65-394

REPORT

ON

BALFOUR, TASMANIA - PROSPECTING

1964-1965

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Melbourne

June, 1965.

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SUMMARY

The original option agreement covering Specimen Hill was terminated on 20th August, 1964. A new agreement was negotiated covering a much larger area, and this option is current until 20th October, 1965.

The prospecting activities have been restricted to specific projects during the year under review - the camp being closed during the winter months.

Activities comprised further ground magnetometer surveys to define the ground centre of a previously detected magnetic anomaly and the subsequent drilling of two diamond drill holes to test inferred magnetic/geologic features.

The first of these holes failed to achieve its target for reasons as yet unknown, while the second hole intersected a narrow zone of magnetic sulphide mineralisation carrying virtually no values of economic interest.

Reappraisal of the magnetometer surveys and resultant interpretations, based on the results of these two bores indicates that on largely geological grounds further testing of the line of magnetic highs, presumably related to a zone of sulphide mineralisation could be warranted, although to date results have shown little encouragement in the form of suitable tin mineralisation.

The writer's recommendations listed in Section "F" are expressed on a purely geological basis.

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A. - INTRODUCTION.

This report covers the limited prospecting operations carried out at Balfour during the 12 month period since the previous report.

It is desirable that readers of this report should have read the previous report since much background information has not been included here.

Activities during the period included the negotiation of a new option agreement, further ground geophysical surveys and the drilling of two diamond drillholes to test magnetic anomalies.

Assay results of the drill core from the last three bores are not encouraging, however, geological information has been accumulated as a result of the drilling.

The graphic and assay logs of all bores are appended to this report.

No ore reserves have been inferred.

The recommendations listed are intended as the basis on which further work can be formulated if it is decided to fully test the apparent magnetic anomaly.

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B. - TITLES.

The initial option agreement with the Syndicate, which had been in force for a period of 16 months, was terminated on 20th August, 1964, by the Company.

This option covered an area of 320 acres which took in the main extent of the surface tin bearing area around Specimen Hill, as consolidated lease 38M/63 in the name of Mr. G.M. Force.

The various geophysical surveys had indicated that the magnetic anomaly was an extensively developed feature which extended beyond this limited area and hence a new option agreement was negotiated covering a larger area and including the northern extension of the line of copper mineralisation. (See Fig. 6)

This new option agreement covers an area of 25 square miles which is held by Mr. G.C. Kingston acting as agent for the Syndicate, under Special Prospector's Licence No. 410 which was renewed on the 18th January, 1965, for a further period of six months.

The agreement came into force on the 20th October, 1964, under the following conditions:

(a) 12 months option on payment of £200.
(b) Extension for further 12 months on payment of £200.
(c) Purchase price £45,000, including above payments.
(d) Results of testing to be made available to the Vendor if option is not exercised.

The option allowed the Company full rights to test both the copper and tin mineralisation at depth.

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C. - GENERAL.

1. PERSONNEL:

Operations were suspended during the winter of 1964, the camp being unattended during the period July to December. The camp has again been closed for the current winter.

During the periods of operation, a general average of about three persons were engaged on the specific projects discussed below.

During the period under review the Arthur River Punt load limit was reduced from 7 to 4 tons. This meant that it was not possible to obtain the services of a bulldozer for road work, drill site access and costeans.

2. GEOPHYSICAL:

Following the interpretation of the results of the B.M.R. aero-magnetometer work undertaken early in 1964, the Company geophysical team extended their previous ground work over Specimen Hill, to the north and south, in an endeavour to further define the magnetic anomaly. The results of this work are shown on Fig. 4, while full details are to be found in a separate report by Mr. Taylor.

3. GEOLOGICAL:

Virtually no geological mapping has been undertaken since the previous report and hence the recommendations listed as Nos. 1, 2 and 6 of Section I of the 1964/1964 report are still highly desirable before further prospecting is carried out.

Core logging, sampling and surveying of actual drill hole sites comprised the only field geological activities carried out. Some petrological work was carried out on selected core specimens from DDB.5 - see petrological report by S. Whitehead No. 9/65.

4. DRILLING:

A programme of two diamond drill holes totalling 1529 feet was drilled with the Company owned FD.20 drilling machine, with Company operators drilling under contract.

Details of these drill holes are:

Drillhole	Co-ordinates	Total Depth	Remarks
DDB.5	S 25.7, E 0.7	929.1	Vertical
DDB.6	N 0.5, W 10.6	600.2	Inclined at 55° to the 236° mag.
		1529.3'	

These two holes were sited to test the magnetic anomalies located by the ground magnetometer surveys. Results which were not encouraging are discussed later.

It is mentioned that DDB.6 was not surveyed on completion to check its spatial attitude.

As a result of the operation of contract drilling incentives these two holes were drilled at exceptionally fast rates. Costs which are being computed by the Drilling Superintendent are likely to be much lower than previous Balfour drilling.

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D. - APPRAISAL OF RESULTS

1. GEOPHYSICAL:

Preliminary interpretations of the nature of the subsurface geological feature, which was giving rise to the surface magnetic anomaly postulated as "a source 700 feet wide, 350 feet below the surface striking at about 350° magnetic and dipping east at 70°". From this, further assumptions were made which indicated that the dyke-like body had a magnetic susceptibility of 2.5×10^{3} C.G.S. units which would indicate a fairly high pyrrhotite or magnetite content - see Report by Mr. C.P. Taylor, January 1965.

Previous drilling at sites DDB. 2 and 4 was inconclusive, since hole No. 2 was not carried deep enough while hole No. 4 was located in an area where the magnetic anomaly was lowest - see Fig. 4.

Hence the two drillholes of the recently completed programme were sited so as to test specific anomalous targets.

The results of the drillholes appear to indicate that the dispersion of sulphide blebs (including pyrrhotite) throughout the shale-siltstone sequence tends to mask a relatively thin dyke-like body with an associated high sharp magnetic anomaly.

Further, it appears that this dyke-like body has a near vertical dip - see Fig. 2.

In order to appreciate the implications of thelimited magnetometer work carried out at Balfour, figure 5 is a compilation showing the available aeromagnetic information of the area - compiled from Mines Department records. By inspection it can be seen that the magnetic anomaly at Specimen Hill is one of a series which occur along an apparently continuous line over a distance of at least 20 miles. This then introduces a degree of

doubt as to whether the intersection encountered in testing one of the anomalous highs can be validly extrapolated to cover all the anomalies.

A further point which arises is that any economic mineralisation need not necessarily be associated with the anomalous "highs" along the line - it could conceivably be associated with the "lows" in between the highs.

2. DRILLING:

The two drillholes are considered separately below:

(a) DDB.5:

This hole was sited at the centre of the marked southern anomaly with the aim of intersecting the sulphide body inferred from the geophysical results. The hole was drilled vertically with the object of obtaining a greater length of intersection of the inferred sulphide dyke (with a 70° dip).

The hole failed to intersect the inferred large scale magnetic sulphide zone inferred from the magnetic survey, in fact for its full length of 929 feet it passed through a sequence of steeply dipping banded light and dark grey siltstones with disperse blebs of sulphide scattered throughout. A number of typical Specimen Hill type quartz sulphide veins up to 6 inches thick were also encountered.

Thus, a number of possibilities arise:

(i) The disperse blebs of sulphide are sufficient to produce the magnetic high.

(ii) The drill hole was sited to the west of the inferred dyke like body (dipping east), which was thinner than inferred.

(iii) The dip of the body was more nearly vertical and the hole parallelled it (on either the eastern or western sides).

(iv) The dip of the body was to the west and the hole was sited too far to the east.

The susceptibility measurements made by the B. M. R. on three representative core specimens taken from near the top, middle and bottom of the hole show little variation. Further the susceptibilities are inferred as being sufficient to produce the measured magnetic anomaly - according to Mr. Taylor. The writer disagrees with the latter since there is virtually no difference in the abundance of sulphide blebs in the core from DDB4 and DDB5.

Hence the writer would tend to discount the first possibility.

It is of course not possible to determine which of the remaining possibilities is the most likely, but on considering the relative straightness of the line of the anomalies (over 20 miles) and the evidence from hole No. 6, it appears the third possibility is most probable.

(b) DDB.6:

This hole was sited to the east of a localised high on the northern anomaly. Associated with this high was a surface exposure of massive leached quartz near the interpreted axis of the fold structure mapped on Specimen Hill.

The drillhole was angled at 55° to the 236° magnetic so as to intersect the inferred dyke-like body at a vertical depth of about 400 feet. This was based on an inferred dip of the body of "steeply to the southwest". Outcrop of the leached quartz body indicated a thickness of about 10 feet.

The cross section opposite (Fig. 2) shows the general spatial attitudes of the bore and surface features together with the mineralised zone intersected by the bore. It should be remembered that the inclination of the hole was not checked by down the hole survey.

The bore intersected a zone between 422.1 feet and 447.1 feet in which replacement along a probable fault zone or major joint system had taken place. In the process of replacement some of the siltstones in the zone were silicified and in part chloritised and had some disseminated sulphide mineralisation imparted. In other sections of the zone presumed complete replacement of siltstones had taken place, with the resultant development of massive vein type quartz with variable amounts of sulphide minerals.

The average sulphide content in the zone was probably about 5 to 10% overall. The core had a fairly strong magnetic attraction indicating that pyrrhotite was a major constituent of the sulphide mixture. Pyrite, minor chalcopyrite and very minor galena and sphalerite made up the rest of the sulphide mineral assemblage. No cassiterite or wolframite was evident, but a 10.6 feet section of quartzite (silicified siltstone) between 415.8 and 426.4 assayed 0.19% Sn. This was the only mineralisation of any interest.

It seems feasible on the grounds of relative similarity of the core intersection to that observed in outcrop, that the two zones can be correlated as shown in Fig. 2. If this correlation be valid then it can be inferred that the mineralised feature giving rise to the magnetic anomaly is of vertical dyke form, about 10 - 14 feet thick, carrying admixed sulphides. In this particular intersection the mineralisation did not include cassiterite in quantities of interest.

3. GEOLOGICAL:

A number of geological factors have become apparent as a result of the activities carried out at Balfour.

(a) Petrological:

Microscopic examination of specimens of core from various drill holes and specimens of surface rocks from widespread outcrops around

Balfour have all shown the presence of authigenic tourmaline both in quartzitic and siltstone rock types.

The sulphide blebs have been inferred as being of two ages both syngenetic and epigenetic, with pyrrhotite predominating in the latter.

Deformation of the bedding has taken place in two stages - during consolidation and by later tectonic shearing.

(b) Palaeontological:

Specimens of quartzite collected from various localities in the Balfour area have had apparent fossil remains identified by Dr. A. Opik of the Bureau of Mineral Resources. This places the geological age of the host rocks as Lower Palaeozoic rather than pre-Cambrian.

(c) Structural:

Despite limited regional ground mapping in conjunction with a number of different photo geological interpretations (carried out by different workers) it is not yet possible to determi ne the main structural elements of the area. As a consequence there is no apparent relationship between the line of isolated magnetic highs and any known structural feature, the results of bore number 6 being the only positive indication that a linear structural feature actually exists along the apparent axis of the fold on Specimen Hill - see Figs. 3 and 6.

A similar problem arises when the line of copper mineralisation is considered - Fig. 6. There is no apparent structural or trend line which could explain the presence of the discontinuous series of sulphide occurrences. Furthermore there is no associated or related aeromagnetic feature (Fig.5).

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E. - CONCLUSIONS.

In assessing the results of overall prospecting activities in this area the following points appear to be of importance when considering the possibility of economic mineralisation. These conclusions are predominantly concerned with tin mineralisation since virtually no detailed work has been carried out on the line of copper mineralisation.

1. One anomaly of an apparently continuous line of isolated aeromagnetic "highs" of low relative intensity has been shown to have a ground development associated with a narrow near vertical zone of sulphide mineralisation.

   The relative continuity of the line of anomalies seems to indicate that correlation along the line may be valid - i.e. the highs are associated with magnetic sulphide mineralisation.

2. The structural controls for this inferred line of apparently discontinuous mineralisation are unknown (see Item 6).

3. Once the regional ground trace for the line of the anomalies has been located individual target areas must be traversed in detail so as to allow precise interpretation as to thickness and attitude - bearing in mind the results of DDB.6.

4. A single intersection of a magnetic sulphide body apparently related to a small (area) anomalous high showed a negligible tin content. The validity of extrapolating this result to the remainder of this magnetic high and even further afield to other isolated highs is dubious.

5. The possibility arises that economic mineralisation (copper or tin) may not be related to magnetic highs - it may in fact be related to magnetic lows.

6. The exposure of relatively continuous lines of bedrock over Specimen Hill appears to indicate that no particular zone has an appreciably higher proportion of veins developed on it, though the abundance of workings on the northwestern side has resulted in the exposure of a lot more veins.

This apparent uniformity of vein development over Specimen Hill, which appears to be the main area of vein development, indicates a fairly broad control for the premineralised fractures which are presumably due to the effect of folding on the interbedded brittle and plastic sandstone and shale sequence.

Whether the axis of the Specimen Hill fold structure is related to the axis of the inferred zone of sulphide mineralisation is unknown - in plan they appear identical.

7. It has been shown that the magnetic method is locating (defining) an anomaly which appears related to a subsurface structure (zone of magnetic sulphides). However, it is not defining a known surface feature (zone of copper mineralisation). Hence it may be appropriate to test other geophysical methods, which may detect non-magnetic sulphide mineralisation.

8. It appears that the development of disperse blebs of mixed sulphides (i n part magnetic) throughout much of the siltstone sequence below the weathered zone, causes a masking effect over the relatively narrow, sharply defined, strongly magnetic sulphide body. This is a basic inferred conclusion and could only be confirmed by a drill hole intersection or an induced polarisation geophysical method which detected the more intense mineralisation.

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F. - RECOMMENDATIONS

The prospecting activities at Balfour have not yielded any results which confirm the occurrence of other than minor tin mineralisation in the area.

However, the presence of a magnetic zone of sulphide mineralisation has been shown to exist in part of an anomalous magnetic high of relatively small magnitude which is one of a series spread over a considerable length.

Hence purely on the basis of testing this magnetic zone, the mineralisation of which shows varying degrees of resemblance to other West Coast (Tasmanian) tin occurrences (parts of Mt. Bischoff, Renison Bell, Mt. Cleveland), the following testing programme is put forward as a guide for any future prospecting:

1. REGIONAL:

(a) Detailed geological mapping of the area between the "high plain" and the Mt. Frankland ridge system. This comprises a strip some 2 miles wide and should be continued to the north and south of Balfour along the line of the aeromagnetic anomalies.

Mapping should be predominantly aimed at elucidating structure in relation to the trend of the line of magnetic highs and the inferred line of copper mineralisation.

(b) Use of another geophysical method, e.g. Induced Polarisation to endeavour to define the non-magnetic mineralised features - the copper mineralisation and the magnetic "lows" associated with the line of magnetic highs.

2. IMMEDIATE TESTING:

(a) Tin:

If further testing of the tin potential of the magnetic sulphide zone is considered desirable, two drillholes are warranted after further detailed ground magnetometer and induced polarisation traverses. These traverses are required primarily to determine whether non magnetic sulphides exist in the areas of magnetic "lows" and the dip of the inferred bodies.

The locations of these proposed traverses which are considered the minimum are shown on Fig. 4.

Location 1: Following determination of dip an inclined drill hole is desirable to test this magnetic feature. It is considered of more value to drill this large "high", rather than the isolated "high" at Location 3; although the traverse at location 3 is required as a check for dip determinations (since some casing was left in drill hole DDB.5).

Location 2: Following an induced polarisation traverse along this line to confirm the presence of a non-magnetic sulphide zone, an inclined drill hole is necessary to test the nature of the sulphide mineralisation. It may be considered of greater value to drill the more marked magnetic lows, after checking by induced polarisation which exists to the south and north of the magnetic high - location 4 or north of location 3.

The depression and actual locations of these suggested drill sites cannot be precisely sited until the geophysical traverses have been carried out and a more reliable dip has been determined (direction and angle).

(b) **Copper:**

From the aeromagnetic map (Fig. 5) it is apparent that the copper mineralisation has no associated magnetic susceptibility and hence other geophysical methods must be utilised to locate targets for drilling. In conjunction with this geophysical work, detailed mapping is necessary.

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MELBOURNE
WSC:MJP
August, 1965.

GEOLOGICAL MAP - SPECIMEN HILL
BALFOUR, TASMANIA. FIG 3.

SCALE OF FEET
100 0 100 200 300
Approx 1:2400

500 Magnetic contour. (Gammas)
79·0 Gravity contour. (Milligals)

5 cm

245020

G4932

LEGEND

- Fine sandstones and quartzite.
- Finely banded contorted shales, banded light and dark grey siltstones.
- Peat soil cover.
- Road
- 480' Contour - 20' interval.
- O DDB3 Diamond drill hole.
- 4", V. / 1½", 5", Sn Outcrop quartz veins with thickness, dip and mineral.
- 60° Bedding dip and strike.
- Fault.
- Trend line (structure).
- No. 7 Costean.
- Workings.

2·6·64

MAGNETIC CONTOUR MAP
BALFOUR, TASMANIA.

SCALE OF FEET
0 400 800 1200

5 cm

LOCATION 3.
Traverse along this line with stations at say 50' spacings, possibly with additional traverses north and south.

LOCATION 2. Traverse along this line with stations at say 50' spacings.

LOCATION 1.
Traverse along this line with stations at say 50' spacings.

LOCATION 4. South of conglomerate.

LOCALITY MAP
SMITHTON
Marrawah
BALFOUR
Mt. Hazleton
Waratah

LEGEND
- Road.
- Costean
- Shaft
- Tramway (old)
- Traverse cutting contours.
- 500 / 550 — Magnetic intensity contour in gammas.
- ⊙DDB2 Diamond drill hole.
- Proposed magnetometer traverses prior to selection of final drill sites.
- Creek
- Inferred axis of magnetic anomaly.

5000'W 2500'W 00 2500'E
3500'N
2500'N
2500'S
5000'S
7500'S
9M 63
8M 63
10M 63
11M 63
DDB1
DDB2
DDB3
DDB4
DDB5 (10" BX casing at collar)
DDB6
No.1 Costean
No.2 Costean
No.3 Costean
No.4 Costean
No.5 Costean
No.6 Costean
No.7 Costean
Balfour townsite
Creek
Dam
Adit
Set. outcrop
Quartz and pebble conglomerate
O.C black shale.
Quartzite
Conglomerate

FIG 4.
245021
13-1-65 G.B.
G4310

245022

GEOLOGICAL MAP

BALFOUR DISTRICT N.W. TAS.

Photo scale, approximately 1" = 2200'

approx 1: 25000

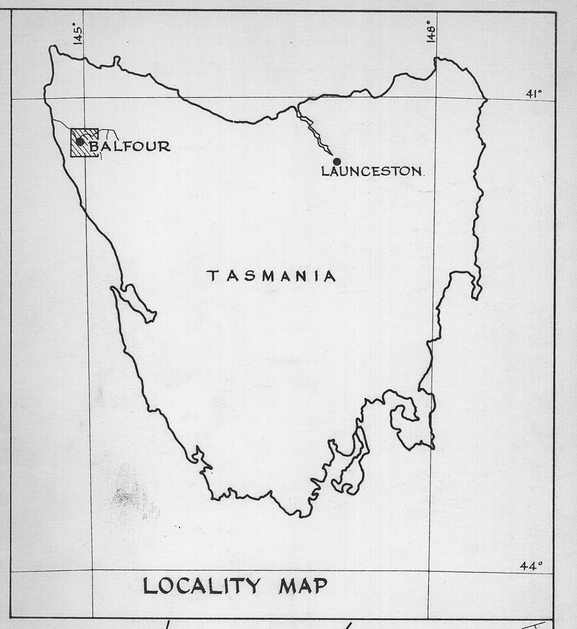
LEGEND

	Basalt.	Major quartz veins.
	Conglomerate.	75° Bedding dip & strike.
	Old conglomerate surface.	Cleavage strike direction.
Mt Frankland Beds.	Conglomerates sandstones & quartzites.	F—— ——F. Inferred faults (air photos)
		Trend lines, air photos.
Balfour Sequence.	Siltstones.	Shearing.
	Carbonaceous shales.	Adit
	Quartzites (& sandstones) with interbedded siltstones.	Location of old prospecting adits, shafts, costeans etc on sulphide lode? occurrences.

5 cm

GEOLOGY FROM LONGMAN MATTHEWS McNEIL (1961)

LOCALITY MAP



S.P.L. 410
25 sq. mls.

Adit and costeans
Adit and shafts
Costeans
THE CLUMP
Siltstones and quartzites
GURR & HERRINGS Adits
Shaft and adit.
CONSOLIDATED AND BLOCKS Shaft
Costeans
Pits
PREMIER
Adit
Shaft
Adit
Shaft
Adit
PIERPONT MORGAN Adits.
MT BALFOUR
Siltstones and greywacke.
Basalt tuffs breccia etc
Smithton
Bryant Hill Quartzite.
Dolomite.
Unassigned quartzite.
PUBLISHED MAPPING OF LIMIT
NELSON RIVER
FRANKLAND RIVER
OLD TRAMWAY
Emmetts Ck.
Creek
CENTRAL MT BALFOUR
BALFOUR CAMP
SPECIMEN HILL
MURRAYS REWARD MINE
TEMMA - BALFOUR ROAD
(OLD) Walking track to CRAMPONTINA
Mt Lyell Prospecting Adits and shafts
MT FRANKLAND
Costeans and adit
LEIGH RIVER
LINDSAY RIVER
BALFOUR SOUTH Adit.
MT HAZELTON
THORNTON R.
Mt Lyell prospecting.
Open adit.
Surface pits
Adit

FIG. 6.
27.5.64 G.B.

65-394

G4928