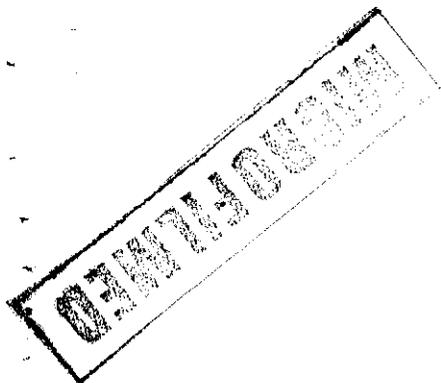


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SOUTHWEST TASMANIA

GEOCHEMICAL REPORT E. L. 13/65

1966 - 67

M. McINTYRE AND E. D. BUMSTEAD

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INTRODUCTION

Geochemical reconnaissance techniques were first used by the Company in S. W. Tasmania after Barringer Research Ltd. acting as consultants undertook and completed a feasibility study in 1964. Results obtained by Barringer Research Ltd. (1, 5 and 6) can be interpreted as successful in indicating known mineralization. It was recommended that samples be taken from streams every  $\frac{1}{4}$  mile and from every side stream. Several types of sample treatments were investigated and it was concluded that digestion with hot hydrochloric acid was the most favourable of the methods tried.

To date over 5,600 samples have been collected in fourteen effective field weeks. Samples collected in the 1966-67 season were attacked by a perchloric-hydrochloric acid mixture and analysed for copper, zinc and nickel.

Sampling has been confined to areas underlain by Precambrian and Cambrian rock.

FIELD METHODS

The aim of geochemical reconnaissance is to measure element distributions and concentrations in a particular region in an effort to draw attention to areas with values which are anomalous when compared with the local tenor. These anomalous values may indicate mineralization. Both soil and stream sediment surveys have proved successful in other parts of the world for this work and these methods have both been used in Southwest Tasmania during the years 1966 to 1967.

Sample collection from stream sediments was carried out in the following manner. After a work area was selected, aerial photographs were studied and stream sample positions and the most efficient traverse selected. Sample sites were spaced first at quarter-mile intervals but later half-mile intervals were used, as the dispersion trains of the elements under investigation were found to be sufficiently long. Sites immediately above the confluence of two streams were also sampled. Samples were taken from the active stream bed. Each sample should be from a similar position in the stream and of similar composition. These criteria were not easy to meet. The fraction of sediment required in this survey was less than 80 BSS mesh which contains silt and clay material.

Since streams of Southwest Tasmania are immature, their sediments are coarse grained. This meant that large samples, up to 1000 gms, were collected to provide 25 gm of less than 80 BSS mesh material for analysis. Samples were kept and dried in prenumbered water resistant paper bags, sample site and number were recorded on aerial photographs and pH, estimates of grain size, organic content and stream flow and type were noted in the field book. These field features are of use in interpretation.

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Field data in the areas tested is comparatively uniform. pH lies between 4.5 and 5.5 units and the other parameters recorded could not be expected to cause 'non'-anomalies.

The distribution of the various values is shown on figures 3 a, b and c by line thickness annotation of the drainage maps in which the thickest line represents the most anomalous stretch of stream.

The cause of an anomaly is decided after examination of the geochemical patterns and their correlation with the distribution of metal in the bedrocks. Anomalous values can be due to any of the following causes.

- a. High grade mineralized bodies of non-economic size.
- b. Contamination from mine workings.
- c. Large areas of weakly mineralized rocks.
- d. Fertilizer.
- e. Ore bodies.

Although the largest anomaly would be expected to lead to the richest mineralization, the large number of exceptions cited in the literature indicate that all anomalies should be investigated.

INTERPRETATION

Stream sediment samples represent a drainage area and as such give mean values of elements in that area. The information from the aerial photographs is transferred to a base map and the results of analysis are plotted on these. A decision at this time is required to delineate anomalous lengths of stream. A statistical method was employed during the 1966-67 season in an endeavour to obtain a more objective definition of anomalies. Unfortunately the distribution (statistical) of geochemical values is often not normal. It can not readily be described by any distributional form but the results are closest to log normal. It would be possible to obtain values assuming a log normal distribution but the work involved is manually excessive.

The method used here has applied normal distribution statistics to the problem. The median, the middle value, of values arranged in ascending order, has been taken in calculation of the standard deviation.

$$SD = \left( \sum (x - m)^2 \right) / (n - 1)$$

where m is the median

x is the value

n is the total number of values.

Background is then considered as being: zero to median (m) plus one standard deviation SD ( $\sigma$ )

- Threshold between  $m + 1\sigma$  to  $m + 2\sigma$
- 3rd order anomaly "  $m + 2\sigma$  to  $m + 4\sigma$
- 2nd " " "  $m + 4\sigma$  to  $m + 8\sigma$
- 1st " " " greater than  $m + 8\sigma$

It is felt that statistics give a more consistent picture and the results obtained by this method indicate certain areas to be anomalous.

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6.

GEOLOGY

A generalized geology is presented in Figure 2 and it can be seen that areas covered by geochemical sampling are underlain, mainly by Precambrian and Cambrian rocks.

The detailed geology of the area is reported by Hall et al. (4)

RESULTS OF GEOCHEMICAL RECONNAISSANCE 1966-67

The areas in which streams have been sampled during the season 1966-67 tenure of E.L.13/65 are shown in Figure 1. Complete coverage of the area was not carried out for two main reasons.

1. Much of the area is underlain by Triassic and Permian sedimentary rocks, Jurassic dolerite, and Tertiary basalts and semi-consolidated sediments, all of which have been considered devoid of economic mineralization.
2. Access, support and traversing are very difficult in certain areas (e.g. Mt. Anne, Frenchmans Cap and Gordon River) and costs per sample became excessive.

As far as is possible the analysis results (Figure 3a, b, c) have been considered with respect to the underlying bedrock.

Cambrian Sediments

Cambrian sediments and tuffs occur along the west coast between the Lewis and Modder Rivers, and in the Hibbs River Belt. The range of values for each element is shown in Table 1. Seventeen nickel anomalies were delineated by statistical methods in this area. All are in the Hibbs River Belt and are associated with ultrabasics. All but three anomalies lie over ultrabasic rock and it is probable that these results are characteristic of this type of rock. The coexistence of zinc and nickel values is noted in this area. The zinc values will be discussed later.

Eleven copper anomalies were detected in sediments from stream draining interbedded Cambrian sediments and tuffs

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between the Lewis and Spero Rivers. One first order anomaly is situated in this area, which warrants further work.

These streams indicate an anomalous area which could be associated with aeroelectromagnetic anomaly 20/6.

Three anomalous streams occur in the Hibbs River Belt. One second order anomaly is underlain by gabbro which is sufficient to explain its presence. The remaining two, third order anomalies are underlain by argillite and Ordovician limestone in the Modder River area. Their significance is not known. No follow up work is planned for these anomalies.

Zinc values from stream sediments over Cambrian sedimentary rocks show 29 anomalous stretches of stream. The majority are associated with copper anomalies. Other, third order anomalies are scattered sporadically over the area and are not at present considered significant.

In the Hibbs River Belt zinc anomalies of second and third order are associated with ultrabasic rocks and are in the main coexistent with high nickel values. No reason for this occurrence can be given at present. However, the similarity of ionic radius and charge of the zinc cation to those of cations derived from the magnesium-iron group of metals (Mg, Fe, Ni, Co and Mn) could lead to substitution of both nickel and zinc in the lattices of ferro-magnesian minerals expected in ultrabasics.

CONCLUSIONS

Regional reconnaissance in the Lewis to Modder Rivers area and the Hibbs River Belt has indicated two major areas for further work. The first, the Cypress Creek area, covering the Urquhart River and Cypress and South Cypress Creeks, is anomalous in copper and zinc values and the second in the Hibbs River Belt is now known as the Noddy Creek area. The Noddy Creek area shows anomalous nickel values.

RECOMMENDATIONS

It is recommended that in the Cypress Creek area certain anomalous stretches of streams, Cypress, South Cypress and Urquhart Rivers, be resampled using bank and stream sediment samples at a spacing of 100'.

In the Hibbs River Belt soil sampling along all cut roads should be carried out to investigate the nickel-zinc anomalies. Depending on the soil type samples should be taken from the B horizon. In the case of peats the base should be sampled.

Further reconnaissance sampling is required in the Hibbs River Belt to give more complete coverage. The area of Cambrian Sediments to the north of the Hibbs River Belt between Macquarie Harbour and the Indian Ocean still remain to be reconnaissance sampled. This last area includes three aeromagnetic anomalies.

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TABLE 1. STATISTICS FOR CAMBRIAN SEDIMENTS VALUES IN PPM

| Metal                      | Nickel    | Copper   | Zinc      |
|----------------------------|-----------|----------|-----------|
| Range of Values            | 0 - 477   | 0 - 190  | 0 - 180   |
| Median (m)                 | 17        | 7        | 22        |
| Standard Dev. ( $\sigma$ ) | 61        | 17       | 32        |
| Background                 | 0 - 78    | 0 - 24   | 0 - 54    |
| Threshold                  | 79 - 139  | 25 - 41  | 55 - 86   |
| Anomaly 3rd Order          | 140 - 261 | 42 - 75  | 87 - 150  |
| 2nd Order                  | 262 - 505 | 76 - 143 | 151 - 278 |
| 1st Order                  | > 750     | > 143    | > 278     |

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# THE BROKEN HILL PROPRIETARY CO. LTD. SOUTHWEST TASMANIA

AMG 348600mE,  
5326620mN

AMG 392750mE,  
5230650mN

1967

Areas covered by geochemical sampling

1965-66

0 2 4 8 16

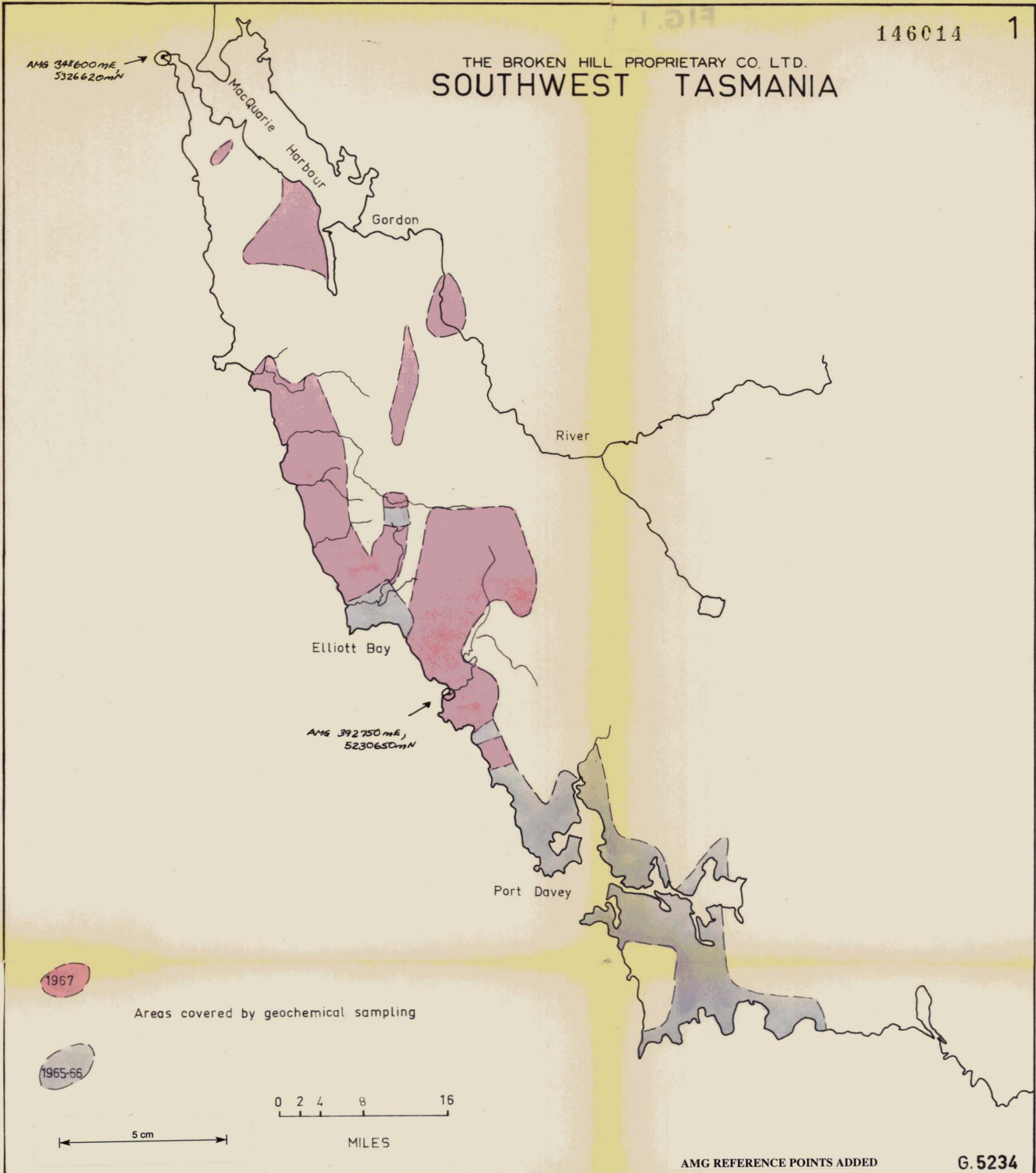
5 cm

MILES

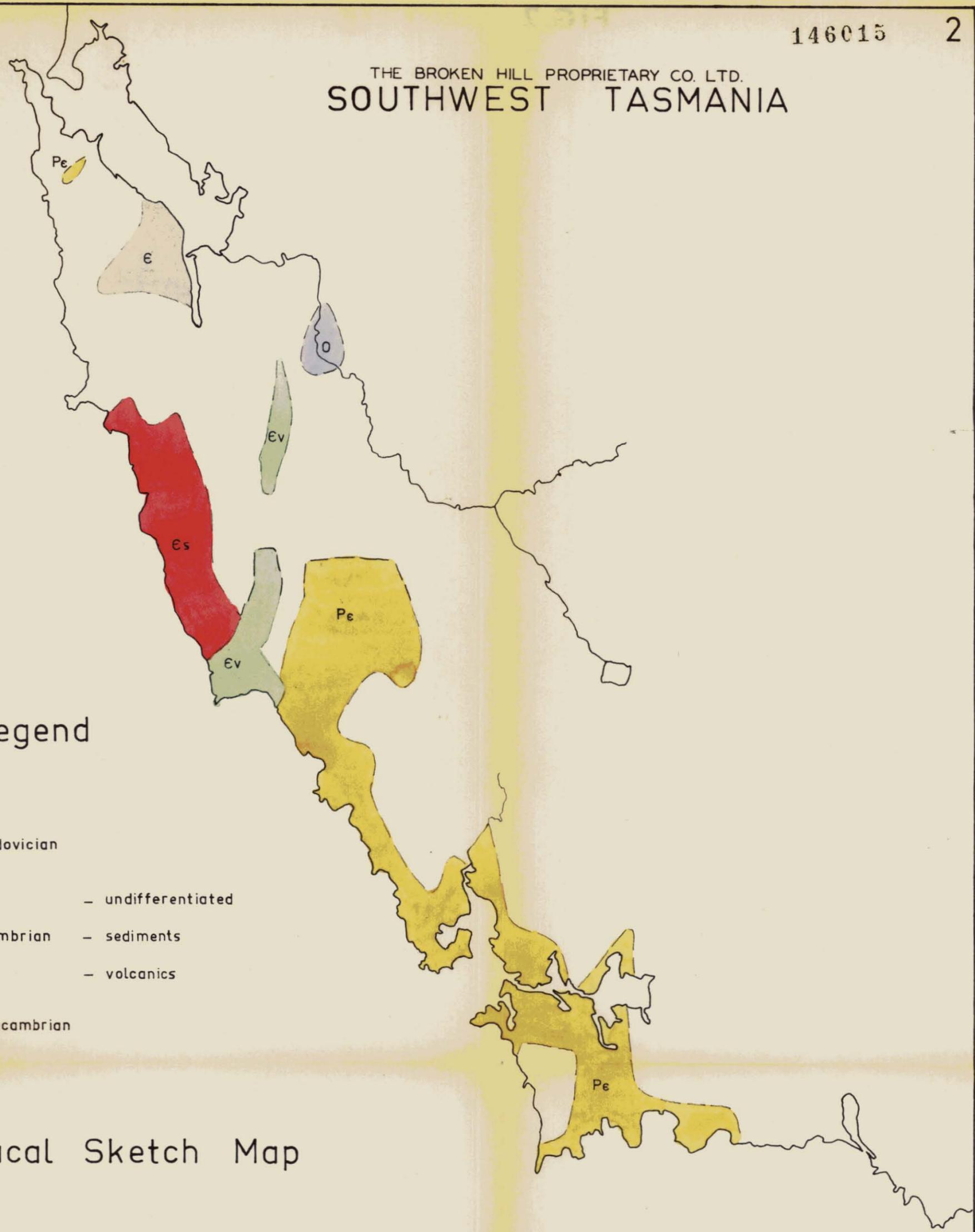
AMG REFERENCE POINTS ADDED

G. 5234

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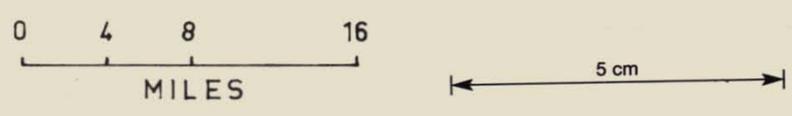
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SOUTHWEST TASMANIA



Legend

- O Ordovician
- E                    - undifferentiated
- Es Cambrian        - sediments
- Ev                    - volcanics
- Pe Precambrian

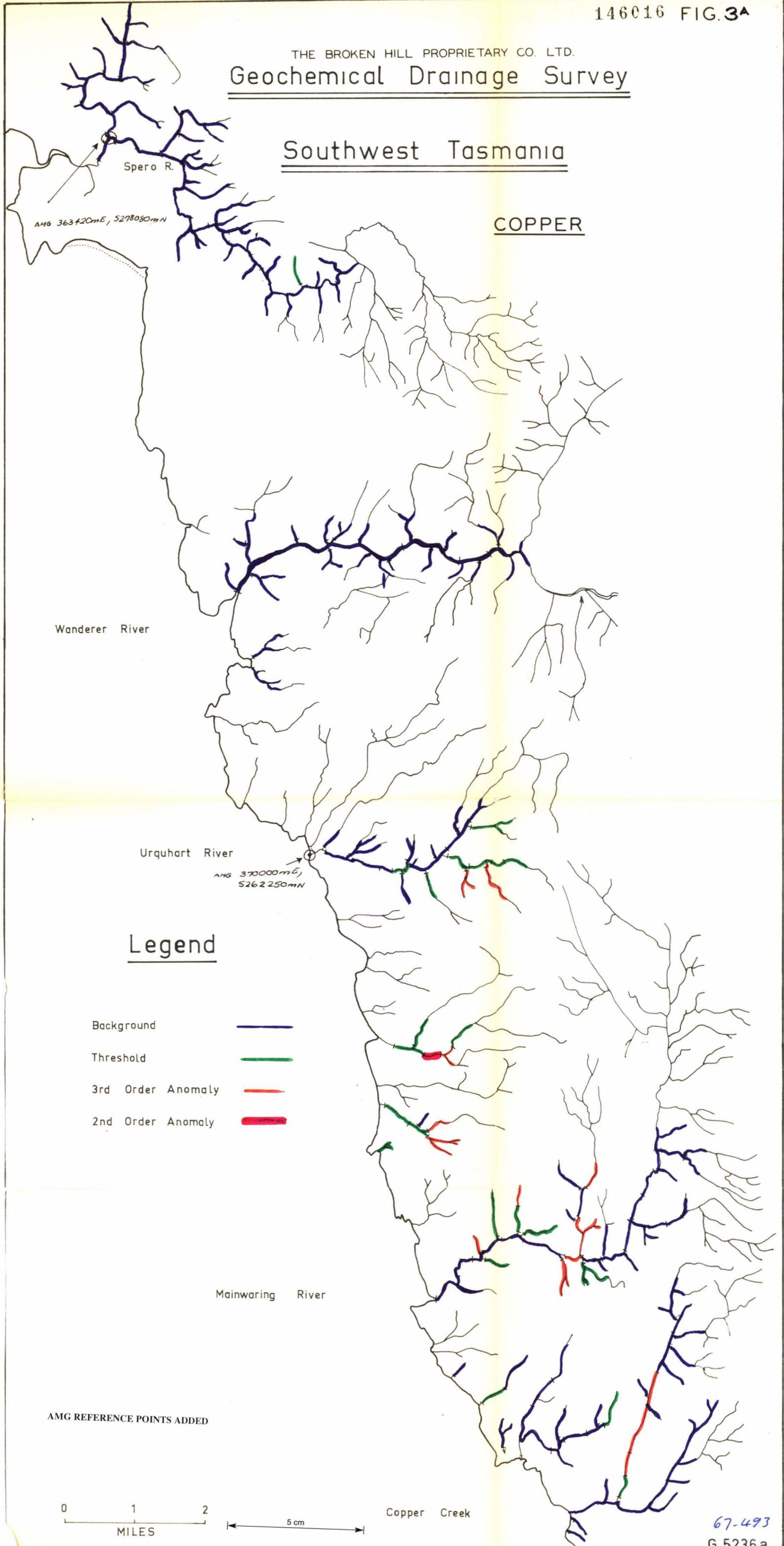
Geological Sketch Map



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Geochemical Drainage Survey

Southwest Tasmania

COPPER



Legend

- Background —
- Threshold —
- 3rd Order Anomaly —
- 2nd Order Anomaly —

AMG REFERENCE POINTS ADDED

0 1 2  
MILES

5 cm

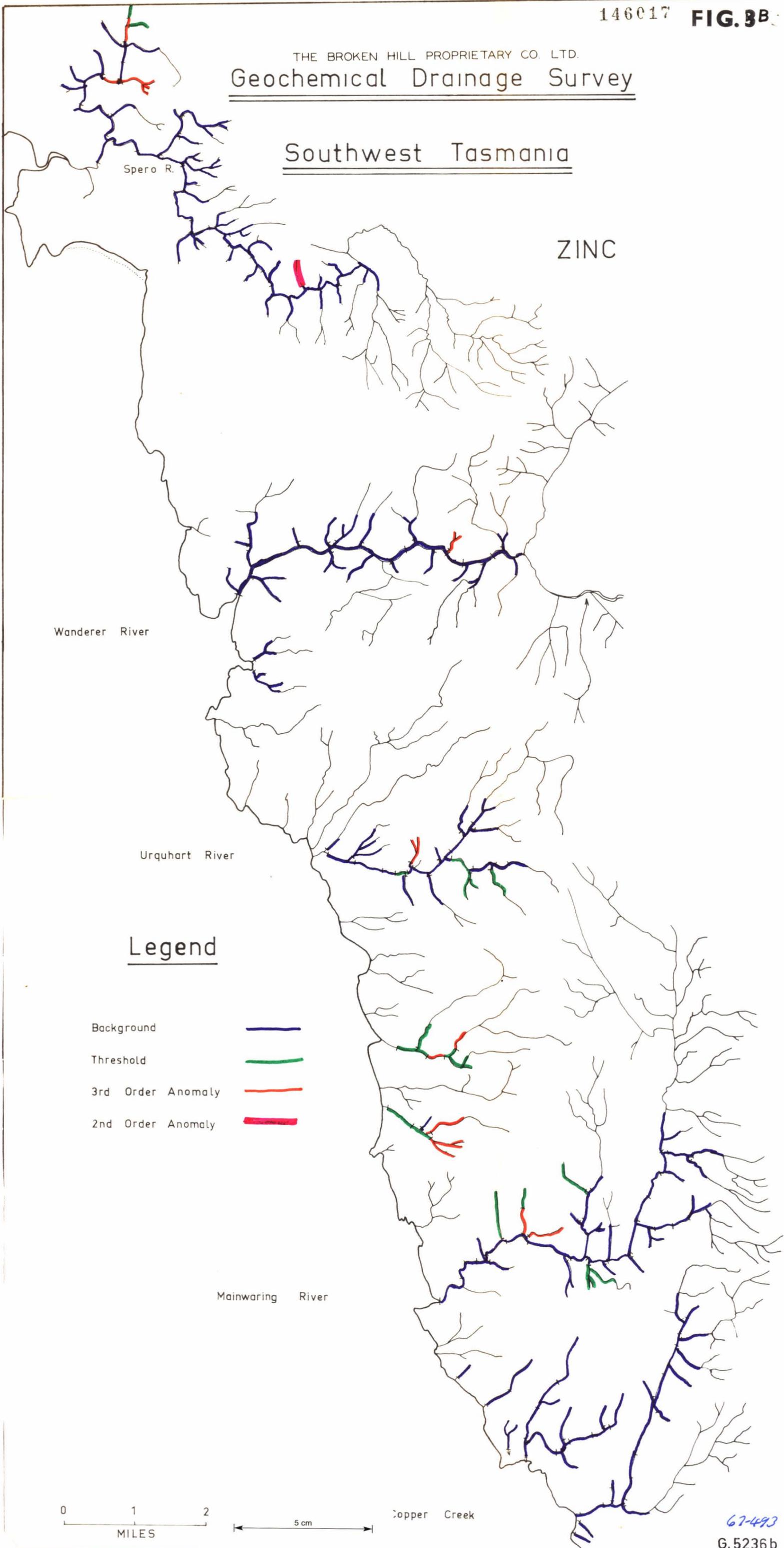
Copper Creek

67-493  
G.5236 a

THE BROKEN HILL PROPRIETARY CO. LTD.  
Geochemical Drainage Survey

Southwest Tasmania

ZINC



Legend

- Background —
- Threshold —
- 3rd Order Anomaly —
- 2nd Order Anomaly —

0 1 2  
MILES

5 cm

Copper Creek

67-493  
G.5236b

THE BROKEN HILL PROPRIETARY CO. LTD.  
Geochemical Drainage Survey

5 cm

Southwest Tasmania

- Background —
- Threshold —
- 3rd Order Anomaly —
- 2nd Order Anomaly —

INDIAN

OCEAN

Big Gravelly Beach

AMG 372800mE  
5299720mN

Birch

Inlet

RIVER

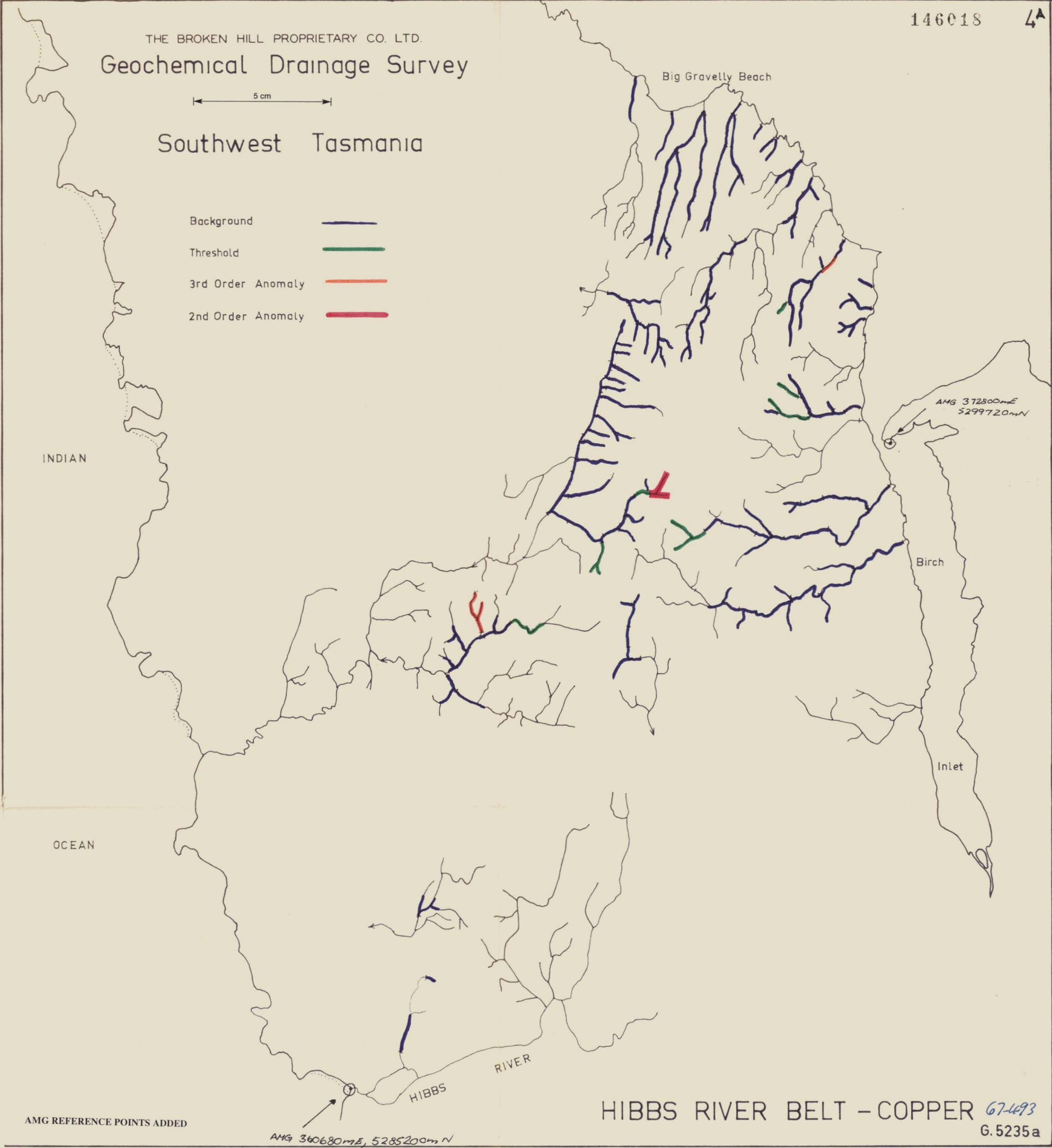
HIBBS

AMG REFERENCE POINTS ADDED

AMG 360680mE, 5285200mN

HIBBS RIVER BELT - COPPER 67-493

G.5235a



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Geochemical Drainage Survey

5 cm

Southwest Tasmania

- Background — blue line
- Threshold — green line
- 3rd Order Anomaly — red line
- 2nd Order Anomaly — thick red line

INDIAN

OCEAN

Big Gravelly Beach

Birch

Inlet

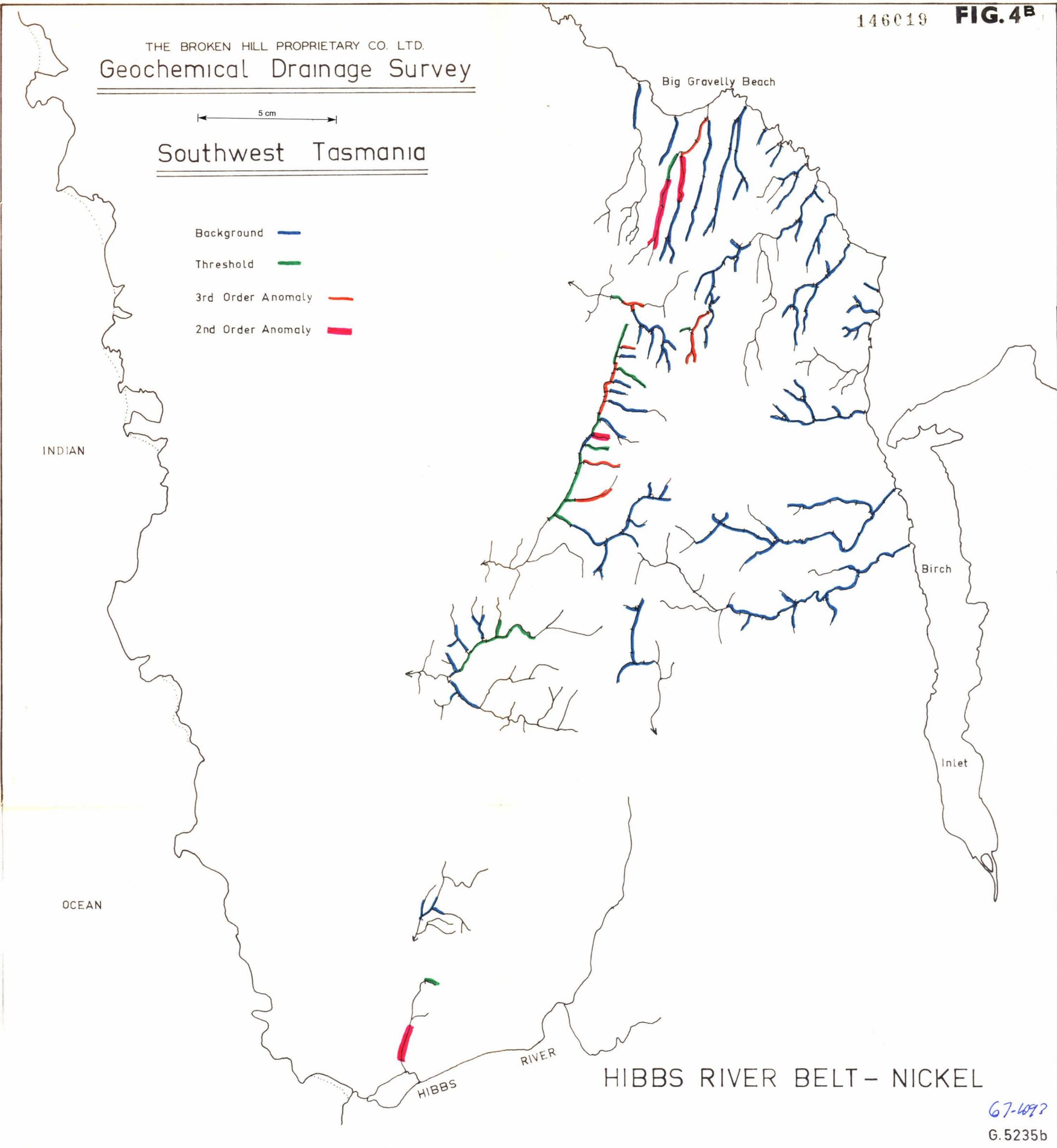
HIBBS

RIVER

HIBBS RIVER BELT - NICKEL

67-1097

G. 5235b



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Geochemical Drainage Survey

5 cm

Southwest Tasmania

- Background —
- Threshold —
- 3rd Order Anomaly —
- 2nd Order Anomaly —

INDIAN

OCEAN

Big Gravelly Beach

Birch

Inlet

HIBBS RIVER

HIBBS RIVER BELT - ZINC

67-493  
G.5235c

