Progress reports on exploration on S.P.L. 56, Arthur River district, north-western Tasmania during 1971

P.B. Nye, 1971

Mineral Holdings Aust. Pty Ltd

Contents

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PART 1

Report on operations on Special Prospecting Licence 56 during January, 1971

P.B. Nye

February, 1971

Mineral Holdings Aust. Pty Ltd

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REPORT ON OPERATIONS ON SPECIAL PROSPECTING LICENCE 56 DURING JANUARY, 1971.

The prospects, anomalies, formations, etc. in the Licence are as listed in the Report for December, 1970.

The operations on the Licence included -

Magnesite-Dolomite Body

Operations on this body are described in the report on E.L. 43/70.

Aero-magnetic Anomalies

No. 1 Prospecting operations in the area occupied by this anomaly have been completed. Descriptions are given under Iron Formations.

No. 2 The operations on this anomaly (and the Atlas leases) are described in the report on Licence 43/70.

No. 3 The operations included -

(a) Bull-dozing of a track into the area of the anomaly from the Arthur River Bridge.

(b) Bull-dozing south of the bend in the Arthur River to further expose the amphibolite dyke. The first trench exposed the dyke, but further bull-dozing was hindered by thick layers of fine-grained alluvial material. Further from the river a trench in a small gully exposed schists.

(c) Prospecting around the dyke yielded no additional information. Another dyke was found about 0.5 miles downstream.

(d) A visit was paid to the dyke by Messrs. Nye, Thomas and Pinner and a detailed examination of the dyke made.

The quartz-carbonate formation containing chalcopyrite proved to be a narrow and irregular vein and of no commercial importance. A sample has been sent for analysis to determine the minerals present.

The magnetite occurrence proved to be a narrow and irregular patch and not a vein.

Small amounts of chalcopyrite are present throughout the dyke.

(e) Representative samples from the dyke were assayed in the Department of Mines Laboratory with the following results -

Reg. No.	Sample No.	W. %	Sn. %	Cu. %
710023	D 1	0.01	Nil	0.02
4	D 2	0.01	Nil	0.03
5	D 3	0.01	Nil	0.02
6	D 4	0.01	Nil	0.02

Determinations by Minex, Melbourne were -

Sample No.	Bi. ppm	Sn. %	Cu. ppm	W. ppm
D 1	60	0.02	365	8
D 2	50	0.02	415	6
D 3	50	0.01	260	2
D 4	<10	0.02	335	3

Aero-magnetic Anomalies (Cont.)

(f) Prior to the above analyses, specimens of the dyke had been analysed by Spectrometer Services, Melbourne. One specimen gave 0.5% W. and 0.2%, Sn. A repeat gave 0.2% W. and 0.15% Sn. One determination by the Mines Department Laboratory also gave an anomalous result. It would appear that these results are due either to the irregularities of distribution of tungsten in the samples, or to some interference in the determinations by other elements.

(g) Analytical work by the Mines Department Laboratory and Spectrometer Services prove that magnetite is present in the dyke and tends to prove that ilmenite is not prominent.

The Iron Formations

(a) Searching and prospecting the surface were restricted as this phase is nearing completion.

(b) An outcrop was found near trench A 3. It consisted of limonite with some haematite and quartz, and is 70 feet long and 25 feet wide. Scattered outcrops of limonite are present between the above one and that in trench.A 4. These would be in the zone of the south-western extension from the Keith body.

(c) Further surveying was carried in order to check and fix the position of the creeks in this area.

(d) Mr. P. B. Nye continued to improve the map of the area. A copy is attached.

(e) Mr. P. B. Nye was interviewed by representatives of the following companies -

1. Kathleen Investments (Mr. Edyvean).
2. C.R.A. (Mr. Pattison).
3. Toyomenka (Australia) Pty. Ltd. (Messrs. Hense and Martin).

(f) Representatives of the following companies visited the field.

1. Kathleen Investments (Mr. Edyvean). Mr. Edyvean sampled the iron formations.
2. C.R.A. (Messrs. C. L. Knight and Pattison) (second visit).
3. Tokomenka (Australia) Pty. Ltd. (Mr. Martin).
4. United States Steel (Mr. Hase).

(g) Messrs. Nye and Thomas visited the formations and examined many of the outcrops and track.

Basalt was found on the main trench about five chains to the south of trench A 9.

(h) The analysis of the sample of magnetic pieces from the Red Soil area (see December report) was received. The Davis Tube test recovered 50% by weight. The assay results were -

Iron %	Titanium %	Ni. %
66.8	0.19	0.01

The magnetic material is therefore magnetite.

The Iron Formations (Cont.)

(i) The results of analyses of seven samples from the Keith body and two from one part of the south-western extension were received, and are given below:-

Reg. No.	Location and Sample No.	% HCI Sol. Fe.	% Cu.	% Zn.	% Pb.
710121	Lightfoot Ridge No. 1	34.0	0.04	Tr.	0.02
710122	No. 2	37.2	0.04	Tr.	Nil
	New Keith Body				
710123	No. 1	22.0	Tr.	0.02	"
710124	No.2	52.9	0.04	0.01	"
710125	No. 3	36.8	0.03	Tr.	"
710126	No. 4	43.4	0.04	Tr.	"
710127	No. 5	44.9	0.03	Tr.	"
710128	No. 6	28.2	0.03	Tr.	"
710129	No. 7	30.9	0.02	Tr.	"

(j) Two companies, one Australian and one overseas, are interested in the iron formations, and discussions are in progress with Mineral Holdings Australia in regard to a partnership agreement.

PBNye

P. B. Nye

Melbourne

2nd February, 1971.

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PART 2

Report on aero-magnetic anomaly No. 3 and the associated amphibolite dyke, S.P.L. 56, Arthur River district, north-west Tasmania

P.B. Nye

February, 1971

Mineral Holdings Aust. Pty Ltd

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REPORT ON AERO-MAGNETIC ANOMALY NO.3

AND THE ASSOCIATED AMPHIBOLITE DYKE, S.P.L. 56,

ARTHUR RIVER DISTRICT, NORTH-WEST TASMANIA

1. Introduction

In July and August, 1970, copies of maps showing the results of aero-magnetic surveys made in 1956 were supplied by Pickands Mather (geological map with magnetic contours) and by Conzinc Riotinto Australia (flight lines and magnetic contours). The results were shown by magnetic contours, and several weak anomalies (highs) were present on, and near, S.P.L. 56. One of these was situated at a sharp bend in the Arthur River about 1.5 miles west from the old Victory mine workings or a slightly greater distance from the nearby bridge over the Arthur River.

On referring to the geological report and map (McNeil, 1960) covering the bend in the river, it was found that an amphibolite dyke cropped out at the bend, and that it has a strike similar to that of the anomaly. The dyke was reported to contain ilmenite and it appeared that the dyke was the feature giving rise to the magnetic high.

The anomaly was termed the No.3 anomaly and the area of the anomaly and the dyke have been prospected and examined.

2. Location and Access

The area under review is situated about 22 miles to the south-west of Wynyard on the northern coast of Tasmania.

Access is gained by road from Wynyard; and also from the port of Burnie. The two roads join at Yolla and from a place about 2.3 miles south-west from Yolla, a branch road runs in a west-south-westerly direction through Takone and West Takone to a bridge over the Arthur River. The branch road is sealed to Takone, and is macadamised from there to the Arthur bridge.

3. Previous Literature

The following reports deal with the whole or a part of the area under review

Montgomery, A.	Mineral Fields of the Gawler Range etc., Tas. Sec. Mines Report 1895-96.
Nye, P.B.	Geological Report on the Hydro-Electric Water Conservation Scheme on the Arthur River, Tas. Mines Dept. 1924 (typewritten)
McNeil, R.D.	Geological Reconnaissance of Part of the Arthur River Area, Tas. Dept. Mines Tech. Report No.5, 1960.

4. Geology (See Plate 1)

Amphibolite Dyke

The amphibolite dyke crops out on the southern bank of the sharp bend in the Arthur River. It extends for 30 to 50 feet under water to the north-north-east, but further north it can be seen to be overlain by basal Permian rocks. On the southern bank, the amphibolite crops out for a length of about 50 feet to the south of river. (the water level in the river determines how much can be seen).

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<u>Amphibolite Dyke</u> (Cont.)
It is then overlain by alluvium, but a bull-dozed trench exposed it about 50 feet further south. The dyke is about 8 feet wide and has a general north-north-easterly strike.

<u>Precambrian</u>
To the east of the dyke at the river bend, Precambrian mica schists crop out for a short distance. Schists occur also on the western side of the dyke and on the western banks of the river downstream from the bend. They can be seen cropping out on the eastern bank downstream from the bend. Schists have been exposed in a bull-dozed trench in a small gully about 150 feet south from the river; these schists are apparently on the eastern side of the dyke. The schists are mica schists. The schistosity strikes at 20°.

No contact between the schists and the amphibolite is seen. The strike of the amphibolite and the schists are the same (about 20°). The amphibolite is, however, regarded as a dyke.

<u>Permian</u>
To the east of the amphibolite and the schists at the bend, Permain rocks overlie the schists unconformably. At this place, the unconfirmity strikes about 335° and dips north-easterly at about 10°. The Permian strata have similar strikes and dips. To the west of the above outcrop the Permian strata and the unconformity can be seen underwater for 200 to 300 feet. As it is followed to the west, the strike of the unconformity becomes more westerly.

In the outcrop, the Permian rocks are tillites or glacial conglomerates and contain numberous small pebbles. They represent the basal beds of the Permain system. McNeil (1960) mapped the Permian rocks as extending in every direction except to the north and north-west. He correlated the basal beds with the Wynyard Tillite, but did not report the nonconformity at the river bend, probably because it is visible only when the river level is low.

McNeil mapped a probable fault slightly to the east of the dyke, but this was neither seen nor searched for.

In 1924, the writer reported that Permian rocks were present along the northern bank from the river bend to near the old Victory mine workings.

<u>Alluvium</u>.
Alluvium occurs along the southern bank of the Arthur River, between the river bend under review and the Arthur bridge. In 1895-96, the alluvial terraces were visited by Montgomery who inspected the operations of the Campbell Hydraulic Gold Mining Company. Numerous shafts were sunk to the gravels and a water race was started, but it is doubtful if any actual sluicing for gold was conducted.

5. <u>The Amphibolite Dyke</u>

The dyke crops out on the south bank of the Arthur River at a sharp bend, 1.5 miles downstream from the Old Victory mine workings. The dyke extends to the north for 40 to 50 feet under the river. It also extends about 50 feet south from the river (that is, the water level at January, 1971) and has been exposed about 50 to 100 feet further south in a bull-dozed trench.

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5. <u>The Amphibolite Dyke</u> (Cont.)

The strike of the dyke is north-north-easterly.

The rock was petrologically examined by G. Everard whose description is included in McNeil's 1960 report. It is described as Specimen II situated $1\frac{1}{2}$ miles downstream from the Victory mine.

"Medium to fine-grained, somewhat sheared, greenish grey rock with disseminated pyrites. The specimen sparkles with the cleavage faces of innumerable minute felspar crystals. Lineation is shown by acicular hornblende and elongated opaque white grains.

In thin section a granoblastic and glomerablastic texture is shown similar to that of No.I except that the proportion of felspar to ferromagnesians is higher. The felspar grains, moreover, are larger and freer from inclusions which consist of fine hornblende needles and indicate rotation and recrystallisation in the same way as in No.13. Ilmenite is fairly common, but there is much more opaque white leuxocene in irregular elongated grains and brown hematite. Much of the green, strongly pleochroic, hornblende has been altered to fine granular carbonate.

The rock is an albitised amphibolite, the amphibolite of which has been largely carbonated."

Specimens can be gathered showing the white elongated grains and the shining crystal faces, and that the rock is more or less greenish grey. Away from the river's edge, the rock appears to be fresher and is of a bluish colour. In the bull-dozed trench the rock is bluish and is slightly coarser in grain than that near the river. In the fresher rock in particular, there are numerous shining triangular faces of a black mineral (see below for identification).

The dyke contains a few very narrow veins of quartz or of quartz and carbonates (see Plate 2). Some veins and particularly the quartz-carbonate ones, contain chalcopyrite and a whitish sulphide (probably a pale pyrite). Near the eastern side of the dyke (sample OE) there is a small and narrow irregular body of magnetite with some pale pyrite, quartz and a hard carbonate-like mineral. Several feet to the west there is another small irregular body (sample ON) up to 6 inches wide containing a hard pinkish mineral, quartz, a little carbonate, pyrite and chalcopyrite with a little malachite. A small amount of pyrite and chalcopyrite is present at intervals throughout the dyke, but it cannot be determined definitely whether the sulphides are disseminated or associated with minute veins, but the latter is the more likely mode of occurrence.

A specimen from Sample OE was sent to the Mines Department Laboratory, Launceston for determination of the magnetic mineral. The results (Reg. No. 703141) were that the Davis Tube test yielded 40.0% by weight of magnetics and that the mineral was magnetite.

Later a sample of the amphibolite was sent to Spectrometer Services Melbourne and, amongst other determinations, it was asked that a magnetic concentrate be made and the concentrate analysed for iron and titanium. A result of 66% metallic iron (all acid soluble) was obtained. If all the iron is contained in magnetite there would be a content of 91% magnetite in the concentrate. As the magnetic concentrate contained some rock, there could not, therefore, be much ilmenite present. The titanium in the magnetic concentrate was not determined, but in a silicate analysis of the amphibolite (see Table I) the TiO_2 content was determined as 2.6% If all this was contained in ilmenite, the ilmenite content would be no more than 4.6%.

5. The Amphibolite Dyke (Cont.)

Later, the Mines Department, Launceston is investigating Sample D4 (Reg. No. 710026) which was a representative sample from the amphibolite, found that the heavy black mineral was magnetite.

It would appear from the above investigations and determinations that the magnetic mineral in the amphibolite is magnetite and that there can be little ilmenite present. The shining triangular crystal faces are therefore almost certainly the octahedral faces of magnetite crystals.

Earlier in this section of the report, the veins in the amphibolite were described and references were made to a hard carbonate-like mineral in sample OE and to a hard pinkish mineral in sample OW. There is some carbonate in both bodies but, especially in sample OW, much of the mineral is too hard to be a carbonate. In a sample from OW sent to the Mines Department, Laboratory, Launceston, the result (Reg. No. 710139) was a loss on ignition of 2.2%. The main mineral present was therefore not a carbonate. From its hardness (6 to 7) and colour (pinkish) the mineral could be a felspar, but further determinations to establish the identity of the mineral may be arranged.

6. The Aero-Magnetic Anomaly

The contour map of the results of the aero-magnetic survey revealed an anomalous zone near, and over, the sharp bend in the Arthur River already referred to in this report; the anomalous zone was termed the No. 3 Anomaly.

The anomaly has an amplitude of about 163 gammas and is therefore a comparatively weak one. The strike of the anomaly is north-north-easterly. The axis of the anomaly is a short distance to the east or south-east of the sharp bend in the river.

An examination of the map in McNeil's 1960 report showed that an amphibolite dyke was present at the sharp river bend and had a strike similar to the axis of the anomaly. As already stated in Section 5, the dyke was reported to contain ilmenite, a magnetic mineral. However, the investigations and analyses in Section 5 proved that the amphibolite contained magnetite and almost certainly much more magnetite than ilmenite.

The only other rocks present near the sharp river bend are Precambrian schists, Permian tillites, mudstones, etc., and river alluvium and gravels. These rocks would not be as magnetic as the amphibolite. It seems therefore that the amphibolite dyke with its content of magnetite and ilmenite, must be the geological feature giving rise to the No.3 Anomaly. Moreover, the axis of the anomaly is in a similar position in relation to the amphibolite dyke, as the Anomaly No.1 is to the Track Formation (containing magnetite, hematite, pyrite and limonite).

The dyke crops out over only a short distance, its possible northerly and southerly extensions being covered by Permian rocks. The highest part of the anomaly corresponds with the outcropping portion of the dyke (see Plate 1 attached).

7. Economic Geology

There are no mineralised formations in the area of the No. 3 aero-magnetic anomaly, but some consideration has to be given to the amphibolite dyke because it contains some minerals of economic importance. Most of these minerals are normal components of the rock, but one at least may have been introduced by mineralising solutions.

A silicate analysis of the amphibolite was made and the results are shown on Table I. Other analyses were made and the results are shown in Table II. The reasons for the analyses; and especially those in Table II will be discussed when dealing with the mineral under review.

The minerals to be considered are ilmenite and magnetite and those of copper and tin and tungsten. The different minerals and metals will be considered separately below.

Ilmenite
Ilmenite was reported in the microscopic analysis by Everard quote in McNeil (1960) in Section 5. However, the investigations and alayses described in Section 5 indicate clearly that the ilmenite content must be small (not more than 4.6%), and that most of the oxide mineral must be magnetite.

A content of even 4.6% of ilmenite is much too small to render the amphibolite of any use for the production of ilmenite.

Magnetite
The magnetite content of the amphibolite was not determined, but some idea of the content can be obtained. The silicate analysis in Table I shows that the rock contains 16.8% of ferric oxide. This would no doubt contain a part or the whole of the iron in the magnetite, ilmenite, ferro-magnesium silicates, pyrite and chalcopyrite. The amount of iron in the minerals is not known, but it is most unlikely that even half of the iron is in magnetite, and the magnetite contant is therefore likely to be not more than say 7% and to be probably less than 7%. Such a content of magnetite would not make the rock a low grade iron ore. Even if all the iron content (ferric oxide 16.8%) were considered, the rock would be too low grade for an iron ore. Moreover, the rock being composed of silicates would not be acceptable as an iron ore in comparison with ores composed mainly of iron oxides.

Copper
As described in Section 5, the amphibolite contains short and narrow veins of quartz, carbonates, and perhaps felspar, and that pyrite and chalcopyrite are present in such veins. In addition, pyrite and chalcopyrite appeared to be disseminated in the rock, but it cannot be definitely stated whether such is the case or whether the sulphides are parts of minute veins. The distribution of the veins along the line sampled in D1 to D4 is shown on Plate 2 (attached).

At an early stage in the investigation, it was considered that the copper content would possibly justify investigation. Largely for this reason, representative samples were taken across the dyke and analysed. Other analyses were made and all results are given in Table II. The results of the copper determinations are listed below in Table III.

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Table III

Analyst	Type of Sample	Sample Reg. No.	Sample No.	Results p.p.m.
Spectrometer	A few pieces		No.1	100
Services	" " "		No.3	140
Minex	Representative	71-08	D.1	365
"	"	"	D.2	415
"	"	"	D.3	260
"	"	"	D.4	335
Tasmanian	"	710023	D.1	200
Mines	"	710024	D.2	300
Department	"	710025	D.3	200
Laboratory	"	710026	D.4	200
"	Composite of above four		Composite of D1 to D4	200
Minex	1 piece		TMT 1	500
"	1 piece		TMT 2	100
"	1 piece		TMT 3	300
"	1 piece		TMT 4	900

The copper contents therefore range from 100 to 900 parts per million. For the representative samples however, the copper contents range from 200 to 415 parts per million and average 275 p.p.m. or 0.0275%. This content is, of course, much too low to consider the amphibolite as a copper ore.

Tungsten and Tin
A sample (No.1) of the amphibolite was submitted to Spectrometer Services, along with another from a different locality, for "scanning". The results were received, but a statement about their magnetism was thought to indicate that the two samples may have been wrongly identified. Another sample (No.3) of the amphibolite was submitted. No's 1 and 3 samples consisted of a few pieces only.

The results of No.3 sample included high contents for tungsten and tin in comparison with those for No.1 sample (it was subsequently decided that the first two samples were not confused). High values were obtain in repeated determinations on the No.3 sample.

Four representative samples, each across 21 feet were taken and submitted to the Tasmanian Mines Department Laboratory and Minex Analytical Laboratories. The results were low and comparable with the No.1 sample; except that for one sample (D4) an anomalous result was obtained by the Mines Department Laboratory by one method. Other methods gave the low results shown in Table II (attached) and in Table IV below.

The anomalous results were caused either by the irregular distribution of the tungsten and tin in the samples or by some factor associated with a method.

The first anomalous values were tungsten 0.5% and tin 0.2 to 0.3% approximately. Subsequent determinations on the same sample gave values for tungsten of 1000 to 2000 p.p.m. and for tin of 1000 to 1500 p.p.m.

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All other determinations of tungsten ranged from 2 to 100 p.p.m. and for tin from nil to 200 p.p.m., that is, tungsten up to 0.01% and tin up to 0.02%.

All determinations are given in the following Table IV

Table IV

Analyst	Type of Sample	Sample Reg. No.	Sample No.	Results W ppm	Sn ppm
Spectrometer	A few pieces		No.1	∠15	∠15
Services	" " "		No.3	5000	2000to 3000
"	" " "		No.3 (repeat)	2000	1500
Minex	Representative	71/08	D.1	8	200
"	"	71/08	D.2	6	200
"	"	71/08	D.3	2	100
"	"	71/08	D.4	3	200
"	1 piece		Part of No1	48	300
Tasmanian	Representative	710023	D.1	100	Nil
Mines	"	710024	D.2	100	Nil
Department	"	710025	D.3	100	Nil
	"	710026	D.4	100	Nil
Laboratory	Composite of above four		composite	100	Nil
Minex	1 piece		TMT 1	7	200
"	1 piece		TMT 2	2	200
"	1 piece		TMT 3	2	200
"	1 piece		TMT 4	16	200

It is clear that the normal values in representative samples for tungsten (up to 0.01%) and tin (up to 0.02%) are much too low for the amphibolite to be considered as an ore of those two metals. Moreover, such low contents probably mean that the two metals are not present as separate minerals, but are present in the composition of other minerals, which would make the rock even more unattractive as an ore.

8. Conclusions

Aero-magnetic anomaly (high) No.3 is present on the magnetic contour map and is situated over a sharp bend in the Arthur River, slightly more than 1.5 miles west from the Arthur River bridge.

It is considered that the geological feature causing the anomaly is an amphibolite dyke cropping out on the southern bank of the river at the sharp bend. The dyke is 84 feet wide and is known along a length of about 150 feet on the south bank and visible underwater for about 50 feet. The dyke and the anomaly strike north-north-easterly. To the north, the dyke is overlain by basal Permian rocks and to the south it is overlain by Permian rocks (probably the basal beds). The magnetism of the dyke is caused by its content of magnetite and perhaps some ilmenite.

8. <u>Conclusions</u> (Cont.)

The amphibolite dyke is a rock but it contains two accessary minerals that are minerals of economic importance, and may have been slightly mineralised, and the different minerals will be considered.

The amphibolite dyke contains ilmenite and magnetite as accessory minerals. The ilmenite content is small (Less than 4.6 per cent) and the rock cannot be regarded as an economic source of ilmenite. The magnetite content is somewhat greater, but the total ferric oxide content of the rock is only 16.8% and the rock cannot be considered as an iron ore.

Very narrow veins and small lens are present in the amphibolite and possibly represent mineralisation. The veins contain usually quartz, carbonate, felspar(?), pyrite and chalcopyrite. The small lenses contain the same minerals and also magnetite. The veins and the amphibolite cannot be considered as copper ore because the samples taken contain only 0.01 to 0.04% copper.

The tin and tungsten contents of numerous specimens and samples were investigated because high anomalous values for these two metals were obtained from one specimen by one method. Later, an anomalous value was obtained from one sample by one method.

However, values for all other specimens and samples were low, particularly when appropriate and accurate methods of analysis were used. It seems probable that the anomalous values were due to irregularity of the distribution of the minerals containing tin and tungsten, in the specimens and samples. It is clear that neither the amphibolite dyke nor a small lens contain tin and tungsten in amounts of economic importance.

The "scanning" of specimens showed that many other metals were present, but only in extremely small amounts, none of which were of economic importance.

P.B. Nye

<u>P.B. NYE</u>

Melbourne
28/2/1971

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Table I

Silicate Analysis.

	per cent	
SiO_2	46.8	
Al_2O_3	12.3	
Fe_2O_3	16.8	
CaO	4.15	**Analyst**
MgO	6.05	Spectrometer
Na_2O	~~3.40~~	Services
K_2O	0.40	
MnO	0.32	
TiO_2	2.62	
	92.82	

Table II

	Spectrometer Services			Minex Analytical Laboratories									Tasmanian Mines Dept. Laboratory				
Tin	15	2000 to 3000	1500	300	200	200	100	200	200	200	200	200	0	0	0	0	0
Tungsten	15	5000	2000	48	8	6	2	3	7	2	2	16	100	100	100	100	100
Arsenic	30																
Antimony	30																
Iron	1%		1%														
Niobium	15																
Copper	100		140		365	415	260	335	500	100	300	900	200	300	200	200	200
Lead	15		74														
Zinc	900		360														
Nickel	10																
Cobalt	40																
Molybdenum	5		5														
Bismuth	5				60	50	50	10	130	130	130	130					
Beryllium	2																
Manganese	3000		2000 and 5000														
Chromium	100																
Vanadium	500																
Silver			1														
Sample	No.1	No.3	No.3		D.1	D.2	D.3	D.4	TMT 1	TMT 2	TMT 3	TMT 4	D.1	D.2	D.3	D.4	Composite of D.1 to D.4

All results are in parts per million (p.p.m.) unless otherwise shown.

SUPPLEMENT

After the report on the No.3 Anomaly and the Amphibolite Dyke had been completed, a certificate was received from Spectrometer Services Pty. Ltd. giving the results of a spectrographic analyses of two specimens from the amphibolite dyke area.

It was considered desirable to prepare this supplement and to attach it to the report so that all analyses would be presented at the same time.

Two specimens, one of the amphibolite and the other of schist, were collected by Director, N.M. Thomas on 13th January, 1971 and subsequently submitted to Spectrometer Services for "scanning". They will be referred to as specimens No.4 and 5 respectively.

The results are given in the Table V attached to this Supplement. The results for Samples 1 and 3 are also included in the table.

The results for Specimens No.4 and 5 show that the contents of the metals are small and that the rocks are of no economic importance for those metals.

The results from Specimen No.4 are very similar to those from Sample No.1 The highest values in each are copper, zinc, manganese vanadium and iron. This correlation suggests strongly that both are from the same rock, namely amphibolite. In other words, Sample No.1 was an amphibolite and as stated in the Report, there was no confusion between the samples (No.1 & 2). Moreover, it will be noted that the results of Sample No.2 (limonite) in Table II differ from those of Samples No.1 & 4.

The high results for tin and tungsten in Sample No.3 in Table V are some of the anomalous ones on that sample that led to arrangements being made for so many analyses of the amphibolite.

PBNye

P.B. NYE

Melbourne
15/3/1971

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TABLE V

	Amphibolite (Specimen No.4)	Schist (specimen No.5)	Amphibolite (Sample No. 1)	Amphibolite (Sample No. 3)
Copper	350	25	100	
Lead	70	10	15	
Zinc	330	180	900	
Nickel	10	30	10	
Cobalt	50	50	40	
Tin	10	20	<5	1500
Tungsten	<15	<15	<15	2000
Molybdenum	2	2	5	
Bismuth	<5	<5	<5	
Arsenic	<30	<30	<30	
Antimony	<30	<30	<30	
Beryllium	<2	<2	<2	
Manganese	2000	2000	3000	5000
Chromium	40	40	100	
Vanadium	400	400	500	
Iron	>1%	>1%	>1%	>1%
Niobium	<15	<15	<15	1
Silver	1	1		

All results in parts per million unless otherwise indicated.

7610118

018 PLATE 1.

761019

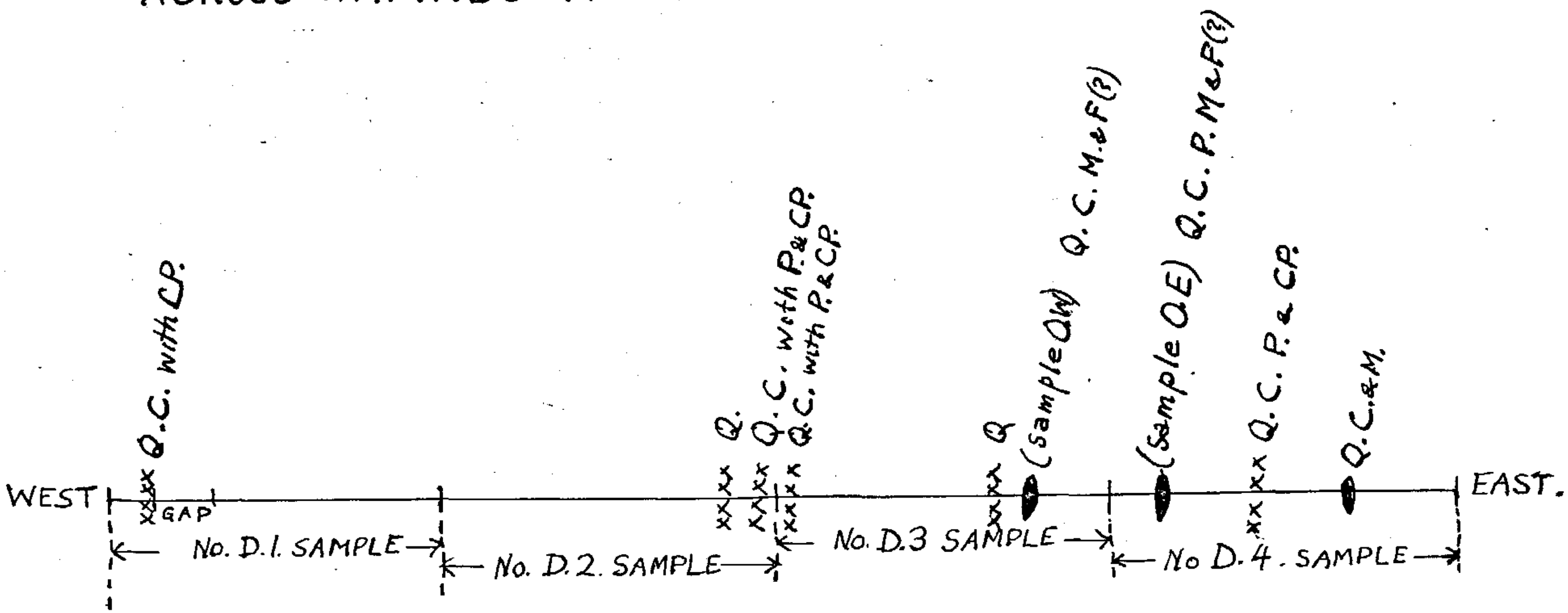
ANOMALY No. 3.

SCALE
1 INCH TO 5 CHAINS.
30

Geology based on McNeil (1960) with modification.

9/11/70

DETAILS OF SAMPLES ACROSS AMPHIBOLITE DYKE.



LEGEND

Vein (narrow)	xxxx
Lens (small)	(lens symbol)
Quartz	Q.
Carbonate	C.
Felspar	F.
Pyrite	P.
Chalcopyrite	CP.
Magnetite	M.

SCALE
1 inch to 10 feet

NOTE Samples QW & Q.E not included in Samples D.3 & D.4. respectively.

5 cm

A Belye 28/2/71

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PART 3

Third report on the magnesite-dolomite deposit near the former New Victory mine, Arthur River district, north-western Tasmania

P.B. Nye

March, 1971

Mineral Holdings Aust. Pty Ltd

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THIRD REPORT ON THE MAGNESITE-DOLOMITE DEPOSIT

NEAR THE FORMER NEW VICTORY MINE, ARTHUR RIVER DISTRICT,

NORTH-WESTERN TASMANIA

1. Introduction

The following two reports on the above deposits were prepared at earlier dates.

Report on the New Victory Mine and the Adjacent Magnesite-Dolomite Body, Arthur River District, North-Western Tasmania, 29th June, 1970.

Supplementary Report on the Magnesite-Dolomite Deposit, Arthur River District, North-Western Tasmania, 26th November, 1970.

Since the last report, some further investigations have been made, and additional information obtained. The third report will describe the investigations and information obtained, and will deal briefly with the possible utilisation of the material in the deposit.

2. Bull-dozing near the Victory Outcrop

In order to test any northerly extension of the body of magnesite, in this Outcrop, some bull-dozing was done to the north of the outcrop. The steep slopes of the hill made conditions difficult for bull-dozing, and only one excavation could be made.

The excavation proved that magnesite occurs at least 15 feet to north of the outcrop and to a height of about 30 feet above that outcrop. Higher than, and to the north of, the most northerly exposure of magnesite, there is a whitish and completely weathered rock that probably represents the pyroxenite near the old mine workings. The magnesite appears to finger out into the weathered rock, with one small isolated body slightly to the north of the fingers of magnesite.

The above structure is in agreement with the fact that no outcrop of magnesite (or magnesite-dolomite) has been found between the Victory and Main Outcrops. It is an open question as to whether there is any extension at depth between the two outcrops. It would appear that the northernmost exposure in the bull-dozed excavation is not quite as far north as the place to which the "dolomite" in the old mine workings was proved to extend, but this cannot be checked by direct measurement as the old mine workings have collapsed. Drilling would be necessary to test if there is any underground extension between the Victory and Main Outcrops.

3. Contouring the Main Outcrop

The Main Outcrop rises to a considerable height above Central Creek, and it was decided to make some measurements to determine the approximate height and contour of the outcrop. The measurements were restricted to the part of the outcrop to the north-west of Central Creek. This part includes most of the outcrop and is the part that contains the highest outcrops.

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3. <u>Contouring the Main Outcrop</u> (Cont.)

Chain and Abney level surveys were made along those portions each of three Traverses (1, 2 & 3) to the north-west of Central Creek, and also along Central Creek joining the lower ends of the three traverses, and along lines joining the upper ends of the three traverses. The survey was started from the intersection of Traverse 1 and Central Creek (station 1) and this was taken as the datum with a value of zero feet. The altitudes were calculated for all stations and contours drawn. The contour map is shown on the attached Plate 1.

The highest point was at the north-western end of Traverse 3 and it was about 220 feet above station 1. Along Traverse 3 there was a difference in elevation of about 170 feet.

The contours are necessarily smooth ones because of the limited number of stations measured, and represent the general configuration of the surface of the outcrop. An accurate and detailed survey would show more intricate contours, because of the crags and crevices in the magnesite-dolomite body.

Approximate calculations suggest that the contoured area down to creek level could contain some 300,000 to 400,000 tons, if the magnesite-dolomite extends down to creek level over the whole of the area. In order to obtain the total amount of magnesite-dolomite in the Main Outcrop, there would have to be added the amounts to the south-west of Traverse 1, to the north-east of Traverse 3, and to the south and south-east of Central Creek.

4. <u>Impurities in the Magnesite-Dolomite</u>

The report of 27th November, 1970 contained the analyses of representative samples from Traverse 2 across the magnesite-dolomite of the Main Outcrop, and from the smaller magnesite and dolomite bodies. The determinations were magnesia (MgO), lime (CaO) and insoluble matter. The content of insoluble matter was higher than expected, and it was decided to have analyses made of the silica (SiO_2), alumina (Al_2O_3) and ferric oxide (Fe_2O_3). Composite samples were made of the 15 samples of magnesite-dolomite and of the two samples from the magnesite body. The one sample from the dolomite body was used for the determinations on the dolomite.

The results of the analyses by the Tasmanian Department of Mines Laboratory are given in the following table.

Registered No.	Mineral	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	Previous Analyses	
						Insol %
710007 (Composite of samples 703275 to 703289)	Magnesite -Dolomite	5.1	Nil	1.7	Average of 703275-89	7.0
710008 (Composite of samples 703291 to 703292)	Magnesite	2.3	Nil	1.4	Average of 703291-2	2.5
703290	Dolomite	6.2	Nil	2.3	703290	6.5

..../3

4. <u>Impurities in the Magnesite-Dolomite</u> (Cont.)

The table includes the insoluble content of the dolomite (703290) and the averages of the insoluble content for the fifteen samples of the magnesite-dolomite (703275 to 89), and of the two samples of the magnesite (703291-2).

The results of the analyses indicate

(1) there is no alumina in the magnesite-dolimite, magnesite and dolomite

(2) the insoluble matter consists mainly of silica

(3) the dolomite contains more insoluble matter (and silica) than the magnesite

(4) the ferric oxide is less than the silica.

As stated in the report of 27th November, 1970, weathered surfaces of the magnesite-dolimite in Main Outcrop showed numerous small crystals of quartz. These crystals would account for most, if not all, of the silica content. The absence of alumina indicates that there was no residual pyroxenite (either altered or unaltered) in the samples. The iron content is expressed as ferric oxide, but is not necessarily present as such. The iron could be contained in any siderite present, in the magnesite and dolomite, and in any pyrite and chalcopyrite. As the absence of pyroxenite (either altered or unaltered) is suggested by the absence of alumina, it is unlikely that any iron comes from that source. The two sets of analyses suggest that the iron in samples 710008 (magnesite) and 703290 (dolomite) is acid soluble, and therefore, probably contained in the carbonate minerals, whereas the iron in sample 710007 (magnesite-dolomite) is insoluble in acid and may therefore be derived from any pyrite and chalcopyrite and silicate minerals present.

5. <u>Utilisation of the Deposit</u>

The deposit of magnesite and dolomite includes three outcropping bodies - the Main, Victory and Eastern Outcrops. The Main Outcrop consists mainly of mixed magnesite and dolomite, but contains a small body of magnesite and one of dolomite. The Eastern Outcrop consists of mixed magnesite and dolomite, and the Victory Outcrop of magnesite. Under these conditions, it becomes a problem as to what minerals can be produced and whether the products can be utilised. Another problem is related to the high content of insoluble matter. These problems will be considered below

a) <u>Marketing Magnesite</u>
Magnesite could be mined from the Victory Outcrop and the small body in the Main Outcrop and from any other small bodies in the Main Outcrop.

i) The magnesite from the Victory Outcrop appears to be the best grade, but the samples were spot ones and not representative ones across the body. The analyses indicated a magnesium carbonate content that ranged from 97.8 to 98.9%. Representative sampling and drilling would be necessary to determine the grade of the magnesite and the extent of the body.

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a) Marketing Magnesite (Cont.)

ii) The small body of magnesite in the Main Outcrop was tested by two representative samples (703291 and 703292) each 30 feet long, across a width of 60 feet. The average of the two samples are as follows

MgO	45.25%
CaO	1.05%
Insol	2.50%

The analysis of a composite sample (710008) from the above two samples gave the following result

SiO	2.3%
Fe_2O_3	1.4%

The average magnesium carbonate is 94.57% so that the grade is not as high as that from the Victory Outcrop. Further representative sampling and drilling would be necessary to establish the grade and extent of the body.

iii) The following samples each across 20 feet from other parts of the Main Outcrop gave high contents of MgO

	MgO %	CaO %	Insol %
703282	46.1	0.3	3.1
703288	44.8	1.8	1.8
703289	44.3	2.2	2.0

The grades are generally similar to those from the magnesite body described in (ii) above, and may represent similar bodies. Samples 703288 and 703289 are fairly close to the magnesite body with no samples between them, and may be an extension of that body.
Further sampling and drilling would be necessary to test and establish the grade and extent of any such bodies.

b) Marketing mixed magnesite and dolomite

Apart from the magnesite body and other possible bodies of magnesite as described in (a-iii) above, and the dolomite body (sample 703290), the greater part of the Main Outcrop consists of a mixture of magnesite and dolomite with magnesite greatly in excess of dolomite. This material would have to be mined as such and presumably market ed as such.

Possible uses of the product would be

i) to calcine or otherwise treat the product to give a refractory material superior to that made from dolomite

ii) to treat the product chemically by processes such as that for making sea-water magnesia from dolomite for the ultimate production of calcined magnesia.

On general grounds, there seems to be no reason why such a mixed product containing about 86% $MgCO_3$ or 41.4% MgO should not be used in the sea-water process in preference to dolomite which contains no more than 21.8% MgO. Any objections on technical grounds could be decided only by operators of sea-water plants.

Another possible process would be the calcining of the mixed product and the storage of the carbondioxide which would be passed later through a "milk" of water and the calcine. This would separate the lime from the magnesia.

..../5

6. Removing the Impurities

The analyses show that the main impurities in the magnesite and particularly in the magnesite-dolomite are the lime, silica, ferric oxide (representing the iron) and perhaps alumina. The removal of one or more of these would greatly improve the grade of the final product.

The lime is contained mainly in dolomite present, and to a slight extent in the composition of the magnesite. The silica is present as small quartz crystals up to 0.5 inch in length. The iron probably is in small amounts in the magnesite and dolomite and any siderite present, and is contained in any pyrite and chalcopyrite present. It could be present also in any other minerals existing in small amounts in the magnesite, dolomite, and magnesite. There is little or no alumina present.

It is most unlikely that any mechanical process would satisfactorily and economically separate the magnesite and dolomite from each other, or the quartz from either of them or both. Any possible separation would probably not produce high grade products.

The removal of the iron would of course be dependent on the minerals in which it occurs and the possible process used, and the result would probably be an unsatisfactory one.

The separation of the impurities, either partly or wholly, is more likely to be achieved by, or during, chemical processes such as the sea-water process. The lime is separated by that process and so, also would be any part of the iron and alumina that is soluble. The knowledge that the silica is present as quartz crystals would help in considering the removal of that impurity. The quartz would be contained in any precipitate such as magnesium hydroxide, and it would be necessary to dissolve and re-precipitate the magnesia to separate it from the quartz.

7. Conclusions

The magnesite-dolomite deposit includes the Victory, Main and Eastern Outcrops. The Victory Outcrop consists of magnesite, the Main Outcrop of mixed magnesite and dolomite with one small body of dolomite and one or more small bodies of magnesite, and the Eastern Outcrop of mixed magnesite and dolomite.

The mixed magnesite-dolomite is too intimately mixed to allow selective mining to separate the two minerals. The only selective mining possible would be the mining of the small body of dolomite and the one or more bodies of magnesite in the Main Outcrop. The necessary preliminary steps to any mining of the small bodies would be to do more representative sampling, and shallow drilling to establish the grade and extent of each body and the amount of mineral obtainable by open cut mining methods.

The possible exploitation of the mixed magnesite and dolomite is more difficult. It is improbable that any mechanical method of separation could be applied, but even if one could be applied, the resulting products would probably not be high grade.

7. Conclusions (Cont.)

The magnesite-dolomite consists mainly of magnesite, and, if calcined, would give a product much better than that from calcined dolomite.

Treatment by chemical methods to produce magnesia such as the sea-water process, appears to offer the best method of utilisation. On general grounds, there seems to be no reason why the mixed magnesite-dolomite could not be used instead of dolomite in the sea-water process, but the opinions of expert operators would be needed to ascertain if there would be any technical difficulties. The magnesite-dolomite contains more magnesia than dolomite does, and this would be advantageous. Further representative sampling and drilling would be necessary preliminary steps to such treatment.

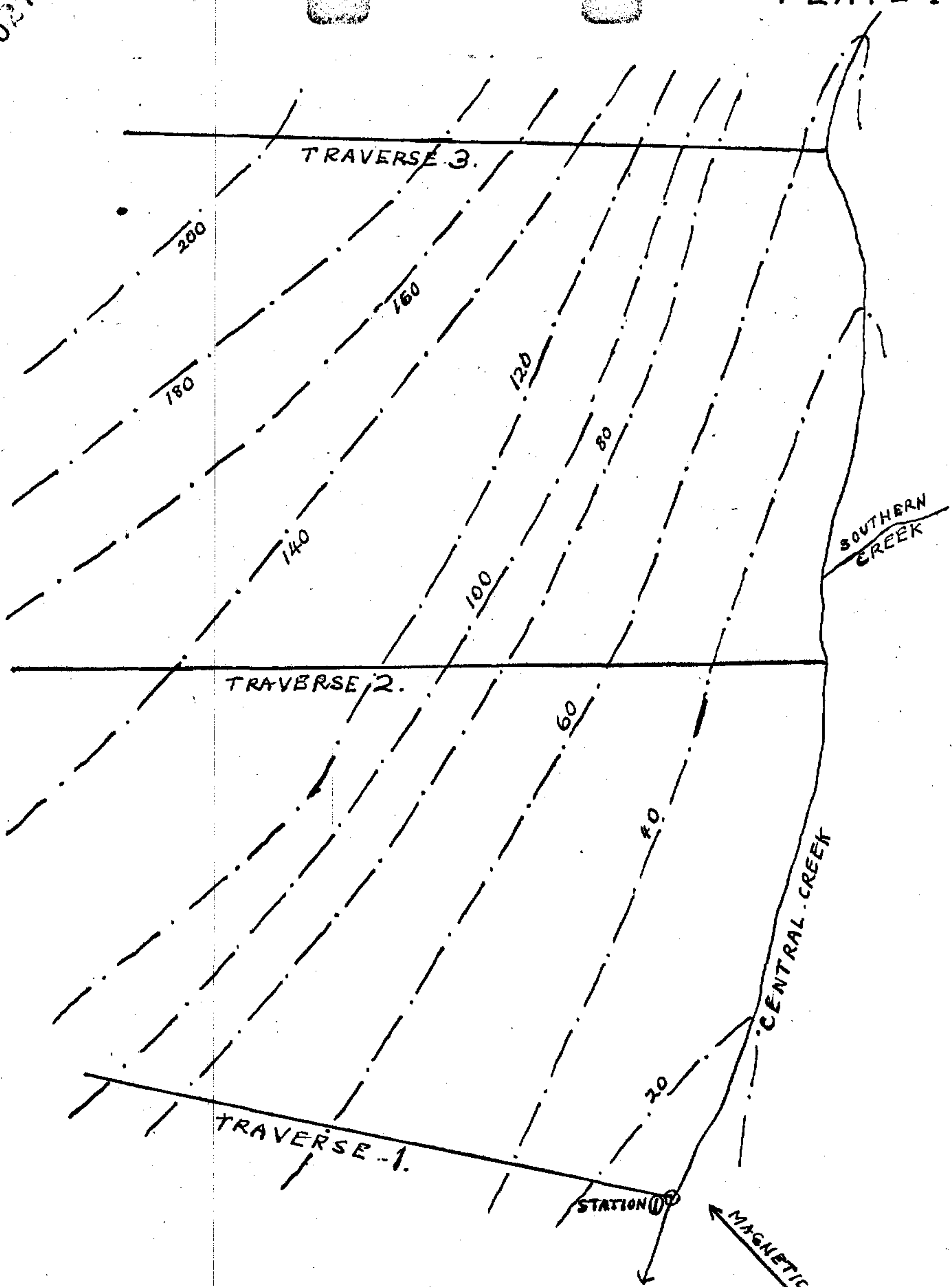
Chemical treatment would probably offer the best method of eliminating the impurities, particularly the silica which is present as quartz. If solution of the magnesia is not part of the normal chemical process it might be necessary to incorporate such solution to separate the insoluble quartz from the magnesia.

PBNye.

P.B. NYE

Melbourne
23/3/1971

PLATE 1



PART OF MAIN OUTCROP
SHOWING CONTOURS (APPROX.)

CONTOURS —·—
INTERVAL 20 FEET
DATUM STATION ①. 0 FEET

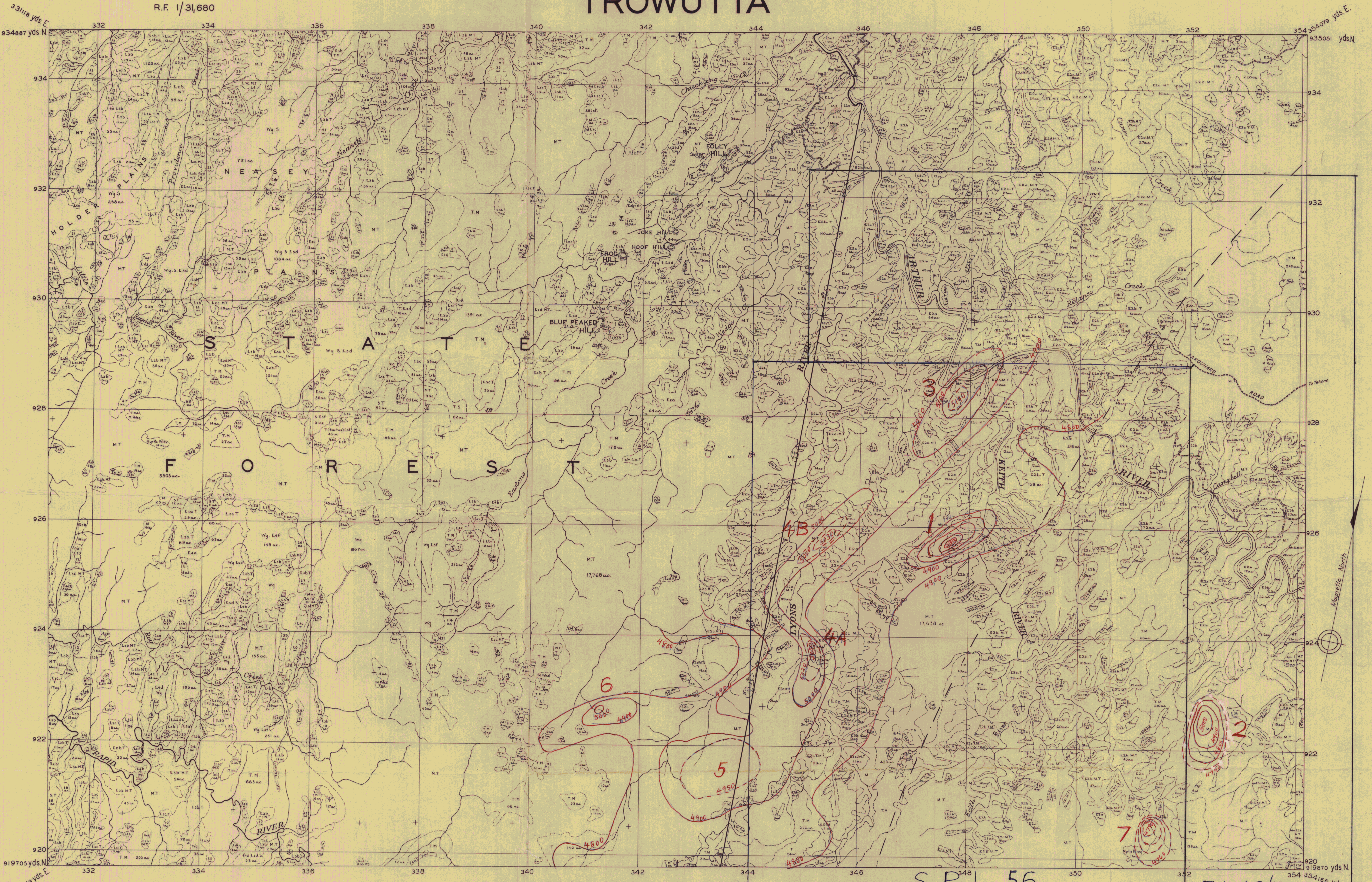
SCALE
1 INCH TO 50 FEET.

23/3/71.

5 cm

TROWUTTA

R.F. 1/31,680



Scale: 40 Chains to an Inch.

20 chs. 0 20 40 60 80 100 120 140 160 chs.

Form Line Interval feet

EUCALYPT REGROWTH CLASS

(As at date of photography)

ER1—up to 50 ft.
ER2—50-90 ft.
ER3—90-120 ft.
ER4—120-145 ft.
ER5—145-165 ft.
ER6—above 165 ft.

KEY TO ADJOINING SHEETS

	SMITHTON		
BLUFF PT.	A	B	BURNIE
	C	D	
	MAGNET		

OTHER FOREST TYPES

M —Myrtle
T —Secondary species
V —Cultivation and pasture
Vo —Orchard
Vz —Rough grazing
S —Scrub
K —Bracken
W —Wasteland
Wg —Button grass, or heathy plain
Wm —Mountain Moor
Wr —Bare ground, or rock
f/d —Fire damaged
O/m —Over mature
C/o —Cut over
Pr —Pinus Radiata

EUCALYPT TYPES

E —Eucalypt Forest
E1—Mature Eucalypt Forest average height of dominants above 180 ft.
E2— " " " from 135-180 ft.
E3— " " " from 90-135 ft.
E4— " " " from 50-90 ft.
E5— " " " less than 50 ft.

ER —Eucalypt Regrowth
ERg—Eucalypt Seedling and Sapling Regrowth
ERp—Eucalypt Pole Regrowth

NOTE—

The figure shown beneath the type classification denotes the Forest Potential of the area. The Potential is based on the remnants of the previous mature stand and is classified in the same manner as Mature Eucalypt Forest. The symbol X indicates that the Forest Potential is not apparent.

DENSITY CLASSES (Mature Eucalypts only)

TREE COUNT
A—More than 15 eucalypt stems per acre
B—11-15 eucalypt stems per acre
C—6-10 " "
D—1-5 " "

CROWN COVER
a—70-100 per cent eucalypt crown cover
b—40-70 " "
c—20-40 " "
d—5-20 " "
f—less than 5 " "

TOTAL MAGNETIC INTENSITY MAP

100 gammas

10 "

MOST 10 GAMMA CONTOURS NOT SHOWN

CONVENTIONAL SIGNS

All weather roads
Summer roads
Tracks
Trams
Private property boundaries
State forest boundaries
Type boundaries approx only
Sawmills
Old mill sites
Fire lookout Stations L.O.
Forestry Comm. trig. stations
Other trig. stations

DATE OF PHOTOGRAPHY: 1952 & 1953

DATE OF PRODUCTION: 1962

761029

5 cm

Compiled from Air Photographs
by
Mapping Branch
Forestry Commission
Tasmania

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27D