fluorite quartz and pyrite.
198 1	202 7	78	Sheared dark grey mudstone and siltstone minor pyrite
202 7	209 0	100	Breccia (sandstone and siltstone fragments in a mudstone matrix). Strong carbonate veins at 208'.
209 0	220 0		Interlayered breccia and sandstone - surfaces of sandstone layers non-uniform in orientation.
220 0	221 0		Sheared mudstone and breccia with a high proportion carbonate and pyrite.
221 0	224 0		Dark grey sheared mudstone and breccia
224 0	234 10		Predominantly pale grey sandstone with minor mudstone.
234 0	245 1		Interlayered sandstone and breccia (sandstone blocks in mudstone matrix) with abundant pyrite throughout.
245 1	247 7		Dark grey mudstone.
247 7	251 6		Sandstone and breccia.
251 6	253 5		Sheared Dark grey mudstone.
253 5	258 4		Pale grey siltstone with minor sandstone.

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STATE
COMPANY
AREA

HOLE NUMBER
BEARINGS (M)
CO-ORDS
DIP

560218

FROM	TO	RECOVERY	CORE DESCRIPTION
258 4	268 5		Pale grey sandstone with minor breccia. Small fracture plane containing minor galena? and sphalerite? at 268'4".
268 5	281 0		Breccia (sandstone blocks in a mudstone matrix)
281 0	286 0		Predominantly pale grey sandstone and breccia .
286 0	291 0		Siltstone and mudstone with minor breccia.
291 0	296 0		Grey sandstone with minor pyrite.
296 0	301 0		Siltstone and mudstone - numerous carbonate veins between 299' and 300'.
301 0	326 0		Predominantly dark grey mudstone with minor siltstone and breccia - pyrite in minor amounts.
326 0	340 6		Medium grey sandstone - some carbonate veins up to 1/4" thick between 334' and 340'.
340 6	350 10		Dark grey mudstone (laminated) with minor siltstone and breccia.
350 10	359 8		Medium grey sandstone with minor carbonate veins.
359 8	363 3		Predominantly breccia and sandstone with minor mudstone.
363 3	367 6		Dark grey mudstone.
367 6	370 11		Low grade mineralisation in dark grey mudstone. Sulphides include pyrite, jamesonite and sphalerite in a gangue of quartz and carbonate.
370 11	372 4		Intense mineralisation - massive jamesonite, sphalerite and pyrite with fluorite and quartz in dark grey mudstone.
372 4	376 10		Fluorite and pyrite mineralisation in dark grey mudstone.
376 10	379 0		Low grade pyrite mineralisation in dark grey mudstone.
379 0	384 7		Black mudstone with minor pyrite, fluorite and carbonate mineralisation.
384 7	388 3		Predominantly minor carbonate and pyrite mineralisation in black mudstone.

FOOKS LODGE

168

COMPANY
AREABEARINGS (M)
CO-ORDS
DIP

560219

FROM	TO	RECOVERY	CORE DESCRIPTION
388 3	393 11		Black mudstone.
393 11	398 9		Black mudstone with minor siltstone and breccia.
398 9	408 1		Black mudstone with minor carbonate and pyrite between 404' and 408' ramifying veins of carbonate up to ¼" thick.
408 1	424 1		Dark grey sandstone with minor carbonate, quartz and pyrite veins. Between 416' and 422' very few veins present.
424 1	434 3		Brecciated dark grey mudstone with pyrite seams and blebs badly broken.
434 3	439 0		Pale grey silica/carbonate rock heavily brecciated with pyrite blebs and veinlets and carbonate (zeolitic?) blebs etc
439 0	457 7		Partly brecciated dark grey mudstone with fine pyritic dissemination and occasional pyrite blebs.
457 7	460 1		Disseminated pyrite and pyrite boxworks in f.g. sandy siltstone.
460 1	620 5		Contorted (pre consolidation structures?) dark grey mudstone with disseminated pyrite, pyrite blebs (Nodules?) - numerous pebbles and/or mud pellets throughout - some minor brecciation in places - fault zones at 516'6" to 578', 558' to 558'7", 560'3", 574', 577', 599'9" - broken towards end.
620 5	625 7		Mineralised contorted and brecciated dark grey mudstone with pyrite, chalcoppyrite, galena, sphalerite.
625 7	630 3		Contorted dark grey mudstone as above.
630 3	636 6		Mineralised dark grey mudstone with pyrite, chalcoppyrite, galena, sphalerite.
636 6	636 10		Quartz vein heavily mineralised with coarse pyrite crystals.
636 10	641 0		Contorted and brecciated dark grey/mudstone with sandstone pellets up to 2" in size mineralised with pyrite chalcoppyrite, galena, sphalerite associated with silica veins and impregnations.
641 0	641 6		grey sandstone.
641 6	660 0		Contorted and brecciated dark grey mudstone with disseminated pyrite and pyrite blebs-numerous pellets and pyrite

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COMPANY
AREA

BEARINGS (M)
CO-ORDS
DIP

560220

FROM	TO	RECO- VERY	CORE DESCRIPTION
			..on joint faces - probable fault at exit
660 0	680 7		Pale grey fragmental? rock with numerous pellet/pebble inclusions - pyrite in flow? patterns around inclusions - mineralised lightly with chalcoppyrite, galena, sphalerite - probable fault at end - leached in centre section.
680 7	800 8		Dark grey mudstones partly contorted with occasional breccia sections - numerous small pellets and flow? structures - NO CORE 700'5" to 709'6"
800 8	805 4		Interbedded mudstone and sandstone.
805 4	830 8		Dark grey mudstone with numerous sandstone pellets and bands.
830 8	833 2		Sandstone
833 2	845 11		Dark grey mudstone with occasional small sandstone lenses and bands.
845 11	849 5		Mainly sandstone with mudstone bands etc
849 5	898 7		Dark grey mudstones as above.
			END OF HOLE

COMPANY
AREA MT BISCHOFF MINE

BEARINGS (N)
CO-ORDS
DIP

560221

FROM	TO	RECO- VERY	CORE DESCRIPTION
195.6	231		<p>Footwall Shale: Light grey (to buff) poorly bedded, finely sandy, hard; 2% pyrrhotite; bedding appears to be steeper than 45° generally; crumbling and brecciated. <u>Decipherable dips 50° and plus.</u></p> <p>END OF HOLE 231 ft.</p>

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SUNNY
COMPANY
AREA

BEARINGS (H)
CO-ORDS
DIP

560222

FROM	TO	RECO- VERY	CORE DESCRIPTION
196 4	203 11		Predominantly breccia with angular to irregular blocks of shales and quartzites in a finer groundmass of angular fragments. Larger fragments up to 3" length. Some pyrite mineralization, partly as small blebs in the groundmass and partly as pyrite replacement in bands within the laminated blocks. Pyrite predominantly post-brecciation. Few small bands of siltstone interbedded with the breccia.
203 11	209 5		
209 5	213 5		
213 5	217 0		
217 0	217 5		
217 5	221 10		First 1'4" in well laminated siltstone with some intraformational brecciation - remainder in breccia as described above.
221 10	223 1		Minor intraformation brecciation.
223 1	225 3		Breccia to 224'3" - then siltstone with some wispy breccias - sedimentary breccias with bands of dark siltstone
225 3	227 2		
227 2	228 5		
228 5	232 3		
232 3	234 6		First 7" in siltstone with minor brecciation.
234 6	237 4		Coarse irregular breccias with large fragments up to several inches in length.
237 4	240 3		
240 3	243 8		Small bands of dark grey siltstone.
232 8	247 11		Small irregular veinlets of pyrite and quartz and blebs of quartz and pyrite.
247 11	252 1		
252 1	258 2		
258 2	265 10		
265 10	268 1		
268 1	272 0		
272 0	276 10		
276 10	283 11		Coarse grey siltstone with some brecciation and 1 mm. quartz veins. Small pyrite blebs and veins cutting breccias.
283 11	290 8		
290 8	295 4		
295 4	298 9		
298 9	302 2		
302 2	308 0		
308 0	308 3		
318 3	314 10		(Coarse breccias with large blocks of (pale grey
314 10	317 8		(sandstones-strong development of pyrite
317 8	318 6		(in places
318 6	326 0		(Puggy material with patches of dark
326 0	333 8		(grey quartzite some mineralization,
333 8	334 10		(pyrite, quartz and fluorite
			(Possible fault zone

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NAME
COMPANY
AREA

HOLES
BEARINGS (M)
CO-ORDS
DIP

560223

FROM	TO	RECOVERY	CORE DESCRIPTION
334	10	344 4	(Coarse breccia with blocks of grey shale,
344	4	349 4	(siltstones and sandstones. Pyrite occurring
349	4	351 6	(as bands within blocks of laminated silt-
351	6	358 6	(stone and as blebs and veinlets cross
			(cutting bedding.
358	6	366 9	(Strongly sheared black shales - extreme loss
366	6	367 6	(of core - possible fault zone.
367	6	374 1	(Preconsolidation breccias, matrix of black
374	1	375 6	(shale with blocks of sanstone & quartzite.
375	6	385 8	
385	8	394 5	(Dark grey breccias with numerous fragments
			(of a variety of rock types.
394	5	404 5	(Black shales of mudstones with some breccias
			(- mixture of lithologic blocks with little
			(matrix.
404	5	406 6	(Sheared black shales with some carbonaceous
406	6	406 11	(bands. Some quartzites with quartz with
406	11	410 0	(carbonate veinlets.
410	0	412 6	(Black shales predominantly with some brecciation,
412	6	420 8	(some blocks of pyritic shales. Bedding well
420	8	430 6	(developed in some sections for the first
430	6	438 10	(time in core.
438	10	443 10	(Black shales with numerous small veinlets
			(of pyrite, carbonate and fluorite. More
			(intensively veined than previous sections.
443	10	445 5	(Dark grey quartzites with some minor
445	5	449 6	(veining.
449	6	450 3	(
450	3	460 0	(
460	0	464 5	(Grey quartzites and black shales with minor
464	5	470 5	(brecciation - some growth of quartz to give
470	5	477 0	(a spotted appearance to the quartzites.
477	0	487 0	(Black shales and grey quartzites - some breccias
487	0	497 0	(with quartzite blocks in shale matrix. Bedding
497	0	503 0	(well preserved in places with quartzite beds
			(up to 6" wide. 1" carbonate vein at 486'11".
503	5	504 3	(Predominantly grey quartzites with minor
504	3	511 6	(black shales and fine siltstones. Minor
511	6	512 6	(breccias in places with minor pyrite and
512	6	521 1	(carbonate veins. Some shearing in places.
521	1	530 2	(
530	2	534 6	(
534	6	536 3	(
536	3	539 9	(
539	9	542 3	(Black shales with soft sediment deformation.
542	3	546 10	(Sheared black shales with minor brecciation.
546	10	553 11	(Black shales and mudstones with minor
553	11	560 11	(brecciation and carbonate veining.

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COMPANY
AREA

HOLE NUMBER FL2
BEARINGS (M)
CO-ORDS
DIP

560224

FROM	TO	RECOVERY	CORE DESCRIPTION
560 11	569 3	3	(Section of broken core - largely black shales. (Predominantly shales with minor carbonate and pyrite veins. Some breccias with fragments of sandstone. 50° zones of strong cleavage (- particularly in first 10'.)
569 3	598 2	2	
598 2	625 5	5	Predominantly shales with some breccias containing fragments of sandstone - some replaced by pyrite. Small carbonate veinlets numerous. Very sheared zone at 606' - for about 1'. Bedding indistinct.
625 5	652 10	10	Black shales continue to 627' - then have pale grey fine sandstone containing black shale bands. Some minor carbonate-pyrite-chalcopyrite veins, particularly between 646'-652'.
652 10	680 11	11	Predominantly fine sandstones with some shale bands - numerous small carbonate and pyrite veinlets with some sphalerite. Brecciation in patches. Bedding indistinct and irregular.
680 11	692 0	0	Broken core - predominantly fine grey sandstone with small pyrite and carbonate veinlets.
692 0	695 0	0	Broken shale.
695 0	697 9	9	Predominantly black shales - strongly fractured in places - some minor quartz and carbonate and pyrite veinlets. bedding poorly defined.
697 9	700 6	6	
700 6	703 6	6	
703 6	707 4	4	
707 4	713 9	9	
713 9	717 11	11	
717 11	723 4	4	Pale grey fine grained sandstone with minor shale. Few small carbonate veins.
723 4	727 10	10	Dark grey shale.
727 10	731 1	1	Coarse breccia zones with predominantly dark shale matrix containing fragments of siltstone and sandstone - some large fragments of greywacke - like sandstone at 746'. Abundant carbonate - pyrite veins and replacements.
731 1	733 6	6	
733 6	738 8	8	
738 8	743 11	11	
743 11	750 3	3	
750 3	753 1	1	
753 1	756 1	1	Black mudstone - shale with minor carbonate veining.
756 1	765 1	1	Unusual rocks - pink cherts in black shale matrix and coarse sandstones - more like known Cambrian rocks.

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STATE
COMPANY
AREA

HOLE NO.
BEARINGS (M)
CO-ORDE
DIP

560225

FROM	TO	RECOVERY	CORE DESCRIPTION
765 11	772 7		Predominantly black mudstones and shales - some brecciation and minor carbonate veining.
772 7	777 10		
777 10	780 8		Probable fault zone at 777' - loss of core
780 8	787 9		Breccias with shale matrix containing pale grey sandstone fragments. Some red and green chert fragments cut by numerous carbonate veins - some associated chalcopyrite.
787 9	797 9		Most unusual suite of rocks. Largely wispy breccias with shale matrix containing blocks of chert, sandstone and possibly volcanic rocks. Abundant carbonate veins and disseminated pyrite and minor chalcopyrite. Unlike normal sequence - similar to some Cambrian sequences.
797 9	807 5		Similar unusual sequences of brecciated rocks - cherts, coarse sandstones (greywackes) and possible volcanic rock fragments in predominantly dark grey shale matrix. Large 3" carbonate veins at 810' - minor veinlets throughout rest of core.
807 5	808 7		
808 7	817 0		
817 0	826 4		Continuation in similar rocks - extremely variable in texture and composition - numerous carbonate and quartz veins. Mostly sand-grade rocks - some possible volcanic rocks? Some thin chalcopyrite veins particularly in the volcanic - type rocks.
826 4	835 2		
835 2	836 2		
836 2	848 0		
848 0	853 9		
853 9	858 0		

END HOLE

B12 and B14

The brecciated limestone from 62 feet in DDH No. B14 has been re-examined and discussed with Professor M.F. Glaessner of the Department of Palaeontology, University of Adelaide.

The peculiar structure of the carbonates in the brecciated limestone fragments were thought to be possibly of the stromatolithic type, thus representing some kind of organic origin.

Professor Glaessner has examined these critically and is of the opinion that these forms are not true stromatoliths, but rather shapes arising from anomalous crystal growth of calcite individuals. The shapes are akin to those of grains of wheat, but groups of calcite individuals with these shapes show no preferred orientation as would be expected with organic structures.

The conclusion from expert opinion is therefore that the limestone is not fossiliferous.

YSC:1

PETROGRAPHIC DESCRIPTIONBasalt - Campbell's Plain: TS 15435: PS8563

The sample is not strictly basalts, but on grain size classification is nearer dolerite in type. It is probably an effusive rock however as is indicated by its well-defined flow structure.

The main components are labradorite and augite which together form about 80 percent of the rock. The tendency to poikilitic texture between augite and plagioclase is inhibited by the flow structure.

Rather more than 10% of the rock is comprised of ilmenite, magnetite and pyrrhotite. Idiomorphic ilmenite is commonest. Pyrrhotite constitutes a small proportion of the rock as minute grains of less than 0.05 mm diameter. These are the primary accessory components of the igneous rock. The remainder of the rock is secondary chloritic material.

DDH no. B48 at 44 feet: TS15436: PS8564

The core consists of irregularly granular, fine grained sercitic quartzite which has a massive structure. The rock contains minor accessory tourmaline which exists amongst the interstitial sericite.

At random, but closely spaced, centres throughout the rock, primary tourmaline and related pyrite impregnates the grain boundaries of the quartzite aggregate over areas of 1-2 mm diameter. The abundance of very fine grained tourmaline with the pyrite suggests that pneumatolytic processes have been responsible for the introduction of sulphide. The vein-like dispersion of the sulphides through the intergranular boundaries, further indicates that replacement of the pre-existent sericite occurred. A few minute grains of highly refracting mineral which resembles either cassiterite or sphene, exists in some tourmaline - pyrite aggregates, but their small size does not permit identification. There is a little marcasite in addition to pyrite, but no other sulphides are present.

DDH no B48 - 79 ft: TS15437: PS 8565

This material is glossy sericite schist derived from interbedded sercitic siltstone and slate. The cleavage is parallel to the bedding.

The siltstone member occupies most of the core whereas the slate occurs in evenly spaced, very thin bands. Thi flakes

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of graphite oriented with the rock cleavage exist in the siltstone lamellae, but at wide intervals. Graphite constitutes less than 0.5 percent of the rock.

The schist contains several percent of pyrite and minor amounts of sphalerite. Much of the pyrite exists as disseminated grains of 0.01 - 0.05 mm diameter throughout the "siltstone" bands, and being without accompanying gangue minerals, may be of syngenetic origin. The remainder is concentrated along the rock cleavage in thin continuous sheets and is associated with finely crystalline tourmaline. The thin "slate" lamellae are replaced in most instances, but the concentrations may also occur at the junction between "slate" and "siltstone" lamellae. This sulphide is epigenetic in origin and results from pneumatolysis.

nw:1

DDH. B44. 32 ft.: TS15116: PS 8422

This is a fine grained, distinctly bedded, sericitic tuffaceous quartzite of even grain size. Angular quartz of 0.1 mm diameter constitutes 60 percent of the rock, sericite some 10 per cent and the remainder consists of angular fragments derived from a volcanic source.

The rock is replaced along its bedding interfaces and along joints at right angles to these, by sulphides, brown tourmaline and minor amblygonite. These epigenetic components which also occur at random centres throughout the rock are fine grained and generally complexly intergrown.

The sulphides, pyrite and pyrrhotite are in equal proportions and usually less than 0.1 mm grain size. Pyrite forms the bulk of the vein-like bodies in which it is associated with tourmaline, whereas pyrrhotite is widely dispersed and forms small aggregates throughout the entire rock.

DDH. B31. 167 ft: TS 15115: PS8421

This core is in very fine grained massive grey rock which appears to be volcanic tuff. Its main original components were quartz and sericitic material, but much of the latter has recrystallised to aggregates of muscovite. Evidence of a volcanic origin is manifest in the abundance of fragments of fine grained hematite-bearing igneous rock throughout the rock matrix which was volcanic dust.

The rock has been replaced at random centres by aggregates of highly refractive carbonate, possibly ankerite and by sulphides with subordinate euhedral quartz, brown tourmaline and cassiterite.

Pyrite and marmatite are the major sulphides. These are commonly intergrown and enclose small grains of cassiterite of less than 0.1 mm diameter. Minor amounts of pyrrhotite exist throughout the rock, and from it, some marcasite has formed.

PETROGRAPHIC DESCRIPTION

B7: 71 ft 0 in.: TS 14156: PS8179

This rock is mineralised pneumatolytically altered quartz-porphyry. Quartz phenocrysts are prominent and euhedral. The groundmass, while retaining its original quartz, had its feldspars replaced by carbonates and by slender crystals of montebbrasite, a variety of amblygonite. Carbonates and montebbrasite form concentrated clusters of coarser material at intervals throughout the rock where they are intimately associated with pyrite and fluorite. These clusters may also enclose relicts of some of the quartz phenocrysts which they have replaced, or may pseudo-morph the rectangular outline of former feldspar phenocrysts.

The pyrite is euhedral and of less than 3 mm grain size. There are also isolated irregularly shaped grains of stannite which do not exceed 0.2 mm diameter. Fine-grained cassiterite was observed in some pyrite crystals. These reach 0.2 mm diameter.

The mineral assemblage clearly indicates strong pneumatolytic action by gases containing lithium, fluorine and phosphorous.

B7: 71 ft 3 in.: PS8186

Pyrite veins occur in this sample and reach 0.5 cm in thickness. Small amounts of native bismuth up to 0.1 mm in diameter are included within the pyrite individuals which form the veins.

Outside the veins, there is very little sulphide, although small quantities of pyrite and stannite were observed at wide intervals as grains of less than 0.2 mm diameter.

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PETROGRAPHIC DESCRIPTION

B9 - 85FT: TS13489

This is fine-grained evenly granular marble with a bedded structure lying at about 45° to the core axis. The rock is virtually monomineralic.

Narrow beds within the rock are of finer grain size and are brecciated into angular fragments which are reconsolidated by later secondary coarsely crystalline calcite. There are no ore-type minerals.

B9 - 109FT: TS13490: PS7947

This is a rock type of both complex structure and composition and may be interpreted as one which results from wall rock alteration phenomena.

The original nature of the rock cannot be ascertained as most of it has been replaced or modified by hydrothermal activity.

As presently constituted, the rock consists mainly of an uncommon green mica of high refractive index and moderate birefringence, which is intimately intergrown with euhedra of an exotic mineral, sellaite and some plagioclase. In addition, there are smaller amounts of calcite, sericite and clays intimately mingled with the main components. Sphene, in granular form, occurs sporadically.

The rock has a banded structure which arises from a tendency for the green micas and the sellaite to occupy separate layers. The sulphides have followed these bands and may be syngenetic with mica and sellaite.

Later transgressive veinlets of fluorite, or of calcite, intersect the host rock banding and also the platy crystals of pyrrhotite. Pyrrhotite is the only sulphide; it is abundant and occurs as large platy crystals which have partly replaced, and enclose relicts of the host rock.

B9 - 130FT: TS13491: PS7948

This is a calc-magnesian silicate rock of secondary origin derived from the alteration of magnesian limestone or dolomite.

The main components are talc, quartz and dolomite. Talc forms radial fibrous aggregates of extremely fine grain size. These aggregates enclose comparable radial aggregates of quartz which suggests that both formed simultaneously. The quartz groups commonly form a nucleus to the radial aggregates of talc.

Dolomite also has a radial structure but is of a more granular texture with concentric bands at intervals marked by rows of inclusions of limonite. This is not original material, but like the quartz and talc is secondary.

This veinlets of pyrite with minor pyrrhotite and zircon pass through the rock. Aggregates of quartz and talc follow the veins within the dolomite.

B9 - 162FT: TS13492: PS7949

This is a fine grained massive rock which consists largely of tourmaline, sellaite zeolites and sulphides. Tourmaline is a brown variety. It exists as minute needles which generally accord with either of two orientations at right angles to each other. Tourmaline and sulphides constitute about 60 per cent of the rock. The remainder is granular zeolite, which is intimately intergrown with sellaite.

Pyrrhotite is disseminated fairly evenly through the rock as irregular grains of 0.2 mm diameter. There are separate sulphides which are intergrown with quartz and traverse the rock in thin veins. Such veins are genetically related to associated thin veins of zeolite and sellaite. Both pyrrhotite and pyrite exist in these veins.

B9 - 205FT: TS13493: PS7950

The rock is mainly grey, fine-grained sericitic quartzite with weakly bedded structure. There is some facies variation and it grades into sandy sericitic slate at intervals across the bedding. Angular quartz grains are dominant, feldspars subordinate and there are some heavy minerals such as tourmaline and zircon. Sericite is the interstitial medium.

The quartzitic beds are brecciated and blocks are displaced. The more highly micaceous slate lamellae have flared and recrystallised amongst these blocks to produce a micro-boundinage-type structure. Concurrent with this, fractures have become filled by secondary chlorite and calcite. Pyrrhotite with a platy habit, has formed in parallelism along a direction at right angles to the bedding, i.e., at right angles to the zones along which brecciation and boundinage have formed. Its emplacement was probably guided by incipient tension fractures.

B9 - 262FT: TS13494: PS7951

This rock is a volcanic breccia, mineralised by transgressive sulphide veins which have a calcite gangue.

There are angular blocks of calcite-sulphide-impregnated, evenly granular quartzite, which are spread through finer grained volcanic rock, probably tuff. The tuff consists mainly of clays with needle-like sericite crystals, quartz or quartzite granules and abundant sulphides. Zircon and tourmaline are prominent as heavy mineral accessories in the quartzite.

The irregularly shaped pyrite and pyrrhotite in the tuff may be of syngenetic origin. The vein sulphide, mainly pyrite, and that of coarse euhedral form which has replaced the edges of quartzite blocks, is of epigenetic origin. Epigenetic sulphides are accompanied by calcite.

B9 - 317FT: TS14157: PS8180

This rock is very similar to B7: 71FT and is again a pneumatolytically altered quartz porphyry. Phenocrysts of quartz remain in a granular quartz rich, topazized groundmass. Former phenocrysts of feldspar are completely pseudomorphed in sulphide, carbonates, topaz, amblygonite, fluorite and perfect quartz euhedra. Carbonates are the major replacement minerals.

B9 - 321FT: TS14158: PS8181

This rock is comparable with that at 317FT. It is a quartz porphyry modified by pneumatolysis and sulphide mineralization.

Euhedral pyrite is the major sulphide which, as crystals up to 1 cm in diameter, constitute about 40 percent of the rock. In much of the pyrite, there are included crystals of cassiterite which vary up to 0.06 mm in diameter. Small aggregates of stannite exist at intervals throughout the rock where they may contain cassiterite intergrowths. There are also clusters of chalcopyrite in various parts of the rock but these seldom exceed 1 to 2 mm diameter. The chalcopyrite contains a few small inclusions of sphalerite.

The sulphides occur mainly in the fine-grained groundmass of the porphyry where the pneumatolytic minerals such as quartz, calcite, fluorite and amblygonite, have been emplaced.

B9 - 328FT: TS13159: PS8182

This rock is a quartz porphyry which is again modified by pneumatolysis and mineralized by sulphides and minor cassiterite. Modification is not so intense as in other samples, but small crystals of topaz and traces of tourmaline have formed throughout the groundmass by replacement of the quartz.

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Pyrite forms aggregates of up to 0.5 cm diameter, but no other sulphides were observed. Traces of bismuth exist as small grains of less than 0.1 mm diameter near open spaces where some component has been leached.

B9 - 388FT: TS14160: PS8183

This is similar to the rock at 328FT except that carbonate is prominent and tourmaline is absent.

Cassiterite is very abundant and relatively coarse-grained. Euhedral pyrite, minor pyrrhotite and stannite form aggregates of several mm size at regular intervals throughout the rock.

DDH, B9, 626 ft. 6 ins. TS 15114: PS8420

The core is mainly fine-grained evenly granular tourmalinized quartzite in which the detrital quartz grains have very irregular shape. The interstitial spaces between quartz grains contain very fine-grained quartz and large amounts of extremely fine tourmaline needles. The tourmaline is an introduced component. Small amounts of zircon and sericite exist as accessory components of the quartzite.

The rock structure is determined by the parallel alignment of unequidimensional quartz grains. This is however a very weak structure.

Epigenetic sulphide-bearing amblygonite-topaz-calcite veins intersect the structure at a high angle and attain a thickness of several mm. Pyrrhotite and marcasite derived from pyrrhotite, are the sulphide minerals of the veins. The sulphides, accompanied by calcite, have spread beyond the vein into the wall rocks in many places.

The whole section of core is permeated by pneumatolytically derived tourmaline, calcite, topaz and sulphide while amblygonite is confined mainly to the vein channel. No cassiterite was observed in this apparently favourable association.

SUMMARY

No graphite was observed in the shales from DDH No. B8 although these are strongly carbonaceous.

It is considered that a zone of significant wall rock alteration exists in DDH No. B9 between 109FT and 162FT. An assemblage of very uncommon minerals has been introduced into the rock. These minerals are characteristic of pneumatolytic or hydrothermal activity and it is probable that these minerals are genetically related to sulphide mineralisation of an epigenetic nature.

More detailed investigation of the petrography of country rock in this area is recommended.

B8 - 386FT: TS13488: PS7945

This is irregularly granular micaceous, and possibly tuffaceous, quartzite of massive structure. Highly angular quartz grains are the main component, with which are associated muscovite flakes, devitrified grains of volcanic glass, tourmaline, biotite and fine grained interstitial clay.

Euhedral pyrite is most abundant and unevenly disseminated throughout the rock. The pyrite in most cases, is partially leached and porous.

Segregations and then veinlets of chlorite-clay-quartz occur within the rock and enclose much larger crystals of pyrite than those disseminated throughout the rock. These too, are leached.

No other sulphides are present. The sulphides are euhedral and replace portions of detrital quartz grains as well as the interstitial rock matrix. They are probably of epigenetic origin.

B8 - 422FT: TS13486: PS7943

This core is a closely laminated series of interbedded black carbonaceous shales and grey-coloured micaceous siltstones. Fine grained opaque minerals which are located mainly in the siltstone lamellae, are pyrite and rutile of 0.01 to 0.03 mm diameter. Rather larger pyrrhotite grains of elongate form, occur along the boundaries between shale and siltstone. These vary up to 0.2 by 0.02 mm in size and are oriented parallel with the interfaces.

Graphite was not detected in either sedimentary facies.

The shale obtains its dark colour from amorphous carbonaceous material of fine flaky form which is dispersed along the bedding planes.

B8 - 459FT: TS13487: PS7944

The core is black, almost entirely carbonaceous material with disseminated fine-grained angular quartz (0.01-0.05mm), sericite and clay. None of this carbonaceous material is crystalline and graphitic.

Fine-grained pyrite of 0.01 to 0.03 mm size is disseminated throughout the rock in random distribution.

Epigenetic veinlets of quartz-calcite penetrate the rock in many places. Coarser-grained pyrite is a component of these veinlets as well as trace amounts of chalcopyrite and pyrrhotite of less than 0.05 mm diameter.

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PROJECT NAME:

APPENDIX 2
GEOLOGY AND MINERALISATION OF

MT. BISCHOFF

TITLE:

VOLUME III

METALLURGICAL REPORTS

AREA NAME/S, STATE 1:250,000 SHEET NO/S & COORDINATES:

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AUSTRALIAN ANGLO AMERICAN LIMITED

Incorporated in the State of Victoria

27 February 1963.

GEO-MET RESEARCH PROGRESS REPORT #6THE RECOVERY OF TIN FROM MT. BISCHOFF ORE1. INTRODUCTION

Conventional methods of extracting tin by means of concentration and smelting of a high grade concentrate is not a very suitable proposition for the Mt. Bischoff ore, because of low recoveries and the high iron content. Selective chloridising of tin in the run of mine ore, if possible, could be advantageously adopted. It would be advantageous to carry out the chloridisation at low temperatures and relatively rapid rates of reaction in order to limit corrosion problems and fuel requirements.

2. NATURE OF THE ORE

The Mt. Bischoff tin ore is characterised by a high percentage of sulphur. A typical analysis of the ore is as follows:

<u>Constituents</u>	<u>% Composition</u>
Total tin	1.34
Iron	36.26
Sulphur	21.84
Al ₂ O ₃	Medium High
SiO ₂	Medium High
MgO	Medium High

(Medium High: 5 to 50% approximately by semi-quantitative spectrographic analysis).

3. THEORETICAL CONSIDERATIONS

Whether a proposed chemical process is feasible or not in actual practice, depends on two major properties of the chemical reaction involved. These are the free energy change and the rate of reaction. Consideration of free energy values makes possible certain predictions of the direction and extent of a given reaction, as well as the effect of temperature, pressure and composition upon the result. If the free energy change ΔF of the reaction is negative, then the reaction is favourable. Whereas reactions having a positive value of free energy change, render the reaction unlikely to occur.

Reaction rate cannot be predicted from the free energy data and has to be obtained by actual experiment. However, at the elevated temperatures generally used in metallurgical technology, the rates of chemical reactions are usually sufficiently high; and hence the diffusion of the reactants and products to and from the zone of reaction determines the actual rate.

Thus, if the free energy change is favourable (i.e. ΔF is positive) the chances are good that a metallurgical reaction at elevated temperature will proceed at a reasonable rate, if adequate provision for rapid diffusion has been made.

In the literature it is the usual practice to give the values of standard free energy change, ΔF° , instead of the free energy change, ΔF . For the reaction $bB + cC \rightarrow dD + eE$ these two are related by the reaction

$$\Delta F + \Delta F^\circ + RT \ln \frac{A_D^d A_E^e}{A_B^b A_C^c}$$

where A_i = activity of constituent (i)
 T = absolute temperature, °K
 R = gas constant

However, under ordinary practice of high temperature and moderate pressure the second term on the right hand side of the above equation is very small compared to the other two terms. And the value of ΔF° is very nearly equal to ΔF .

4. CHOICE FOR THE APPROPRIATE CHLORIDISING AGENT FOR MT. BISCHOFF ORE

The most important factor in the chloridising process is the selective chloridisation of the valuable mineral. Thus in the present case, the prime consideration is the chloridisation of the tin mineral and avoidance of chloridisation of other unwanted minerals. Not all chloridising agents will be suitable for this specific purpose; hence a judicious choice of the chloridising agents is warranted.

The standard free energy change values for chlorination of the possible constituents of Mt. Bischoff ore with chlorine gas are given in Table I. Alumina and silica are very stable compounds and would not be chlorinated by ordinary means; hence they are not considered.

TABLE I - Chlorination of Mt. Bischoff ore constituents by chlorine alone

No.	Reaction	Standard free energy change ΔF° , K.Cals.	
		500°K(227°C)	1000°K(727°C)
1	$SnO_2 + Cl_2 \rightarrow Sn Cl_2 + O_2$	+ 46.7	+ 23.3
2	$SnO_2 + 2 Cl_2 \rightarrow Sn Cl_4 + O_2$	+ 12.0	+ 4.1
3	$Fe_2O_3 + 2 Cl_2 \rightarrow 2 Fe Cl_2 + 3/2 O_2$	+ 27.8	+ 28.4
4	$Fe_3O_4 + 3 Cl_2 \rightarrow 3 FeCl_2 + 2 O_2$	+ 20.2	+ 28.1
5	$FeS_2 + Cl_2 \rightarrow Fe Cl_2 + 2S \text{ or } S_2 (g)^*$	+ 22.4	- 33.3
6	$FeS + Cl_2 \rightarrow FeCl_2 + S \text{ or } 1/2 S_2(g)^*$	- 9.0	- 29.9

* At 500°K sulphur will be present in the molten state, whereas at 1000°K

From Table I it is seen that by Chlorine Fe S₂ will be chlorinated whereas SnO₂ will not react, whereas the exactly opposite situation is being looked for. Thus Chlorine could not be selected as a suitable reagent.

It is to be noted here that for oxide minerals it is generally required to have a reducing agent together with the chloridising agent. This reducing agent can be used separately as H₂, CO, C, etc. or in the combined form already present in the chloridising agents like CCl₄, COCl₂, HCl, etc.

The free energy change values for the chloridising reactions with hydrochloric acid gas are given in Table II.

TABLE II - Chloridisation reactions with hydrogen chloride gas

No.	Reaction	Standard free energy change ΔF° , K.Cals.	
		500°K (227°C)	1000°K (727°C)
1	$\text{SnO}_2 + 2 \text{HCl} \rightarrow \text{SnCl}_2 + \text{H}_2\text{O} + 1/2 \text{O}_2$	+ 40.7	+ 35.3
2	$\text{SnO}_2 + 4 \text{HCl} \rightarrow \text{SnCl}_4 + 2 \text{H}_2\text{O}$	0.0	+ 8.1
3	$\text{Fe}_2 \text{O}_3 + 4 \text{HCl} \rightarrow 2 \text{FeCl}_2 + 2 \text{H}_2\text{O} + 1/2 \text{O}_2$	+ 15.8	+ 32.4
4	$\text{Fe}_3 \text{O}_4 + 6 \text{HCl} \rightarrow 3 \text{FeCl}_2 + 3 \text{H}_2\text{O} + 1/2 \text{O}_2$	+ 2.2	+ 34.1
5	$\text{FeS}_2 + 2 \text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2\text{S} + \text{S}$ or $1/2 \text{S}_2$ (g)	+ 23.3	+ 4.8
6	$\text{FeS} + 2 \text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2\text{S}$	- 8.1	+ 7.2

From this table it is seen that hydrogen chloride gas alone may be a suitable chloridising agent for recovering tin as SnCl₄. However, this reagent has one main disadvantage. The reaction of cassiterite (SnO₂) with hydrogen chloride gas is endothermic at temperatures below 1200°K (927°C). This would demand the additional supply of fuel to keep up the proper temperature for the reaction. Also a ΔF° value of 0.0 K.Cals at 500°K, gives only a fifty-fifty chance for the success of reaction and at that temperature of 500°K the rate of the reaction may not be high enough. At higher temperatures, on the other hand the reaction has a positive value of ΔF° .

This unfavourable situation of chloridisation reaction of cassiterite with hydrogen chloride gas alone can be remedied by the use of an additional reducing agent such as H₂, CO, or C. The elemental carbon used with hydrogen chloride will favour the chloridisation of the iron compounds together with cassiterite. In other work at Geo-Met Reactors Limited hydrogen has been mentioned as a better reducing agent than carbon monoxide for the reduction of SnO₂ to Sn; hydrogen can penetrate the crystal lattice of SnO₂ more easily than CO. Hence, the chloridisation experiment of Mt. Bischoff tin ore is proposed to be carried out at first with a mixture of hydrogen and hydrogen chloride gas.

The standard free energy change values of chloridisation with hydrogen and hydrogen chloride gas are given in Table III.

TABLE III - Chloridisation reactions with hydrogen and hydrogen chloride gas

No	Reaction	Standard free energy change ΔF_0 , K. Cals	
		500°K(227°C)	1000°K(727°C)
1	$\text{SnO}_2 + \text{H}_2 + 2 \text{HCl} \rightarrow \text{SnCl}_2 + 2 \text{H}_2\text{O}$	- 11.7	- 10.7
2	$\text{SnO}_2 + \text{H}_2 + 4\text{HCl} \rightarrow \text{SnCl}_4 + 2 \text{H}_2\text{O} + \text{H}_2$	0.0	+ 8.2
3	$\text{Fe}_2\text{O}_3 + \text{H}_2 + 4\text{HCl} \rightarrow 2 \text{FeCl}_2 + 3 \text{H}_2\text{O}$	- 36.6	- 13.6
4	$\text{Fe}_3\text{O}_4 + \text{H}_2 + 6\text{HCl} \rightarrow 3 \text{FeCl}_2 + 4 \text{H}_2\text{O}$	- 50.2	- 11.9
5	$\text{FeS}_2 + \text{H}_2 + 2 \text{HCl} \rightarrow \text{FeCl}_2 + 2 \text{H}_2\text{S}$	+ 7.8	- 4.0
6	$\text{FeS} + \text{H}_2 + 2 \text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2\text{S} + \text{H}_2$	- 8.1	+ 7.2

From Table III it is seen that the chloridisation of cassiterite to SnCl_2 in Reaction No.1 is highly favourable at both 500°K and 1000°K. Also most of the iron in Mt. Bischoff ore is probably in the form of FeS_2 and FeS . If FeS_2 is present then to avoid chloridisation lower temperatures should be used. (Reaction 5). On the other hand if FeS is present then for the same reason, higher temperatures would be used. A mineralogical examination of the constituents of Mt. Bischoff ore is under investigation. Another favourable point with reaction No. 1 ($\text{SnO}_2 + \text{H}_2 + 2 \text{HCl} \rightarrow \text{SnCl}_2 + 2 \text{H}_2\text{O}$) is that it is exothermic. Hence the process can be carried out with its own heat of reaction.

5. EXPERIMENTAL WORK

The experimental arrangement is shown in Fig.1. A series of five tests with various gas mixtures of H_2 and HCl (commercial grade) was performed on 50 gm - samples of ore in a 1000 - watt furnace fitted with a Vycor reaction tube. The total gas flow rate was 460 millilitre per minute at a temperature of 600°C. While raising the temperature to 600°C, N_2 was passed to expel the air from the Vycor tube. The volatilised product which condensed in the cooler part of the Vycor tube was collected by washing with dilute hydrochloric acid. Both the hydrochloric acid solutions in the gas scrubbing train and the Vycor tube solution were analysed for tin and iron. Table IV shows the results obtained.

In Table IV, the percent tin volatilisation is calculated on the basis of 1.34% tin in the mine-run ore. In Table V, the percent tin volatilisation based on the analysis of residue and volatilised products in each test, is shown. On this basis of calculation a much higher recovery of tin chloride is obtained. However, in this method of calculation, the tin percent in the ore varied from 0.76% to 1.34% as compared

to 1.34% tin assumed in the previous basis of calculation. An analysis of the unchloridised ore in each test could have been very helpful in checking the material balance in each case. Unfortunately, this analysis was not done. Proper care of this point is being taken in current tests.

It may, however, be pointed out that the 1.31 and 1.34% tin obtained from the raw ore, based on the analysis of chloridised residue and volatilised products, in the first two tests, check well with the assumed figure of 1.34% tin in the raw ore. No other results of percent tin in the present case are as close as the first two. This lends some support to the basis of calculation employed in Table I.

Percentage tin volatilisation as a function of the gas mixture composition from the results of Table IV is shown in Fig.2.

TABLE IV - Volatilisation of tin and iron chlorides from 50 gm samples of mine-run ore.

Test No.	Gas ratio		Time mins.	Distribution of tin						Total tin volatilised gms	Percent tin volatiliz'n	Total iron volatilised gms	Percent iron volatiliz'n
	Volume percent			Percent of tin in sample									
	H ₂	HCl		gms			gms						
			Vycor tube	1st wash bottle	2nd wash bottle	Vycor tube	1st wash bottle	2nd wash bottle					
1	70	30	45	0.4513	0.0176	0.0176	67.36	10.62	2.63	0.540	80.60	Nil	Nil
2	50	50	45	0.4374	0.0626	0.0050	65.28	9.34	0.93	0.505	75.35	Nil	Nil
3	25	75	45	0.3480	0.0585	0.0045	52.00	8.73	0.61	0.411	61.34	0.053	0.30
4	85	15	45	0.4210	0.0092	0.0092	62.83	1.37	1.37	0.439	65.58	0.004	0.02
5	0	100	45	0.2808	0.0282	0.0094	41.91	4.21	1.40	0.318	47.52	0.069	0.38

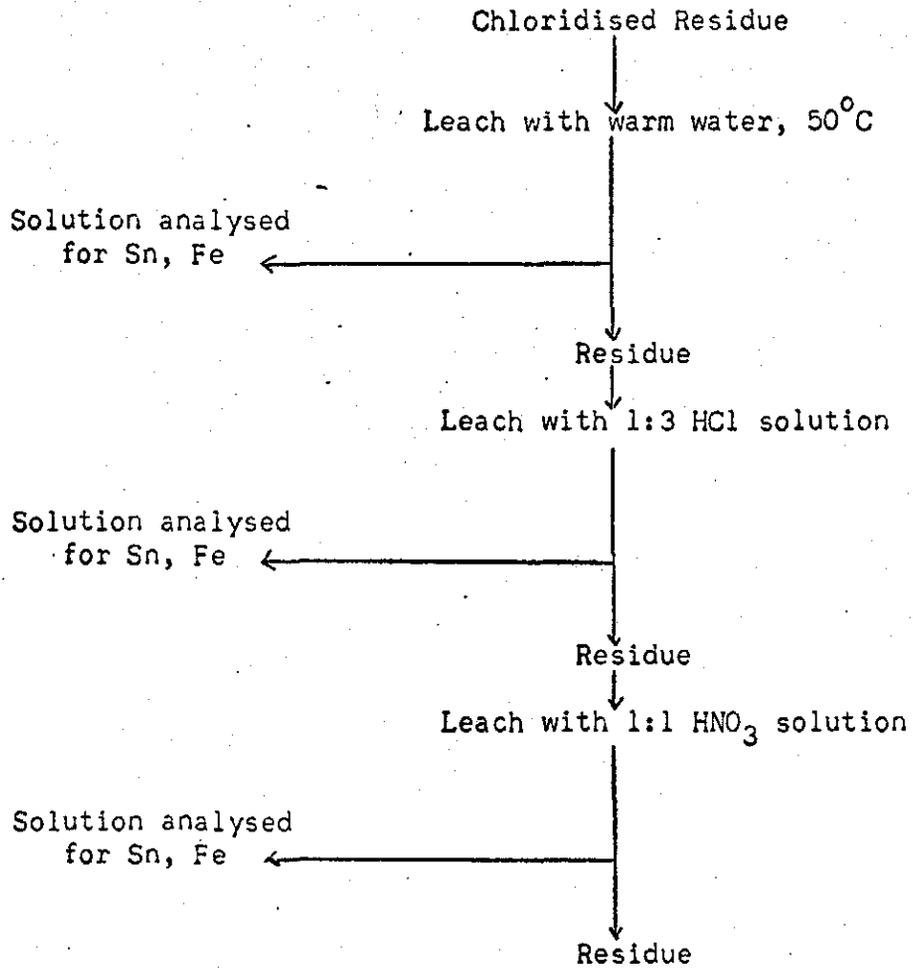
The values for iron volatilisation are based on 36.26% of iron in the ore.

TABLE V - Tin volatilisation based on the analysis of chloridised residue and volatilised products.

Test No.	Gas ratio volume		Time mins.	Total tin volatilised (A), gms.	Total tin in the chlorinated residue (B), gms.	Total tin in 50 gm sample (A+B), gms.	Percent tin volatiliz'n	Percent tin in 50 gm sample
	H ₂	HCl					$\frac{A \times 100}{A+B}$	$\frac{A+B}{50} \times 100$
1	70	30	45	0.540	0.117	0.657	82.20	1.31
2	50	50	45	0.505	0.165	0.670	75.35	1.34
3	25	75	45	0.411	0.118	0.529	77.54	1.06
4	85	15	45	0.439	0.012	0.458	96.00	0.92
5	0	100	45	0.318	0.060	0.378	84.14	0.76

5.1 Leaching Tests

To determine the nature of tin and iron compound in the chloridised product, the residue from Test No.1 was leached according to the following scheme.



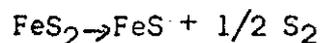
Water should dissolve FeCl_2 , FeCl_3 , SnCl_2 and SnCl_4 ; FeS , Fe_2O_3 and SnS should be dissolved in the HCl solution; and FeS_2 and SnO_2 are soluble in HNO_3 solution.

The results of the analysis of the leach products are given in table VI.

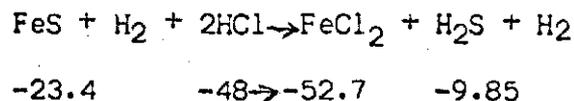
TABLE VI - Results of leaching test on 30 gms of chloridised ore.

Water leach solution, gms.		HCl leach solution, gms.		HNO ₃ leach solution, gms.	
Fe	Sn	Fe	Sn	Fe	Sn
0.0088	0.0064	9.1424	0.0080	1.6000	0.0128

Thus, from the leaching test, it is seen that about 90% of the iron in the chlorinated residue is present as FeS and Fe₂O₃. If it is assumed that FeS₂ is present in the mine-run ore then during the heating up of the ore to 600°C, FeS₂ is favoured to be decomposed to FeS and elemental sulphur according to the following reaction:



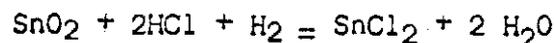
The presence of FeS in the chlorinated residue can thus be explained. The reaction of FeS with HCl proceeds only to a limited extent because of the positive ΔF .



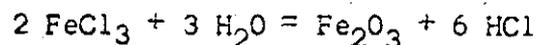
For the above reaction ΔF° at 727°C = +8.95 K.Cals.

The above reaction has a positive value for the standard free energy change, and hence in all probability the reaction would not take place. These considerations apply also to the FeS originally present in the mine-run ore.

Another factor of importance is that any water vapour formed in the reaction



will decompose any FeCl₃ formed as follows:



5.2 Chloridising Experiments at Low Temperature

The ΔF° of the reaction, $\text{SnO}_2 + \text{H}_2 + 2\text{HCl} \rightarrow \text{SnCl}_2 + 2\text{H}_2\text{O}$, as a function of temperature is given in Table VII.

TABLE VII - Standard free energy change for the reaction
 $\text{SnO}_2 + \text{H}_2 + 2\text{HCl} \rightarrow \text{SnCl}_2 + 2\text{H}_2\text{O}$

$^{\circ}\text{F}$	440.6	800.6	1340.6	1700.6
$^{\circ}\text{C}$	227	427	727	1027
$^{\circ}\text{K}$	500	700	1000	1300
ΔF°	-11.7 K.Cals	-5.0 K.Cals	-10.7 K.Cals	-15.0 K.Cals

Hence at a temperature of 350°C (623°K) ΔF° for the above reaction is about -6.0K.Cals . At this temperature SnCl_2 will be formed but will not vapourise. Leaching with water would separate it. With this idea in mind, 50 gm sample of the ore was spread evenly on about 6" length on the Vycor tube, and an unspecified mixture of H_2 and HCl was passed at a reaction temperature of 350°C for a period of 20 minutes. The experiment has to be stopped due to gas leakage in the experimental set up. The chloridised residue was leached with hot water. Some tin chloride also vapourised into the HCl solution in the gas train. Percent tin chloridisation in this experiment was 12%.

No comparison could be made due to the very short time of the experiment. Another experiment with longer reaction time and at slightly higher temperature will be made.

6. DISCUSSION OF RESULTS

Substantial quantities of tin were chloridised and volatilised (75 to 96%) at a temperature of 600°C with a gas mixture of H_2 and HCl containing 15 to 50% HCl . Iron in the residue was present as ferrous sulphide and not as iron chloride. Negligible amount of iron was found in the volatilised product. Most of the sulphur remained in the residue. Elemental sulphur was also collected during the reaction.

The preliminary investigations done, so far, on the chloridisation of Mt. Bischoff ore are promising. It is hoped that by investigating all the process variables, recoveries of tin as chlorides could further be improved.

7. RECOMMENDATIONS

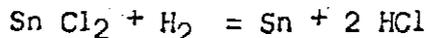
A knowledge of the mineralogical constituents of the mine-run ore would throw more light on the thermodynamic considerations of the different chloridisation reactions by various reagents. This would help to select the proper chloridising reagents for the selective chloridisation of tin.

A more extensive analysis on the reactants and products should be carried out to check the metallurgical balances on each individual experiment.

8. ECONOMIC CONSIDERATIONS

It is difficult at this stage of the work to give accurate costs of recovering tin from Mt. Bischoff ore by chloridising. However, an assessment of the economic feasibility is possible.

Assuming recirculation of the HCl gas and recovery from the SnCl₂ and SnCl₄ by hydrogen reduction



The following consumption of reagents and thermal energy will be required per pound of tin produced.

H cl-0.1 lb	\$0.01
H ₂ -7 cu.ft	\$0.01
Heat Requirements	<u>\$0.05</u>
Total	<u>\$0.07</u>

Labour, overhead and capital depreciation costs of course will have to be added. However, with an ore value of about \$10/ton and no complicated milling circuit the process should prove to be economically feasible.

9. FUTURE WORK

Future work will be carried out along the following lines:

- (a) Further investigation of the optimum temperatures and particles size for reaction of the ore with hydrochloric acid gas.
- (b) The possibility of burning H₂ + Cl₂ in the reaction zone to utilise the exothermic heat produced in this reaction.
- (c) The possibility of a bulk flotation of the sulphides to reduce the quantity of ore to be handled.
- (d) Studies on the optimum conditions for the recovery of tin by hydrogen reduction of Sn Cl₂ and Sn Cl₄.
- (e) Studies on the fused salt electrolysis of Sn Cl₂ and Sn Cl₄.
- (f) Pilot-plant studies.

The cost of the programme including pilot-plant construction and studies will be approximately \$200,000.

10. CONCLUSIONS

Initial experimental work on the chloridisation of Mt. Bischoff mine-run ores has shown that high recoveries of tin (80-96%) can be obtained. The tin is recovered as tin chloride which is only slightly contaminated with iron.

(Sgd) S. Ghosh, M.Sc.

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8 April 1963

A PRELIMINARY STUDY OF MINERAL PROCESSING PROBLEMS
OF MOUNT BISCHOFF TIN ORE

A series of 6 lab scale test was carried out on a sample of ore, marked Mt. Bischoff Tin Ore, Tasmania.

This work was of a preliminary nature, the object being to study some of the characteristics and problems which might be encountered if this ore is to be treated on a commercial scale.

The sample of ore consisted chiefly of serpentine and pyrrhotite. The serpentine was of a "talcy" nature, and floated very readily with a minimum amount of light frother, fed stagewise. In this step a considerable amount of cassiterite reported with the gangue or talc. Some of this tin could be dropped out of the talc flotation concentrate by cleaning. In laboratory test No. D-2 a total of 46% of the mill heads by weight consisted of talc and contained some 40.0% of the total tin. By one-stage cleaning of the talc fraction (Lab test No.D-5), 25.51% containing 12.15% of the total cassiterite was rejected. In test No. D-2 the talc product assayed 0.98% Sn, against an assay of 0.57% Sn in test No. D-5. This would lead one to believe that the cassiterite is very fine-grained and to a large extent free.

Of the pyrrhotite present in the ore, some is magnetic and some non-magnetic. In lab test No.D-4, the crockett magnetic separator recovered 22.12% of the total heads, or 60.58% of the total pyrrhotite in the sample. The pyrrhotite can be recovered from the Bischoff ore by means of a wet permanent magnet (Crockett type) and a high intensity wet magnetic separator (Jones type). An effective way of recovering the pyrrhotite is by either a combination of a crockett magnetic separation followed by flotation, or by straight flotation. The natural pH of the pulp after grinding is 6.8 and is quite satisfactory for a pyrrhotite float with a low consumption of reagents.

In the following table are figures to show weight loss of total heads against the assay content of the cassiterite in the pyrrhotite concentrates.

Test Number	Total wt.of pyrrhotite	Assay % Sn
Lab test D-2	40.23	0.32
Lab test D-3	45.32	0.38
Lab test D-4	22.12	0.11
Lab test D-4	14.38	1.04
Lab test D-5	38.14	0.41
Lab test D-6	57.72	0.57

In lab test D-6, in which the Jones high intensity wet magnetic separator was used, the highest weight loss and the highest tin assay was obtained. This could be accounted for in several ways; the cassiterite may be present as true middlings with the pyrrhotite, or as fine grains in gangue particles containing sufficient pyrrhotite to make them magnetic.

In the mineralogical examination conducted by the Swastika Laboratories Ltd., on this sample, they found some of the cassiterite occurring with titanite. It is felt that this titanite was concentrated with the Jones high intensity separator and that this accounts for the higher weight content and higher Sn content in the magnetic fraction.

In the following table are figures representing the total cassiterite locked or lost in the talc and pyrrhotite products. It is evident that the talc and pyrrhotite must be removed from this ore in the first stages of mineral dressing, and, due to the fact these two fractions carry some 50 to 60 percent of the cassiterite, it is clear that better recovery of the tin from these fractions of the ore is the first major problem.

Lab test number	Conc.	Weight %	% Sn in fraction	Total Sn lost in test
Lab test D-1	1	83.08	61.57	
" "	2	7.91	6.45	68.02
" D-2	1	33.42	30.92	
" "	2	14.74	9.47	
" "	3	40.23	11.03	51.42
" D-3	1	34.93	41.86	
" "	2	45.32	11.35	53.21
" D-4	1	53.00	49.87	
" "	2	22.12	2.13	
" "	3	14.38	13.09	65.09
" D-5	1	25.51	12.15	
" "	2	38.14	13.06	25.21
" D-6	1	57.72	25.56	25.56

(Sgd) A. C. King

GEO-MET PROGRESS REPORT

#17

10 April 1963.

MT. BISCHOFF CHLORIDISATION EXPERIMENTSINTRODUCTION

In a previous series of tests (Research Progress Report No. 6), it has been confirmed that high percentages of tin chlorides are volatilised from Mt. Bischoff tin ore, when it is chloridised with a mixture of HCl and H₂ gases at a temperature of 600°C. In this present series of tests it was decided to study the effect of other variables, mainly the flow speed of gas mixture, on the recovery of tin chlorides.

EXPERIMENTAL DETAILS

The experimental apparatus was the same as before (Report No.6), the only difference being that this time a 1" I.D. silica tube was used while the I.D. of the Vycor tube in the previous tests was 2". The flow rate of the chloridising agents was the same, i.e. 460 ml/min. Hence in the present series of tests the gas flow speed was approximately four times that of the previous tests (neglecting the effect of the area of the boats).

RESULTS

The results of tin and iron chlorides recovery, together with the analyses of the test samples and the chloridised products are given in Table I.

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SAMPLE CALCULATIONS (Test No. 3 Table I)(a) % Sn volatilisation based on the analysis of chloridised residue

Wt. of chloridised ore	=	41.63 gms
% Sn in the chloridised ore	=	.14%) average .21%) Sn % = $\frac{.35}{2} = .175\%$
Wt. of Sn chlorides volatilised	=	.639 gms
Wt. of Sn in the chloridised ore	=	(.175 x .4163) = .071 gm
Total wt. of Sn = (.639 + .071)	=	.710 gm.

$$\text{Hence \% Sn volatilisation} = \frac{.639}{.71} \times 100 = \underline{\underline{90\%}}$$

(b) Metallurgical balance based on the analysis of the products

Wt. of the unchloridised sample	=	46.24 gms
% Sn in the unchloridised sample	=	1.2%) Average Sn % 1.5%) = $\frac{2.7}{2} = 1.35\%$
Wt. of Sn in the unchloridised residue	=	.4624 x 1.35 = .6237 gms
Wt. of Sn in the products (chloridised residue + volatilised chlorides)	=	.710 gms

Hence

$$\text{Metallurgical balance \%} = \frac{\text{Wt. of Sn in the products}}{\text{Wt. of Sn in the raw sample}} \times 100$$

$$= \frac{.710}{.6237} \times 100 = \underline{\underline{112\%}}$$

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(c) % Sn from analytical results

Total wt. of Sn in the products	=	.710 gms
Wt. of the sample	=	46.24 gms
% Sn in the sample	=	$\frac{.710}{46.24} \times 100 = \underline{\underline{1.53\%}}$

DISCUSSION OF RESULTS

Although the analytical results of tin are not very consistent, probably due to the sampling error (although sampling was performed on a small riffle), certain general observations can be drawn from the results of Table I.

1. Higher gas flow speed increases the Sn volatilisation.
2. The maximum amount of Sn chlorides volatilised from 50 gm sample in previous tests was .540 gm (see Report No. 6), whereas the maximum amount of tin chlorides volatilised from a 45 gm sample in the present series of tests is .680 gms at a higher (approximately four times) flow speed. Thus the percentage increase in maximum Sn volatilisation with the present higher speed of flow is given as:

$$\frac{0.680}{0.540} \times \frac{50}{45} = \underline{\underline{140\%}}$$
3. The chloridisation reaction rate is very high at a temperature of 600°C. Thus even within 5 minutes 84% of Sn recovery is obtained (test No. 7).
4. The chloridisation reaction rate is considerably low at temperatures below 600°C. Thus even at a higher flow rate of 690 ml/min the percentage recovery of Sn chlorides at 500°C is only 30% for a test run for 6 minute period (test No. 8).
5. A very high recovery of tin chlorides can be obtained with HCl gas only, at a high flow speed (test No. 5). The reaction rate with HCl gas only is quite high.
6. Very little amount of iron is volatilised.
7. Most of the sulphur stays behind in the chloridised residue.

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RESULTS FOR CHLORIDISATION WITH 100% HCl GAS

The properties of the chloridised product with 100% HCl gas are found to be somewhat different from the rest of the chloridised products with H₂ and HCl gases. The chloridisation with 100% HCl gas gives a residue with about 35% metallic iron, which means that all the iron in the Mt. Bischoff tin ore is being transformed to metallic iron (% iron in raw ore = 36%). The chloridisation experiments with H₂ and HCl mixtures, on the other hand, do not give any metallic iron in the chloridised product. However, this finding is being further investigated, and confirmation of this result would be given at a future date.

(Signed)

S. Ghosh, M.Sc.(Chem),
Project Engineer.

Approved

(Signed)
W. A. Morgan,
President & Managing Director.

SG:jmt

GEO-MET REACTORS LIMITED

16 December 1963.

INVESTIGATION OF MOUNT BISCHOFF TIN ORE BY
FLOTATION, GRAVITY AND MAGNETIC SEPARATION.

INTRODUCTION

A series of laboratory scale tests were carried out on Mount Bischoff ores to determine the most selective frother for the serpentine or talc present in the ore. This work is a continuation of testing reported in March of this year in Geo-Met Progress Report No. 14.

Experimental Work

Details covering this work are recorded in the Appendix to this report.

The main purpose of this work was to determine what frother would be best suited to the removal of the talc or serpentine, from the Mt. Bischoff ore, removing only a minimum amount of cassiterite.

The following reagents were used:-

Syntex "N" (soap powder)
Aerofroth 65
Aerofroth 77
Aerofroth 80

Results

Table II of the Appendix, (page 10) shows the percent weight of talc concentrates floated, the assay value of Sn, and the percentage distribution of Sn. It appears from this work, that one cannot expect a low Sn content in a talc concentrate, when using a standard frother for flotation. The cassiterite may be slime coated (talc) and when only sufficient frother is used to float the talc, a proportion of the cassiterite is also floated.

Bischoff Test D-15 gives a distribution of the talc concentrate in the sub-sieve sizes. This shows the weight distribution down to 10 microns.

There is considerable concentration of cassiterite in the first three cones of the Haulbin Infrasizer. This is due chiefly to the specific gravity of the cassiterite and not so much to grain size. It is natural to expect this to happen, for the air flow through the Infrasizer is adjusted for the movement of quartz, having a specific gravity of 2.6, and not for cassiterite with a S.G. of 6.8 to 7.1. Some of the cassiterite appearing in the first cone or two could belong to the plus 28 micron cone or even the 20 micron cone.

This concentration of cassiterite indicates that separations of cassiterite might be possible in wet or dry cyclones, that is if flotation will not adapt itself to the problem.

The Mt. Bischoff ore used in this work was crushed to minus 20 mesh, and this was the material fed to the flotation cell. Size distribution on this flotation feed is given in Table I of the Appendix. In all tests it appeared that the talc was

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liberated at this mesh size. Grinding below 20 mesh would be required chiefly on the sulphides and a small percentage of quartz present.

This type of ore would readily lend itself to dry autogenous grinding in which the mill would be air-swept and concentration could possibly start in the dry cyclones following the grinding. Test D-16, was a 200 gram lot of talc concentrate passed through the Jones High Intensity Magnetic Separator, with 30 amp input. It was found that some 28% by weight of the material reported in the magnetic fraction, and was dark in colour, indicating sulphides present in the talc concentrates. The non-magnetic fraction was slightly higher in Sn than the heads.

In Test D-17, retains from talc concentrates (Tests 7-14) were conditioned with 2 grams of caustic soda and re-floated with the object of dropping out the cassiterite.

In Test D-18, the retains from Tests 7-14 tailings fraction, which consisted chiefly of pyrrhotite, were screened at 15 mesh. The minus 35 mesh fraction was fed to a Deister table which produced a concentrate assaying 3.48% Sn and containing some 75% of the cassiterite fed to the table. This table concentrate was in turn fed to a Jones High Intensity separator. The non-magnetic fraction assayed some 18.0% Sn and contained approximately 20% of the total cassiterite from the fee. There is little doubt that if further grinding had taken place, less tin would have appeared in the magnetic fraction and middlings from the Jones Separator.

The material used in Test D-19 consisted of combined talc flotation tailings, the plus 35 mesh material from Tests 7-14. The sands, which consisted chiefly of coarse pyrrhotite, were ground in a steel mill and then fed to a Jones High Intensity Separator with the power input set at 5 amps. This gave a magnetic fraction assaying 0.35% Sn in a weight distribution of 46%. The midds of the Jones contained some 54% of the total tin. Here again additional grinding is required to drop more tin into the non-magnetic fraction and increase the pyrrhotite pulled into the magnetic fraction.

Conclusions

Further work is warranted on Bischoff tin ore. It is felt that a talc concentrate could be made, without regard to the cassiterite content and then a further separation carried out either by gravity, cyclones or a combination of methods. The pyrrhotite concentrate should be subjected to additional grinding and stage separation by Jones High Intensity Magnetic Separator.

(Sgd.)

A. C. KING.

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Date: November 13, 1953.
No: Bischoff D-7
Purpose: To produce a talc concentrate with a minimum amount of cassiterite.
Feed: Bischoff Ore, crushed to minus 20 mesh.
Reagents: 1.0 lb/ton of Syntex "N", (soap powder).

PROCEDURE & RESULTS

1. The minus 20 mesh ore was fed direct to a Denver 2000 gram cell at 10% solids pH 7.2
2. Stage fed 1.0 lb per ton of (soap powder) Syntex "N" and floated off a talc concentrate in 6 minutes.
3. The balance of the pulp was designated rougher tails.
4. The concentrate produced in step 2 was cleaned once at a dilute density without the addition of further reagents.

Products	Wt. %	Assay % Sn	Dist. % Sn
Talc concentrate	13.05	1.56	17.44
Cleaner tails	4.38	0.87	2.45
Rougher tails	82.57	1.51	80.11
Heads (cal)	100.00	1.56	100.00

Date: November 13, 1963

Test No: Bischoff D-8

Purpose: To produce a talc concentrate with a minimum amount of cassiterite.

Feed: Bischoff Ore, crushed to minus 20 mesh.

Reagents: 1.0 lbs per ton Syntex "N".

PROCEDURE & RESULTS.

1. A total of 1000 grams of Bischoff ore crushed to minus 20 mesh was fed direct to a Denver 2000 gram flotation cell at 10% solid, pH 7.1
2. Added 1.0 lbs per ton of reagent Syntex "N" to cell, conditioned 5 minutes and then floated off a talc concentrate in 5 minutes.
3. The balance of the pulp was designated rougher tails.
4. The concentrate produced in step 2 was cleaned in a dilute pulp, without the addition of further reagents.
5. All products were dried, weighed and analysed for Sn.

Products	Wt. %	Assay % Sn	Dist. % Sn
Talc concentrate	12.28	1.17	9.69
Cleaner tails	8.38	1.69	9.55
Rougher tails	79.34	1.51	80.76
Heads (cal)	100.00	1.48	100.00

Date: November 14, 1963
Test No: Bischoff D-9
Purpose: To produce a talc concentrate with a minimum amount of cassiterite.
Feed: Bischoff ore, crushed to minus 20 mesh.
Reagents: 1.0 lbs per ton of Cyanamid Frother 65.

PROCEDURE & RESULTS.

1. A total of 1000 grams of Bischoff ore, crushed to minus 20 mesh, was fed to a 2000 gram Denver cell at 10% solids, pH 7.0
2. Stage fed 1.0 lb per ton of Frother 65 and floated off a talc product in 10 minutes.
3. The remainder of the pulp was designated rougher tails.
4. The talc concentrate produced in step 2 was cleaned once in a dilute pulp without the addition of further reagents.
5. All products were dried, weighed and analysed for Sn.

Products	Wt. %	Assay % Sn	Dist. % Sn
Talc concentrate	22.00	1.23	17.07
Cleaner tails	10.81	1.47	10.02
Rougher tails	67.19	1.72	72.91
Heads (cal)	100.00	1.59	100.00

Date: November 14, 1933

Test No: Bischoff D-10

Purpose: To produce a talc concentrate with a minimum amount of cassiterite.

Feed: Bischoff ore, crushed to minus 20 mesh.

Reagents: 1.0 lbs per ton of Aerofroth 65.

PROCEDURE & RESULTS.

1. A total of 1000 grams of Bischoff ore, all minus 20 mesh was fed direct to a 2000 gram Denver flotation cell at 10 percent solids, pH 6.5
2. Conditioned the pulp with 0.75 lbs per ton of Frother 65 and floated a talc concentrate in 6 minutes.
3. The remainder of the pulp was designated rougher tailings.
4. Talc concentrate produced in step 2 was cleaned twice in a dilute pulp, without the addition of further reagents.
5. All products were dried, weighed and analysed.

Products	Wt. %	Assay % Sn	Dist. % Sn
Talc concentrate	15.86	1.93	20.50
Cleaner tails	8.56	1.41	8.09
Rougher tails	75.58	1.41	71.41
Heads (total)	100.00	1.49	100.00

Date: November 14, 1963

I No: Bischoff D-11

Purpose: To produce a talc concentrate from a sample of Bischoff ore, containing a minimum of cassiterite.

Feed: Bischoff ore, crushed to minus 20 mesh.

Reagents: Aerofroth 77, 0.75 lbs/ton.

PROCEDURE & RESULTS.

1. A total of 1000 grams of Bischoff ore, all minus 20 mesh was fed direct to a Denver 2000 gram flotation cell at 10 percent solids, pH 6.
2. Stage fed 0.75 lbs per ton of Aerofroth 77 and floated talc concentrate in 5 minutes.
3. The remainder of the pulp was designated rougher tails.
4. The talc concentrate produced in step 2 was cleaned once in a dilute pulp.
5. All products were dried, weighed and assayed.

Products	Wt. %	Assay % Sn	Dist. % Sn
Talc concentrate	12.11	1.51	12.61
Cleaner tails	10.55	1.90	13.32
Rougher tails	77.34	1.38	73.57
Heads (calc)	100.00	1.45	100.00

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Date: November 15, 1963.
Test No: Bischoff ore D-12
Purpose: To produce a talc concentrate from a sample of Bischoff ore, containing a minimum of cassiterite.
Feed: Bischoff ore, crushed to minus 20 mesh.
Reagents: 0.30 lb per ton Aerofroth 77.

PROCEDURE & RESULTS

1. A total of 1000 grams of Bischoff ore crushed to minus 20 mesh was conditioned for 3 minutes with 0.30 lbs per ton of Aerofroth 77, pH 6.9
2. Floated a talc concentrate in 6 minutes.
3. The remainder of the pulp was designated rougher tails.
4. The product produced in step 2 was cleaned once in a dilute pulp.
5. All products were dried, weighed and analysed.

Products	Wt. %	Assay % Sn	Dist. % Sn
Talc concentrate	9.98	1.78	11.93
Talc cleaner tails	10.57	1.96	13.99
Rougher tails	79.45	1.33	74.08
Heads (cal)	100.00	1.48	100.00

Date: November 15, 1963.

T. No: Bischoff D-13

Purpose: To produce a cassiterite free talc concentrate from a sample of Bischoff tin ore.

Feed: Bischoff ore, crushed to minus 20 mesh.

Reagents: 0.30 lb/ton Aerofroth 80.

PROCEDURE & RESULTS.

1. A total of 1000 grams of Bischoff ore crushed to minus 20 mesh was fed direct to a 2000 gram Denver cell at 10% solids. pH 6.8
2. Conditioned the pulp with 0.30 lb per ton of Aerofroth 80 and floated a talc product in 6 minutes.
3. The remainder of the pulp was designated rougher tails.
4. Cleaned talc concentrate once in a dilute pulp.
5. All products were dried, weighed and analysed.

Results:

Products	Wt. %	Assay % Sn	Dist. % Sn
Talc concentrate	11.82	1.41	11.09
Cleaner tails	3.70	6.93	2.30
Rougher tails	84.48	1.54	86.61
Heads (cal)	100.00	1.50	100.00

Date: November 15, 1963.
Test No: Bischoff D-14
Purpose: To produce a cassiterite free talc concentrate from a sample of Bischoff tin ore.
Feed: Bischoff ore, crushed to minus 20 mesh.
Reagents: 0.20 lb/ton Aerosol
0.10 lb/ton Aerofroth 80

PROCEDURE & RESULTS.

1. A total of 1000 grams of minus 20 mesh Bischoff ore, was fed direct to a 2000 gram Denver cell at 10 percent solids. pH 7.0
2. Conditioned the pulp 10 minutes with 0.20 lbs per ton Aerosol, and 0.10 lb per ton Aerofroth 80, then floated a talc concentrate in 6 minutes.
3. The remainder of the pulp was designated rougher tails.
4. The product produced in step 2 was cleaned once in a dilute pulp.
5. All products were dried, weighed and analysed.

Results:

Products	Wt. %	Assay % Sn	Dist. % Sn
Talc concentrate	12.88	1.69	14.35
Talc cleaner tails	12.39	1.38	11.27
Rougher tails	74.73	1.51	74.38
Heads (cal)	100.00	1.62	100.00

Date: November 15, 1963.

Test No:

Purpose: Screen test on minus 20 mesh Bischoff ore for lab tests D-7 to D-14.

PROCEDURE & RESULTS.

TABLE I - Screen Test: Head Sample

Mesh size	Weight distribution	Cumulative % wt. dist.
plus 35	33.40	33.40
" 48	10.90	44.30
" 65	9.00	53.30
" 100	8.80	62.10
" 150	6.70	68.80
" 200	6.20	75.00
minus 200	25.00	100.00
Total	100.00	-

TABLE II - Results of Talc. Flotation.

Test No.	Product	Percent weight	Percent Ca	Dist. % Ca
D- 7	Talc conc.	13.05	2.03	17.44
D- 8	" "	12.23	1.17	9.69
D- 9	" "	22.00	1.23	17.07
D-10	" "	15.86	1.93	20.50
D-11	" "	12.11	1.51	12.51
D-12	" "	9.98	1.73	11.93
D-13	" "	11.82	1.41	11.09
D-14	" "	12.88	1.69	14.35

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REACTORS LIMITED

Date: November 13, 1963.

T. No: Bischoff D-16

Purpose: To determine the effects of submitting a sample of talc concentrate from Bischoff tests D-7 to D-14 to a Jones High Intensity magnetic separator.

Reagents: A total of 200 grams of talc concentrates were fed to a Jones High Intensity magnetic separator, with the power amperage set at full (30 amps)

PROCEDURE & RESULTS

Products	Weight percent	Assay % Sn	Dist. % Sn
Magnetics	28.30	1.30	15.49
Non-magnetics	71.70	2.30	84.51
Total	100.00	2.33	100.00

Date: November 18, 1963.

Test No: Bischoff D-17

Purpose: To depress cassiterite from a talc concentrate, Bischoff tin ore.

Feed: Retains from talc concentrate lab tests D-7 to D-14 inclusive.

Reagents: Caustic soda.

PROCEDURE & RESULTS.

1. A total of 300 grams of Bischoff talc concentrates were conditioned in a Denver flotation cell with 2 grams of caustic soda, at 10 percent solids. pH 11.6 Temperature 23°C.
2. Floated a talc fraction in 3 minutes which in turn was cleaned once at a pH of 9.8
3. The cleaner tails were the concentrate fraction and the float fraction was the discard.
4. Results in the following table.

Products	Weight percent	Assay % Sn	Disc % Sn
Floats (rejects)	71.34	1.86	67.60
Sinks (concentrate)	28.66	2.22	32.40
Total	100.00	1.95	100.00

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Date: November 18, 1963.

T No: Bischoff D-18

P - use: The recovery of free cassiterite from a Bischoff tin ore, at a coarse size.

Feed: The material used in this test was retains from lab test D-7 to D-14, flotation rougher tails, the minus 35 fraction only.

Reagents: Gravity and Jones High Intensity Magnetic separator at 5 amps.

PROCEDURE & RESULTS.

1. The retains from Bischoff lab tests D-7 to D-14 flotation rougher tails were screened at 35 mesh. The minus 35 mesh fraction was thoroughly mixed (some 3000 grams) and fed to a Deister Diagonal Deck concentrating table at a given rate. From this unit we obtained 3 products, a concentrate, a middlings and a tailings.
2. The midds and tails from the above step were dried, weighed and analysed for Sn. The concentrate was fed wet to a Jones High Intensity separator at 5 amps voltage.
3. Three fractions were obtained from the Jones magnetic fraction, a midds, and a non-magnetic fraction. All products were dried, weighed and analysed for Sn.

Total Results:

Products	Weight percent	Assay % Sn	Dist. % Sn
Deister table midds.	32.16	1.05	19.60
Deister table tails.	14.10	0.66	5.40
Jones magnetics	36.30	1.30	27.39
Jones midds.	15.62	3.13	28.33
Jones non-magnetics	1.62	18.18	19.73
Total	100.00	1.72	100.00

Deister table conc. 53.74% wt. 3.48% Sn. 75% Dist.

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Date: November 19, 1963.

Test No: Bischoff D-19

Process: To produce a high tin (cassiterite) fraction from a product obtained in lab tests D-7 to D-14.

Feed: The material used in this test was retains from lab tests D-7 to D-14, flocculation rougher tails, the plus 35 mesh fraction only.

Reagents: None.
Regrinding and Jones high intensity separator at 5 amps power input.

PROCEDURE & RESULTS.

1. The retains from the Bischoff tests, plus 35 mesh fraction only, were ground in a steel mill for 15 minutes at the required density, a total of some 2800 grams.
2. The ground pulp was fed to a Jones high intensity magnetic separator, with the power input set at 5 amps reading.
3. Three fractions were obtained, magnetics, a mids, and a non-magnetic product.
4. All products were dried, weighed and analysed for Sn.

Results:

Products	Weight percent	Assay % Sn	Dist. % Sn
Jones magnetics	45.91	0.35	9.99
Jones mids.	28.96	3.00	54.05
Jones non-magnetics	25.13	2.30	35.96
Total	100.00	1.61	100.00

GEO-MET INFORMATION MEMORANDUM

SUMMARY REPORT ON THE PRESENT STATUS AND
FUTURE DEVELOPMENT OF THE GEO-MET MILLING
AND CHLORIDISING PROCESS FOR THE TREATMENT
OF MOUNT BISCHOFF ORE

BY: W.A. MORGAN, B.Sc. , Ph.D
D.E. King, B.Sc.
S.K. Ghosh, M.Sc. (Chem.Eng)

GENERAL INTRODUCTION

This report summarises briefly the basic consideration applying to the beneficiation and extraction of tin from Mount Bischoff ore. The status of the research project sponsored by Mount Costigan Mines Limited is reviewed, and future work required to obtain the necessary design information for a commercial plant is outlined.

THE BENEFICIATION OF MT. BISCHOFF OREINTRODUCTION

A mineralogical examination and a series of six tests was carried out on a bulk sample of mineralised rock from Mt. Bischoff, Tasmania, on behalf of Mt. Costigan Mines Ltd., Ottawa. The object of this work was to examine some of the physical characteristics of the ore, and determine the possibilities for commercial recovery of the cassiterite.

Mineralogical Examination

The sample consisted chiefly of serpentine and pyrrhotite. Other minerals present were pyrite and chalcopyrite, both in amounts of a quarter of one percent or less, and the cassiterite which was disseminated in both serpentine and sulphide fractions. Some of the cassiterite also occurred with titanite.

Unfortunately, the mineralogical report does not give a clear statement on the cassiterite liberation size.

Grindability

The ore is friable and easy to crush and grind.

Separation Tests

The talc fraction contains about 75% of the tin in about 40% of the ore weight, while the pyrrhotite fraction contains the remaining 25% of the tin in about 60% of the ore weight.

The cassiterite is apparently finely disseminated, but much of it was liberated during the test work. This is evident from the results, although it would appear, from the low grades obtained, that much of the cassiterite remained attached to the main minerals.

The most highly magnetic fraction of the ore appears to contain a relatively low concentration of tin. For example, about 22% of the ore separated at low magnetic intensity contained only 2% of the total tin.

In a run using the Jones high intensity magnetic Separator, it was demonstrated that the tin tended to concentrate in the non-magnetic fraction. In addition, the non-magnetics were tabled and a tin concentrate of 34% Sn grade was floated from the table concentrate.

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Talc was easily floated using only a frother. In one test the talc float reject, comprising 25% of the weight contained only 12% of the tin. Likewise, a pyrrhotite float reject, amounting to 38% of the weight, contained only 13% of the tin. Thus, a total of 63% of the weight was rejected with a tin recovery of 75%. The tin-bearing "tails" ran 2-3% tin and comprised pyrrhotite and talc in a ratio of 2/1.

There is some indication that a higher pH in talc flotation reduces the loss of cassiterite. At a pH of 5.2 the floated talc contained about 30% of the tin, as opposed to 12% of the tin at a high pH.

DISCUSSION

No completely clean separations were made during the six mill tests on this ore. Nevertheless, the progress throughout the series was encouraging and the work revealed that good recoveries of tin might be made.

A further mineralogical examination of the coarse ore should be aimed at revealing cassiterite liberation size.

Selective flotation of the talc is the most desirable main separation to achieve. It floats readily with only a frother, but it carries some cassiterite with it. This might be free, in locked particles or in "smeared" particles. If talc and cassiterite are free a table flotation procedure might give the best separation. If they are present in locked particles further grinding may be necessary. If the talc has "smeared" the cassiterite perhaps conditioning during grinding would be effective.

Pyrrhotite is compatible with pyrometallurgical treatments and its presence is desirable to some extent. The optimum concentrations of pyrrhotite to suit pyrometallurgical operations are not yet known. Some of the pyrrhotite may be removed as a low intensity wet magnetic concentrate, while further removal may be effected by flotation.

Talc and pyrrhotite fractions may be separated fairly cleanly by high intensity wet magnetic separation. The two fractions may be separately treated if desirable.

Projections.

In the next phase of work the objective will be to reject as much talc and pyrrhotite as possible with a minimum loss of cassiterite.

In the case of talc flotation a weaker frother will be used, and at higher pH levels. Grind will also be investigated.

In the case of the pyrrhotite fraction, the effect of grind will be examined for both low intensity magnetic separation and flotation. The effect of depressants and pH will be examined in flotation tests.

With further work it would appear that about to 1 concentration ratio could be obtained with a recovery of better than 80% of the tin in the ore.

A portion of the tin in the talc fraction can be upgraded to a +30% tin concentrate.

This phase of the work will take approximately four weeks to complete.

Extraction Process

Conventional methods of extracting tin by means of concentration and smelting of a high grade concentrate should probably result in low recoveries of tin from the Mt. Bischoff ore because of the following factors:

- a) Much finely divided cassiterite is lost during concentration thereby resulting in a low recovery in the concentrate.
- b) Any concentrate from Mt. Bischoff ore will invariably contain a high amount of iron. Iron is one of the most undesirable elements in the smelting operation of tin concentrate.

Chloride Volatilisation Process as Applied to Mt. Bischoff

The main advantages of a chemical extraction process such as chloride volatilisation process, are:-

- a) Specific reactions can be carried out to selectively potacilise tin from the large mass of gangue and iron.
- b) The reation can be carried out to completion whereby nearly 100% extraction of the tin is obtained.
- c) Low grade concentrates and even mine-run ore, can be treated by this process thus eliminating major losses of tin and an expensive beneficiation process.

In the early consideration of this process, therefore, the work was aimed at determining :-

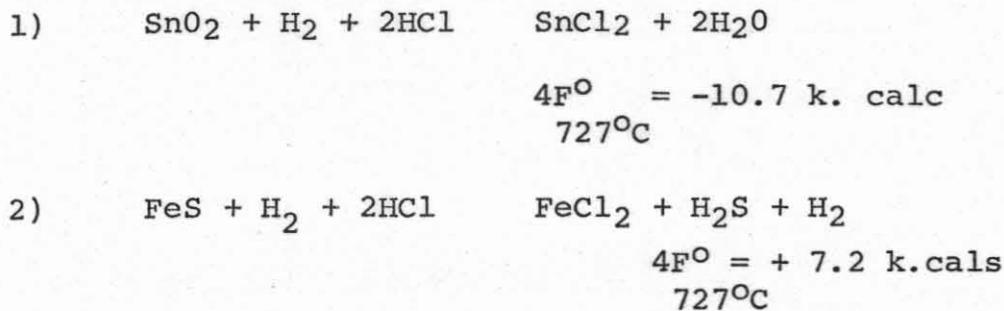
- a) A specific reaction for the selective chlorid-isation of cassiterite in the Mt. Bischoff ore,

and

- b) Suitable reaction conditions for maximum tin extraction with the minimum amount of energy and reagent consumption.

Specific Reactions for SnO₂ chloridisation

From the theoretical study of the thermodynamics of chemical reactions, it is found that certain chloridization reactions can be carried out in the Mt. Bischoff preferential chloridisation of SnO₂.



Thus, reaction of the Mt. Bischoff ore with H₂ + HCl at 727°C will chloridise the SnO₂, but the positive of 4F indicates that HCl will not react with FeS, major constituents of the ore.

The chloridisation of mine-run ore from Mt. Bischoff was therefore, carried out using HCl and H₂ + HCl mixtures.

Process

The process can be divided into three main stages as follows:

1. The chloridisation stage where the tin in the ore is liberated as a volatilised chloride with minimum quantities of tin remaining in the residue and minimum consumption of HCl and H₂.
2. The collection of the volatilised chloride and purification, if necessary, of the tin chloride. Several routes suggest themselves such as fractional distillation of the chloride or chemical precipitation of impurities.
3. Recovery of the tin from the tin chloride. This can be effected by electrolysis of the anhydrous fused chloride or an aqueous solution of the chloride, by hydrogen reduction of the chloride or chemical precipitation. In addition if it is required to simplify the process because of plant location the chloride could be steam hydrolysed to pure stannic oxide. In fact, this hydrolysis step could be applied directly to the chlorides evolved from the chloridisation reactor.

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Geo-Met Reactors Limited

APPENDIX

STUDY OF THE THEORETICAL COST OF
RECOVERING 1.5 TONS OF TIN FROM
100 TONS OF MOUNT BISCHOFF ORE
BY CHLORIDISATION AT 600°C.

Analysis of the Ore.

Sn	1.5 %
Fe	36.0 %
MgO	25.0 %
Al ₂ O ₃	4.0 %
SiO ₂	12.0 %
S	21.0 %

$$\text{Total} = (99.5 + 0.4)* = 99.9 \%$$

*Sn is present as SnO₂; thus, 1.5% Sn should contribute to 0.4% O₂ for SnO₂.

Assume all the sulphur is present as FeS (very small amount of FeS₂ is present).

Moles of Reactants per 100 gms of Ore.

SnO ₂	.0126	mole
FeS	.65	mole
MgO	.625	mole
Al ₂ O ₃	.04	mole
SiO ₂	.2	mole

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Capacity Data Used for Heat Calculations.

$$H = H_T - H_{298} = aT + bT^2 + cT^{-1} \text{ k.cals/gm mole}$$

	a ↓	b $\times 10^3$ ↓	c $\times 10^{-5}$ ↓
SnO ₂	17.66	2.40	-5.16
Al ₂ O ₃	27.38	3.08	-8.20
MgO	10.18	1.74	-1.48
SiO ₂ (up to 523°C)	11.22	8.20	-
SiO ₂	14.40	1.94	-
HCl	6.34	1.10	0.26
FeS () to 411°C	5.19	26.40	L.T. 570 cal (phase) (change)
FeS () to 598°C	17.40	-	
FeS from 598°C			

In the following calculations the coefficient C has been neglected. Its contribution to the H is very small.

Assumption in Calculation.

From the chloridisation experiments it is found that very small amounts of sulphur and iron comes off and the chlorine in the residue is very small. Hence, it is assumed that only SnO₂ reacts with the chloridising reagents.

Heat Required to Raise the Unchloridised Reactants
to 600°C (873 K).

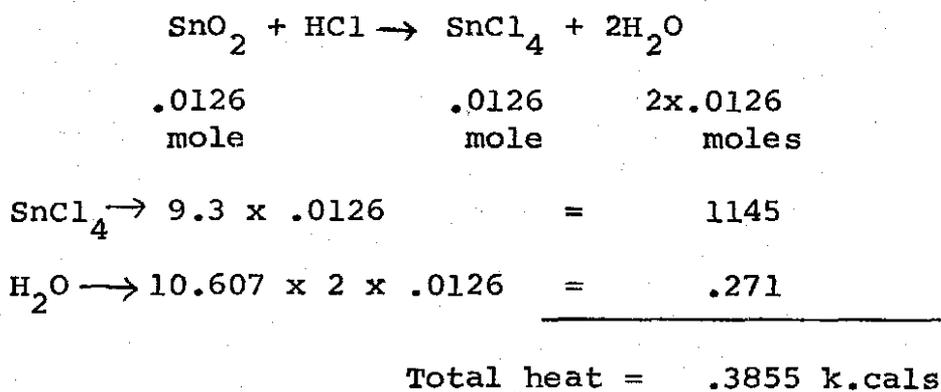
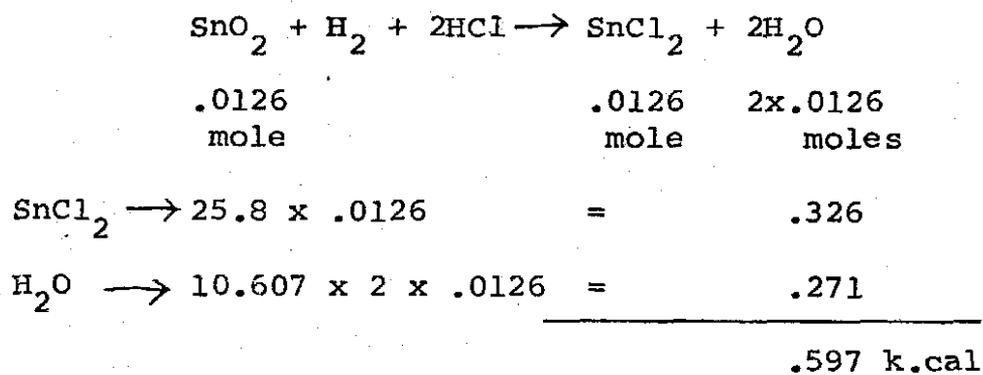
Compound ↓	Gm-Moles ↓	$H_{873} - H_{298}$	Heat required
FeS	.65	19038	12.360
MgO	.625	11650	7.280
SiO ₂	.2	9860	1.972
Al ₂ O ₃	.04	26240	1.049
			Total = 22.661
HCl	.1	6376	.6376*

(Take .1 mole HCl which is approximately twice the stoichiometric; amount for making SnCl₄ from .0126 mole of SnO₂).

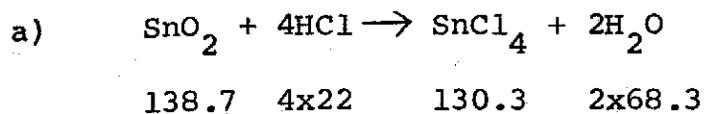
*This .6376 k.cals of heat required to raise .1 mole of HCl to 600°C is not added in the above table. This heat can easily be obtained from the chloridised hot residue. Also, if H₂ is used along with HCl, then heat required to raise H₂ to 600°C would be obtained from the chloridised residue.

NOTE: After this two different heat requirement values will be obtained depending on whether SnCl₄ or SnCl₂ is the product.

- a) assume with HCl only, SnCl₄ is the product.
- b) assume with H₂ + HCl, SnCl₂ is the product.

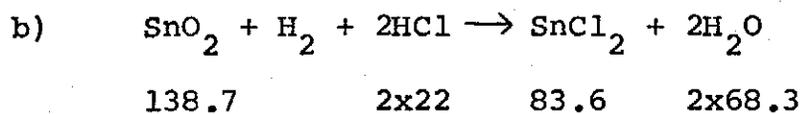
Heat of Vaporisation of Products at 298°K.a) For SnCl₄b) For SnCl₂

Heat Requirements for the Chloridisation Reaction
at 298°K.



ΔH_{298} for this reaction = -40.2 k.cals/mole

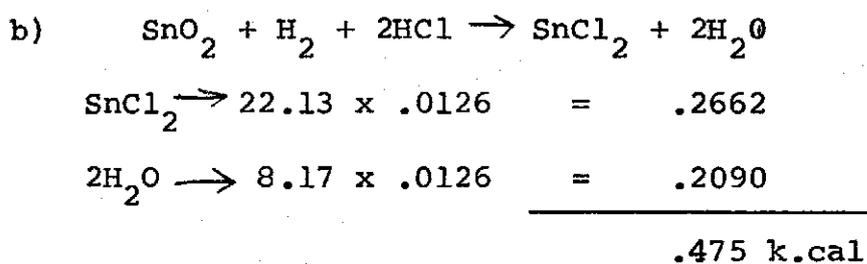
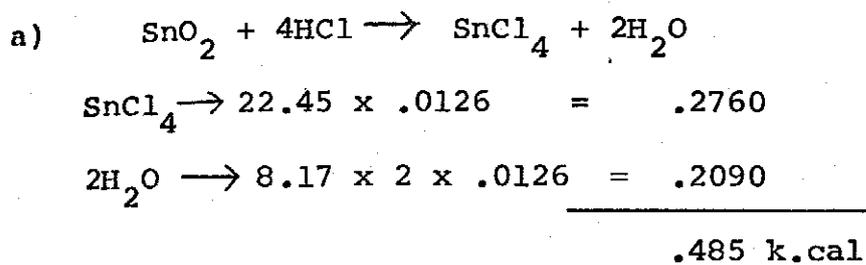
Total Heat Required for .0126 mole of SnO_2
 = .0126 x (-40.2) = -.5065 k.cal



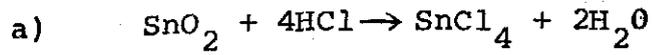
ΔH_{298} for this reaction = -37.9 k.cals/mole

Total Heat Required for .0126 mole SnO_2
 = .0126 x (-37.9) = -.4788 k.cal

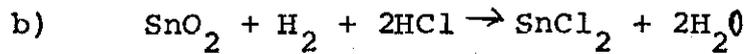
Heat Required to Raise the Products to 600°C
(873°K).



Total Heat Required to Chloridise 100 gms of Ore.



Heat required to raise the reactants to 600°C	=	22.661
Heat for vaporising the product at 298°K	=	.385
Heat required to raise the chloridised product to 600°C	=	.485
Heat of chloridisation reaction at 298°K	=	-.5065
		<hr/>
		23.025 k.cals



Heat required to raise the reactants to 600°C	=	22.661
Heat for vaporising the product at 298°K	=	.597
Heat required to raise the chloridised product to 600°C	=	.475
Heat of chloridisation reaction at 298°K	=	-.4788
		<hr/>
		23.254 k.cals

050

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Heat Requirements per 100 tons of Ore for Chloride
volatilisation Reaction

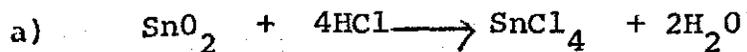
a) $\frac{23.025 \times 454 \times 100 \times 2240}{100 \times .252 \times 3415} = 27300 \text{ k.w.h.}$

Cost of power = $\frac{27300 \times .5}{100} = 136.5 \text{ dollars}$

b) $\frac{23.254 \times 454 \times 100 \times 2240}{100 \times .252 \times 3415} = 27350 \text{ k.w.h.}$

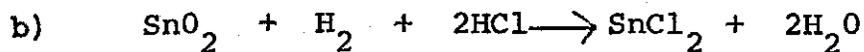
Cost of power = $\frac{27530 \times .5}{100} = 137.6 \text{ dollars}$

Assumed cost of power = .5 cents/k.w.h.

Reagents Required per 100 tons of Ore for Chloridisation

$$4 \times .0126 \times 36.5 \times 2240 = 4030 \text{ lbs of HCl}$$

$$\text{Cost} = 201.5 \text{ dollars (at HCl cost of 5 cents/lb)}$$



$$\text{HCl required} = 2015 \text{ lbs}$$

$$\text{H}_2 \text{ required} = 224 \text{ lbs}$$

$$\text{Cost of HCl} = 100.75 \text{ dollars}$$

$$\text{Cost of H}_2 = 22.4 \text{ dollars (at H}_2 \text{ cost of 10 cents/lb)}$$

$$123.15 \text{ dollars}$$

Power Required for Electrolytic Reduction of the Products From
100 Tons Ore

a) 410 amp.hr/lb tin is required.

Decomposition voltage of SnCl_4 for the production of Sn =
2.275 volts.

Power required for electrolysis of SnCl_4 from 100 tons of
ore

$$= \frac{410 \times 2.275 \times .0126 \times 118 \times 2240}{1000} = 3100 \text{ k.w.h.}$$

Cost of power = 16.5 dollars.

b) 205 amp.hr/lb tin is required.

Decomposition voltage of SnCl_2 is 1.4 volts at 300°C .

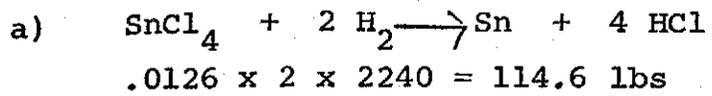
Power required for electrolysis of SnCl_2 from 100 tons of
ore

$$= \frac{205 \times 1.4 \times 10126 \times 118 \times 2240}{1000} = 955.9 \text{ k.w.h.}$$

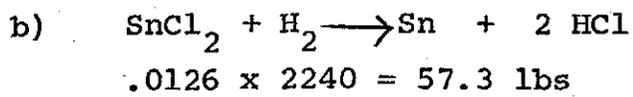
Cost of power = 5 dollars approximately.

053

Hydrogen Required for Reduction of SnCl₄ or SnCl₂



Cost of H₂ for reduction = 11.46 dollars



Cost of H₂ for reduction = 5.73 dollars

054

560292

Total Cost of Power and Reagents for Recovering 1.5 tons
of Sn (potential recoverable amount) from 100 tons of Ore

Reagents to be used	H ₂ + HCl
Hydrogen Reduction of SnCl ₂	
Heating	137.6
Reagents	123.15
H ₂ for Reduction	<u>5.73</u>
Total Cost	<u>266.48</u>
Cost/ton of ore	<u>\$2.66</u>

This cost of course does not include capital write off, labour and maintenance costs.

No credit has been given in these calculations for recovery and recirculation of reagents and heat.

Pyrrhotite roasted to pure iron oxide would be a valuable by-product. The iron content of the ore is about 33% and should be recovered without difficulty. The probable return for the iron oxide would be approximately \$6.00/ton of ore assuming a selling price for the pure oxide of about 10¢ short ton unit.

It should be borne in mind when relating the above costs to the summary of charges at the end of the report that they have been calculated on 1.5% Sn material, whereas the fixed charges and labour and overhead charges have been applied to the 0.5% Sn ore.

APPENDIX II

TENTATIVE COST ESTIMATE OF RECOVERING

TIN FROM MOUNT BISCHOFF ORES

Tentative Cost Estimate of Recovering Tin from Mount
Bischof Ores

Assuming operation @ 1000 tons/day of ore @ 0.5% Sn
Beneficiation ratio 4:1
200 tons/day concentrate assaying 1.5% Sn

1.	Capital cost of plant	<u>\$1,500,000</u>
2.	Depreciation @ 10%	150,000
3.	Annual interest & monetary procurement charges @ 7%	105,000
4.	Real estate, franchise, operational & other taxes on investment @ 3%	45,000
5.	Fringe benefits, insurance, plant protection et al @ 4%	60,000
6.	Repair & maintenance, legal, directors & other fees as percentage of plant investment @ 5%	<u>75,000</u>
		<u>\$435,000</u>
7.	Fixed charges/ton of ore	\$1.28

057

560295

Labour & Plant Operation

8.	Ore receipt & handling	2 man/shift 3 shifts	48
9.	Chloridisation reactor & roasting plant	3 man/shift 3 shifts	72
10.	Collection plant for chloride fume	3 man/shift 3 shifts	72
11.	Purification of chloride	2 man/shift 3 shifts	48
12.	Electrolysis of tin chloride	3 man/shift 3 shifts	72
13.	Electrode repair & casting of tin	6 man/day shift	48
14.	Supervising & clerical personnel	2 man/shift 3 shifts	48
15.	Repair & maintenance	3 man/shift 3 shifts	72
		Total	<hr/> 480
16.	Cost/day for labour @ \$2/hr	\$ 960	
17.	Managerial expenses & overhead @ 100% of labour	\$ 960	
18.	Total for labour & overhead	\$1,920	
19.	Labour & overhead per ton ore	\$1.92	

SUMMARY 1000 ton/day operation

Fixed charges per ton of ore	\$1.28
Labour & overhead per ton of ore	\$1.92
Reagents and power	<u>\$0.66</u>
Total charges per ton of ore	<u>\$3.86</u>

No credit has been given for recirculation and recovery of reagents and heat.

Potential Profit

Overall recovery of 80% of 0.5% Sn ore @ \$1.30 lb	\$10.40
Less metallurgical costs	<u>\$ 3.86</u>
Profit before mining & milling charges	<u>\$ 6.54</u>
Iron oxide recovery/ton ore	<u>\$ 6.00</u>
Total Potential profit/ton ore before mining & milling costs	<u>\$12.54</u>